

SEL-487E

TRANSFORMER PROTECTION RELAY

Starting Price

6,750 USD



FOR COMPLETE INFORMATION, VISIT SELINC.COM/SEL-487E

Multiwinding Protection—Configure the SEL-487E Transformer Protection Relay for transformer differential protection in transformer applications using up to five restraint currents. This includes single transformers with tertiary windings. Use three independent restricted earth fault (REF) elements for protection of grounded-wye windings.

Sensitive Turn-to-Turn Fault Detection—Avoid catastrophic transformer failure. Detect turn-to-turn faults involving as little as two percent of the total winding with the patented negative-sequence differential element.

High-Speed, Adaptive Differential Protection—Implement a two-stage slope that automatically adapts to internal or external fault conditions, even with CT saturation and heavily distorted waveforms, for fast, sensitive, dependable, and secure differential protection. The adaptive differential element responds to internal fault conditions in less than 1.5 cycles.

Diverse Transformer Applications—Protect large transformers with breaker-and-a-half high- and low-side connections. Also, configure for a typical two-winding transformer application, and use the remaining three-phase current inputs for feeder backup protection.

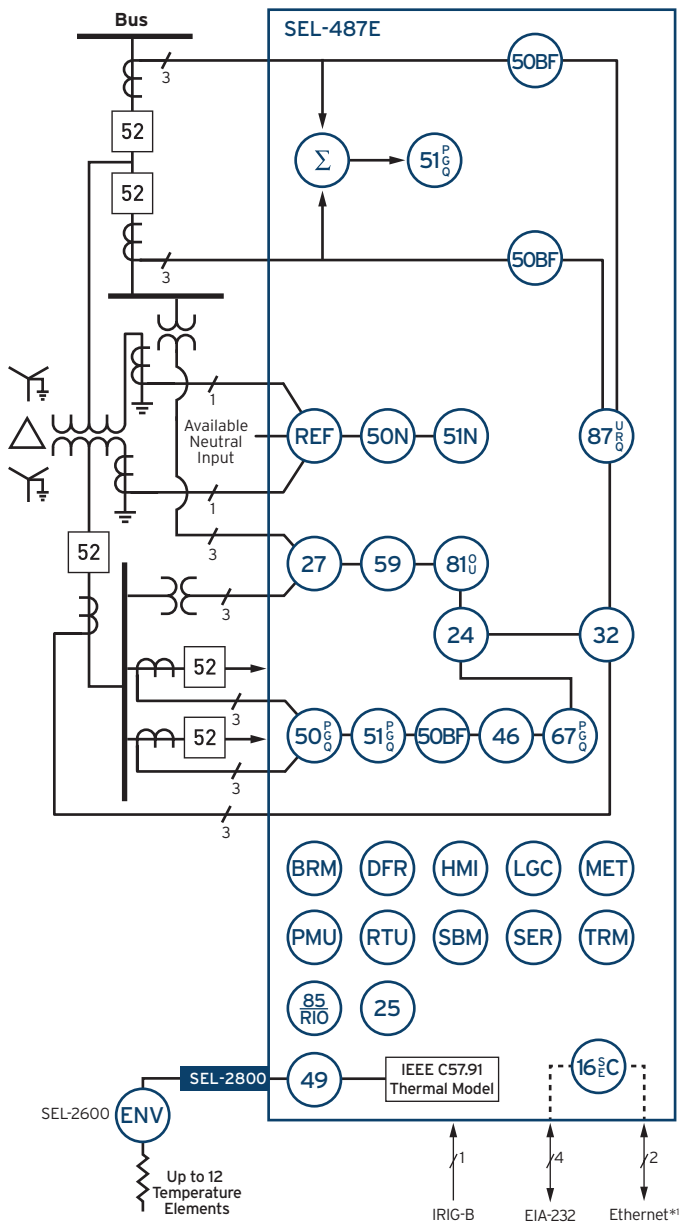
Generator Step-Up Protection—Protect generator step-up (GSU) transformers, and apply the built-in thermal elements (requires the SEL-2600 RTD Module) for monitoring generator and transformer winding temperatures simultaneously.

Advanced Asset Monitoring—Track transformer wear with through-fault and thermal monitoring. Reduce inefficient and costly breaker maintenance with advanced breaker monitoring. Monitor substation dc power systems for out-of-tolerance voltage levels or excessive voltage ripple.

Station Phasor Measurement Unit (PMU)—Improve power system quality with SEL synchrophasors (IEEE C37.118) from all 24 analog channels (6 voltage and 18 current sources) in your relay. Use synchrophasors over serial or Ethernet communications to easily detect reactive loop flows, turn state estimation into state measurement, and provide early warning of potential system instability. Implement real-time control by receiving synchrophasor messages from two PMUs, and take action based on local and remote messages.

Dependable Backup Protection—Provide backup protection with five phase, negative-sequence, and zero-sequence overcurrent elements and ten configurable time-overcurrent elements. Quickly identify the faulted phase with faulted-phase indications for each overcurrent element. Set up breaker failure protection with subsidence detection to rapidly detect breaker failure and minimize system coordination times.

Time-Domain Link (TiDL™) Technology—Modernize your substation by applying the TiDL-enabled SEL-487E with the SEL-2240 Axion® TiDL nodes. In a TiDL system, the Axion node provides remote I/O and digitizes analog signals over fiber optics for the relay. This simple and secure solution is easy to implement, with no external time source or network engineering required. Replacing copper with fiber increases safety, reduces costs associated with using copper, improves reliability, and limits the impact of an electromagnetic pulse.



ANSI NUMBERS/ACRONYMS AND FUNCTIONS

16 SEC	Access Security (Serial, Ethernet)
24	Volts/Hertz
25	Synchronism Check
27	Undervoltage
32	Directional Power
46	Current Unbalance
49	Thermal
50BF	Breaker Failure Overcurrent
50N	Neutral Overcurrent
50 (P,G,Q)	Overcurrent (Phase, Ground, Negative Sequence)
51N	Neutral Time-Overcurrent
51 (P,G,Q)	Time-Overcurrent (Phase, Ground, Negative Sequence)
59	Overvoltage
67 (P,G,Q)	Directional Overcurrent (Phase, Ground, Negative Sequence)
81 (O,U)	Over-/Underfrequency
85 RIO	SEL MIRRORED BITS® Communications
87 (U,R,Q)	Transformer Differential (Unrestrained, Restrained, Neg. Seq.)
DFR	Event Reports
ENV	SEL-2600
HMI	Operator Interface
LGC	Expanded SELogic® Control Equations
MET	High-Accuracy Metering
PMU	Synchrophasors
REF	Restricted Earth Fault
RTU	Remote Terminal Unit
SER	Sequential Events Recorder

ADDITIONAL FUNCTIONS

BRM	Breaker Wear Monitor
LDP	Load Data Profiling
SBM	Station Battery Monitor
TiDL	Time-Domain Link Technology*
TRM	Transformer Monitor

↑Copper or fiber-optic *Optional feature

HARMONIC BLOCKING AND RESTRAINT

Combine Harmonic Blocking, Harmonic Restraint, and Waveform Detection for Protection Reliability

Secure the differential element against inrush by using harmonic blocking, harmonic restraint, and waveform detection; select the best combination for your application. Combine harmonic-blocking and -restraint elements to provide optimum operating speed and security for transformers with higher harmonic content. Waveform detection is designed to prevent undesired operations during inrush conditions for transformers with low second-harmonic content.

A bidirectional differential overcurrent algorithm supervises the waveform detection to identify an internal fault during transformer energization. Fast subcycle external fault detection adds security during external faults with CT saturation. The harmonic blocking element includes common or independent second- and fourth-harmonic blocking and independent fifth-harmonic blocking.

SEL-487E OVERVIEW

EIA-232 front serial port is quick and convenient for system setup and local access.

Front-panel LEDs indicate custom alarms and provide fast and simple information to assist dispatchers and line crews for rapid power restoration.

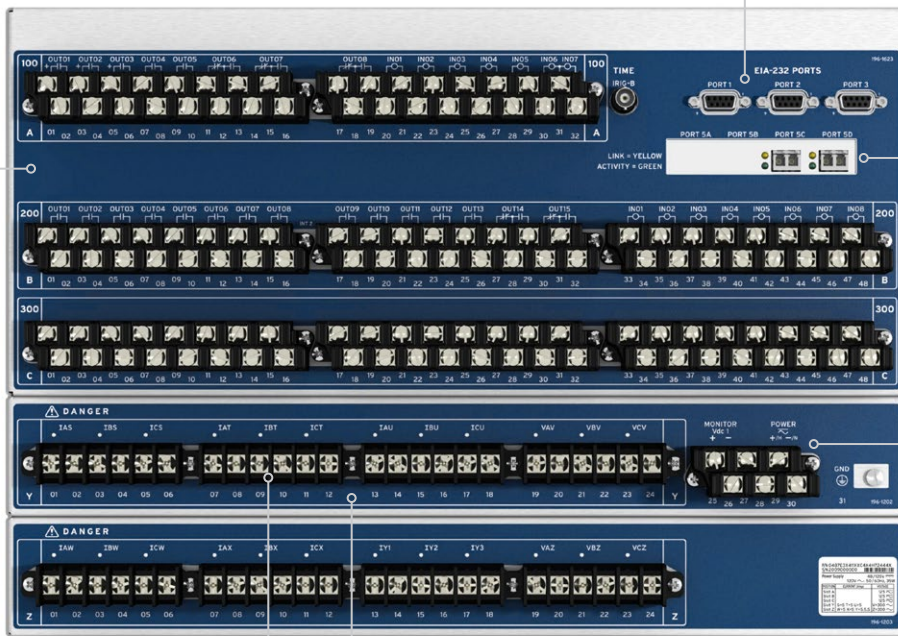


The front-panel display allows operators to control and view the status of disconnects and breakers.

Easy-to-use keypad aids simple navigation.

Programmable operator pushbuttons with user-configurable labels allow for front-panel customization.

Use one front and three rear EIA-232 ports for MIRRORING BITS communications, DNP3, SCADA, and engineering access.



Choose from vertical (5U only) or horizontal, panel-mount or rack-mount hardware and different size options.

Communications protocols include FTP, Telnet, synchrophasors, DNP3 LAN/WAN, the Parallel Redundancy Protocol (PRP), the IEEE 1588 Precision Time Protocol Version 2 (PTPv2)** and IEC 61850.*

Choose from power supply options such as 24–48 Vdc; 48–125 Vdc or 110–120 Vac; or 125–250 Vdc or 110–240 Vac.

The 18 current and 6 voltage channels support transformer differential protection for up to 5 three-phase terminals, 3 independent REF elements, and voltage elements.

Connectorized® hardware configuration or a Euro connector with low-energy analog (LEA) voltage inputs provide flexibility for different line voltage sensors or optical voltage transformers.

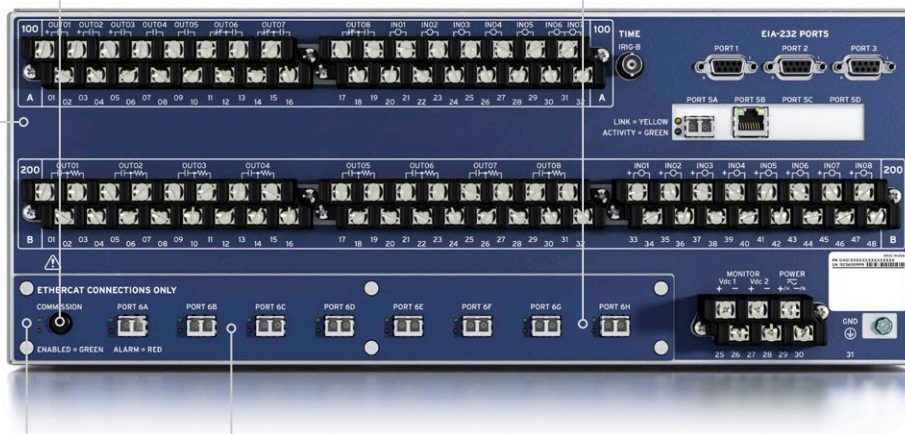
*Optional feature.
**For PTPv2 implementation, Ports 5A and 5B must be ordered as an option.

SEL-487E OVERVIEW—TiDL OPTION

Commission button usage prompts the relay to communicate with the Axion TiDL nodes.

LEDs indicate the connection status to a remote Axion TiDL node on a per-port basis.

4U chassis with mounting options (vertical or horizontal; panel or rack) accommodate users' application needs.

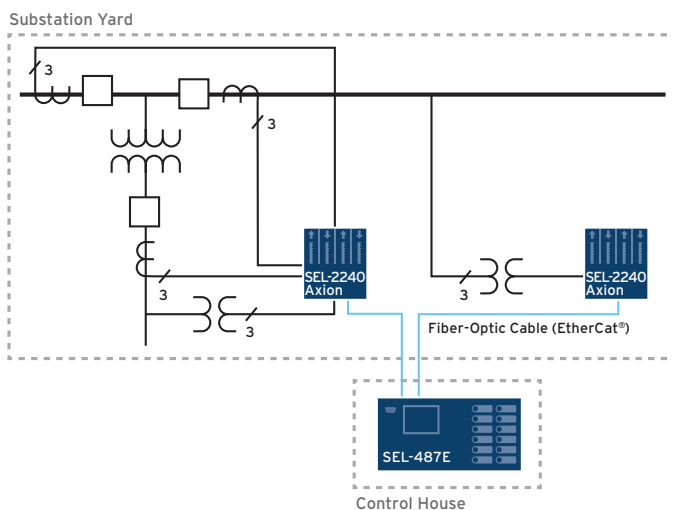


LEDs indicate a valid configuration and successful commissioning.

Eight 100 Mbps fiber-optic EtherCAT® ports allow the TiDL-enabled relay to connect with eight remote Axion TiDL nodes and to receive remote analog and digital data over the network.

SEL TiDL TECHNOLOGY—A SIMPLE, FAST, AND SECURE SOLUTION

In a TiDL solution, Axion nodes are placed in the yard close to the primary equipment to digitize discrete I/O signals and analog data and then transport them over a fiber-optic cable to the SEL-487E in the control house.



NOMINAL CT INPUTS

Select Your Ideal 5 A and 1 A Nominal CT Combination

The SEL-487E allows you to order any combination of nominal CT inputs at 5 A and 1 A for each transformer winding, including the following examples:

- 1 A high-voltage, 5 A low-voltage CTs
- 1 A high-voltage, 5 A low-voltage, 1 A tertiary CTs

Support up to 35:1 CT ratio mismatch without loss of performance. Possible applications include:

- Breaker-and-a-half installation
- Busbar protection for up to five terminals with mismatched CT ratios

