Substation Protection Overview

SEL-787-2/-3/-4

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

SEL-TMU NEW

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 TiDL relays.

SEL-401

Apply the SEL-401 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.

SEL-487V

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

SEL-487E

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

SEL-2414

Provide complete system monitoring and control for new and existing transformers.

SEL-487B

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

SEL-587Z

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

SEL-352

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

Transformer Protection and Monitoring

Applications	SEL-487E	SEL-387E	SEL-387	SEL-387A	SEL-787	SEL-787-2X/-21/-2E	SEL-787-3E/-3S/-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									
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	SEL-487E	SEL-387E	SEL-387	SEL-387A	SEL-787	SEL-787-2X/-21/-2E	SEL-787-3E/-3S/-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				
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				
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		ƒ		■
Underfrequency Load Shedding		ƒ		ƒ
Undervoltage Load Shedding	ƒ	ƒ	ƒ	ƒ

Protection	SEL-352	SEL-451	SEL-487B	SEL-487V
25 Synchronism Check	■	■		
27/59 Under-/Overvoltage	■	■	■	■
32/37 Power Elements	■	ƒ	ƒ	■
46 Current Unbalance	■	ƒ	ƒ	■
47 Voltage Unbalance		ƒ	ƒ	ƒ
49 Equipment Thermal Monitoring	+	ƒ		ƒ
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	■	ƒ		■
Single-Pole Trip/Close	■		■	

Instrumentation and Control	SEL-352	SEL-451	SEL-487B	SEL-487V
Open-Pole Detection		ƒ	ƒ	■
79 Automatic Reclosing	ƒ	■	ƒ	ƒ
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

ƒ May be created using relay elements and timers

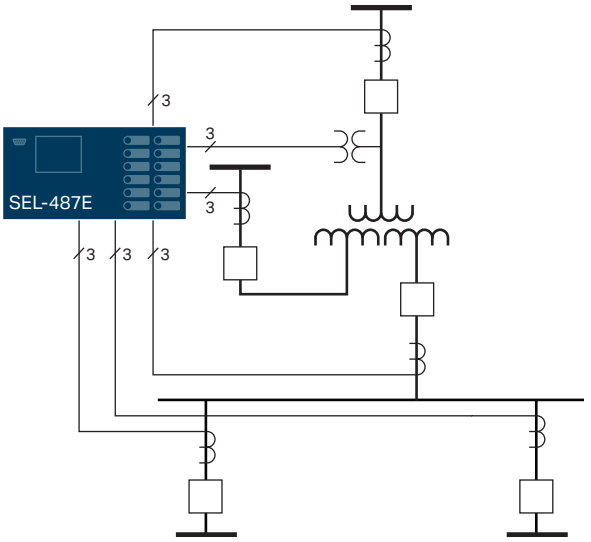
Transformer Applications

Multiwinding transformer protection

Provide current differential protection for up to five windings with an adaptive-slope percentage restraint for transformers at power plants, transmission substations, distribution substations, and industrial plants. The remaining three-phase current inputs can provide feeder backup protection.

Combine harmonic blocking and restraint functions in parallel to provide secure operation during inrush conditions. Second- and fourth-harmonic blocking provides security during energization, while fifth-harmonic blocking provides security for overexcitation conditions. The waveform-based inrush detection method augments the harmonic-blocking and -restraint functions to prevent differential element operation during an inrush condition with low second-harmonic content.

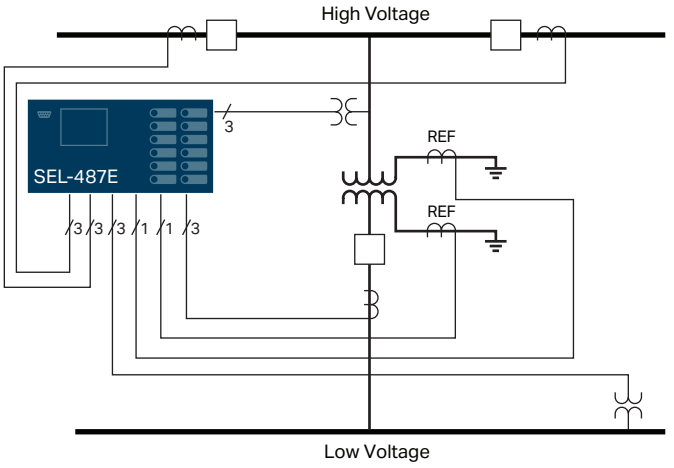
Implement the negative-sequence differential element for sensitive detection of interturn faults within the transformer winding.



Impedance-grounded transformers

Apply the restricted earth fault (REF) protection feature to provide sensitive detection of internal ground faults on grounded-wye-connected transformer windings and autotransformers. The element is “restricted” in the sense that protection is restricted to ground faults within a zone defined by neutral and line CT placement.

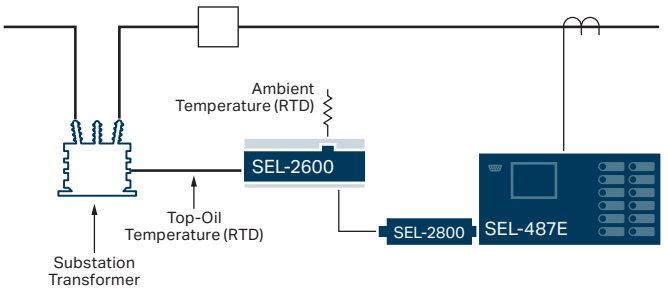
There are three independent REF elements in the SEL-487E Transformer Protection Relay. The SEL-387E Current Differential and Voltage Relay and SEL-387 Current Differential and Overcurrent Relay come standard with an REF element, while this is an optional feature with the SEL-387A Current Differential and Overcurrent Relay and the SEL-787 Transformer Protection Relay.



Through-fault and thermal monitoring

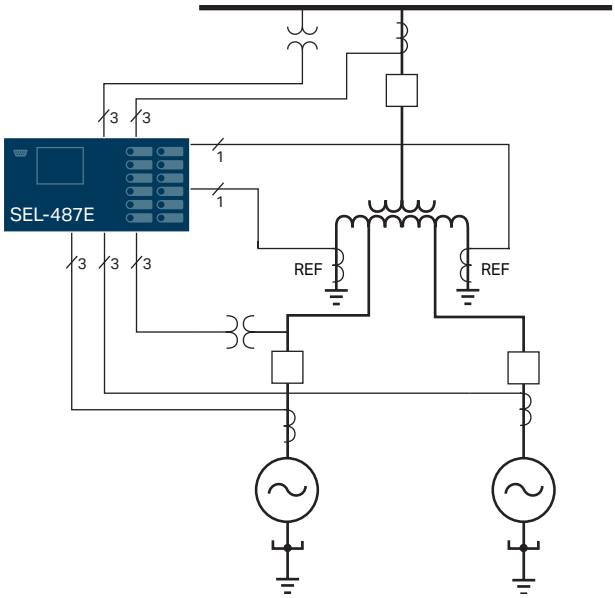
Track transformer wear with through-fault and thermal monitoring using the SEL-2600 RTD Module and SEL-487E Transformer Protection Relay. With the thermal element, you can trip the breaker, activate a control action, or issue an alarm when the transformer is in danger of excessive insulation aging or loss of life.

Gather current levels, through-fault duration, and the date/time of each through fault with transformer through-fault monitoring. Through-fault currents can cause transformer winding displacement, leading to mechanical damage and increased transformer thermal wear. Monitoring through-fault currents allows you to schedule proactive maintenance based on cumulative through-fault duty.



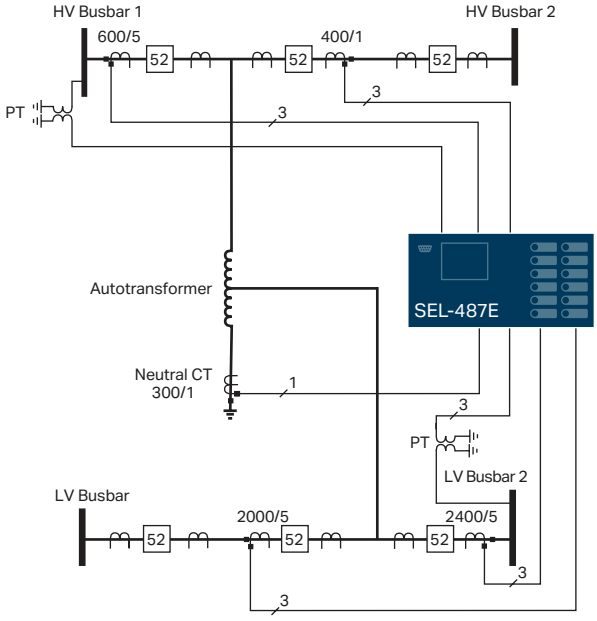
Generator step-up (GSU) units

Install the SEL-487E Transformer Protection Relay for complete protection of GSU transformer applications. The built-in thermal elements let you monitor both generator and transformer winding temperatures. You can apply the volts/hertz element with two-level settings for overexcitation protection of loaded and unloaded generator operating conditions. The directional power elements detect forward and reverse power flow conditions to monitor and protect the GSU transformer in prime power, standby, base load, and peak-shaving applications.



Autotransformer protection

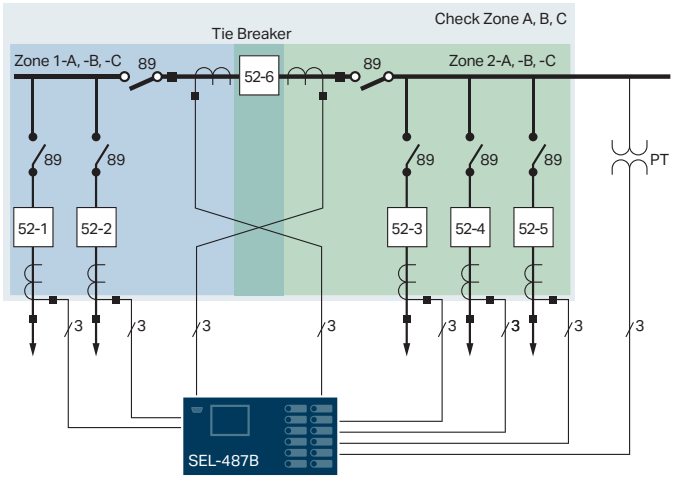
Protect autotransformers, including those with both high-voltage (HV) and low-voltage (LV) busbars configured as breaker-and-a-half busbars. The SEL-487E Transformer Protection Relay accepts CT inputs from up to five sets of phase CTs and up to three neutral CTs and accepts PT inputs from both HV and LV busbars. The voltage inputs provide over-/undervoltage elements, frequency elements, power elements, and volts-per-hertz protection of the transformer.



Bus Applications

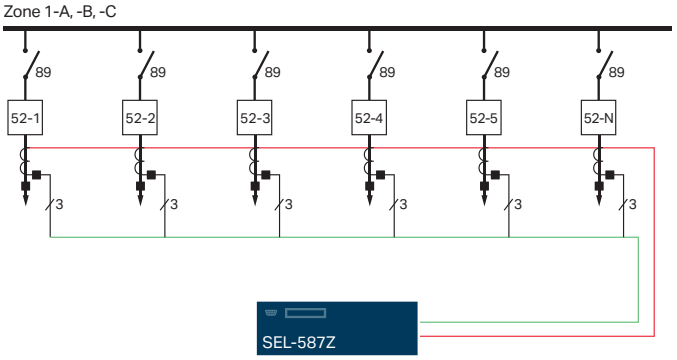
Low-impedance bus differential protection

Provide two three-phase zones of protection for up to seven three-phase terminals (21 total current inputs) with a single SEL-487B Bus Differential and Breaker Failure Relay. A per-phase check zone increases security. For certain bus topologies, such as breaker-and-a-half, you can use one three-phase voltage input to increase security. The SEL-487B works in systems with nondedicated CTs and CT ratio mismatches up to 10:1, allowing you to use the same CTs in other protection applications. The relay also provides circuit breaker failure protection, control for up to 21 breakers and 60 disconnects, backup overcurrent protection, communications, and programmable logic control options.



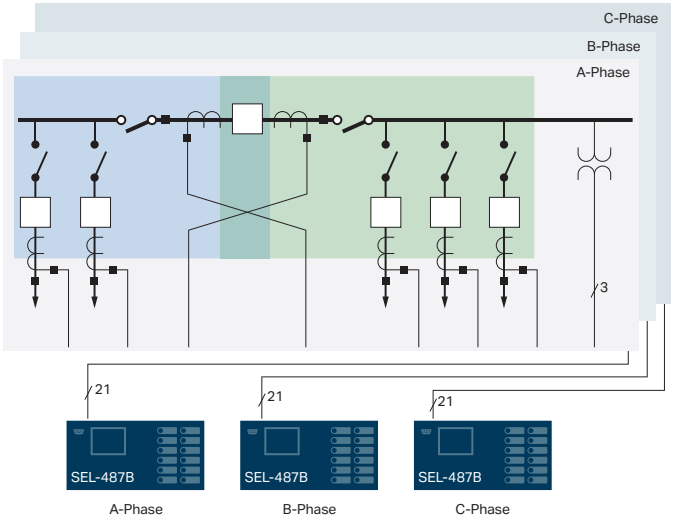
High-impedance bus differential protection

Implement simple and cost-effective bus protection with the SEL-587Z High-Impedance Differential Relay. A single bus zone protects any number of bus terminals since the current inputs are connected in parallel before being brought to the relay. You can create an easily expandable bus protection solution with simple settings and dedicated same-ratio CTs. The relay can also provide backup overcurrent protection, detect breaker failure, and detect open-circuit CT conditions.



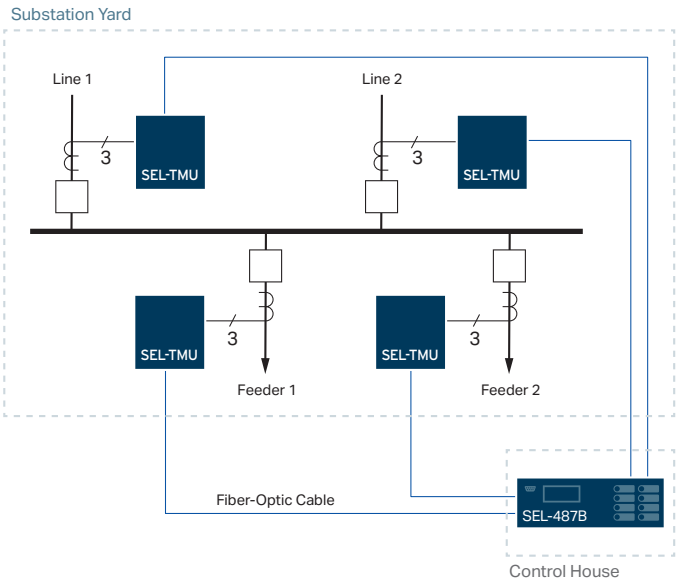
Large bus configurations

Configure three SEL-487B Bus Differential and Breaker Failure Relays on a per-phase basis for large system bus protection. This configuration offers six three-phase zones of protection, a three-phase check zone, 63 current inputs capable of protecting up to 21 three-phase terminals, and voltage inputs for additional security. With six three-phase zones of protection, an internal fault would remove a minimal number of terminals from service for a complex system. Breaker failure detection is available for each terminal. A three-relay configuration is ideal if you plan to expand the busbar in the near future.



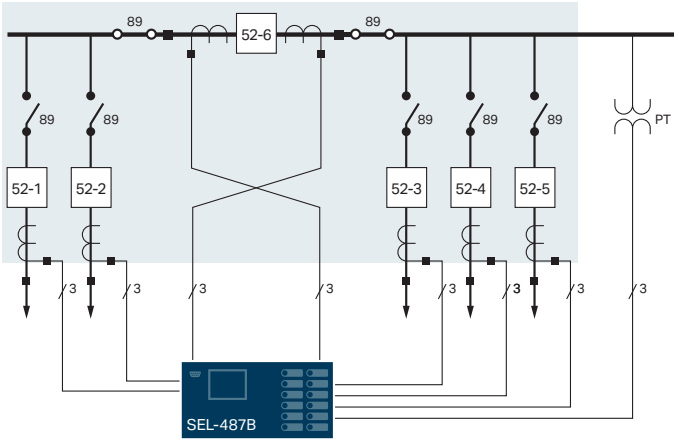
Distributed bus protection

Build a simplified distributed bus solution using Time-Domain Link (TiDL®) technology and a compatible SEL-400 series relay. In a TiDL system, the SEL-TMU TiDL Merging Units are located in the yard next to primary equipment and act as field modules. They digitize analog signals and transport the data over a point-to-point fiber-optic cable to the SEL-487B Bus Differential and Breaker Failure Relay in the control house. TiDL offers strong cybersecurity and is easy to implement, with no external time source or network engineering required.



Dynamic zone switching

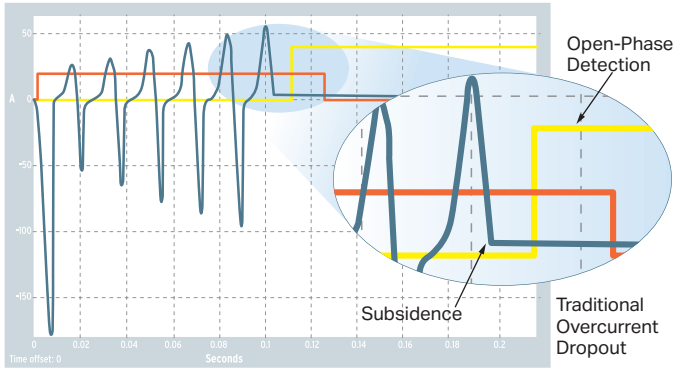
Apply dynamic zone switching with the SEL-487B Bus Differential and Breaker Failure Relay for extra security at busbars with regular disconnect switching. When interbus ties and disconnects change position, the relay will automatically reassign the current inputs to the proper bus zone. In this bus protection application, the disconnects are open and two three-phase bus zones are present. When the disconnects and tie breaker close, only a single three-phase bus zone is needed. When enabled, the SEL-487B will automatically track which current terminals belong to which bus zone based on the disconnect switch position.



Breaker Applications

Breaker failure detection

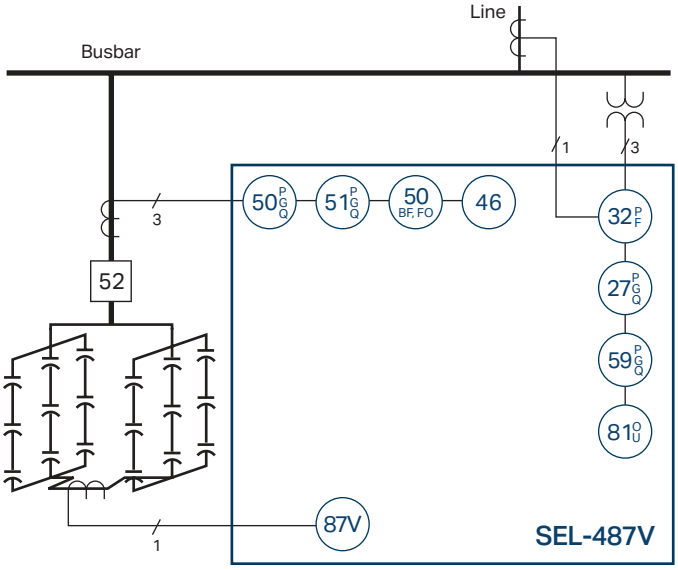
Minimize system clearing times and equipment damage with integrated breaker failure protection and monitoring. Breaker failure detection comes standard with many SEL relays, either with built-in settings or user-implemented SELOGIC® control equations. The built-in breaker failure detection function uses innovative subsidence detection logic to recognize an open-breaker condition by inspection of the ac current waveform. High-speed, open-pole detection logic detects open-pole conditions in fewer than 0.75 cycles to reduce breaker failure coordination times.



Capacitor Bank Applications

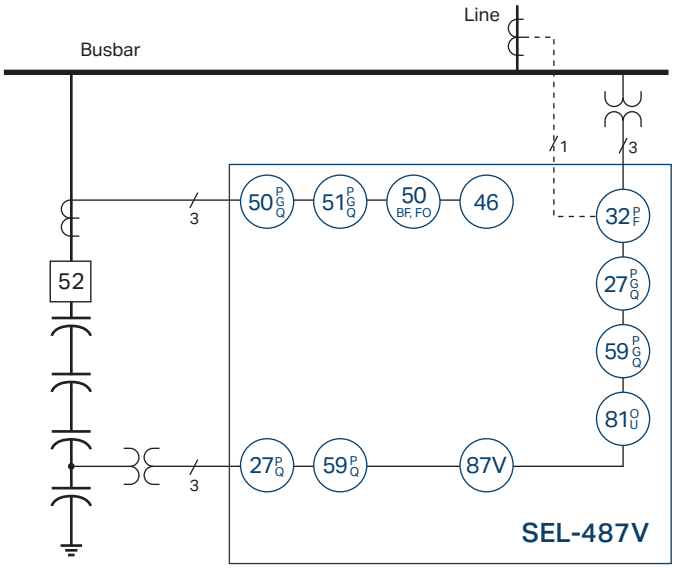
Ungrounded capacitor banks

Provide protection for many ungrounded capacitor bank configurations with voltage unbalance, neutral current unbalance, and phase current unbalance elements. For example, with ungrounded wye shunt capacitor banks that have neutral current unbalance measurement (shown in the graphic), you can apply neutral current unbalance elements with automatic compensation adjustment. This eliminates any unbalance current caused by capacitor unit manufacturing tolerances or measurement tolerances. RMS or fundamental voltage elements and overcurrent elements provide backup protection.



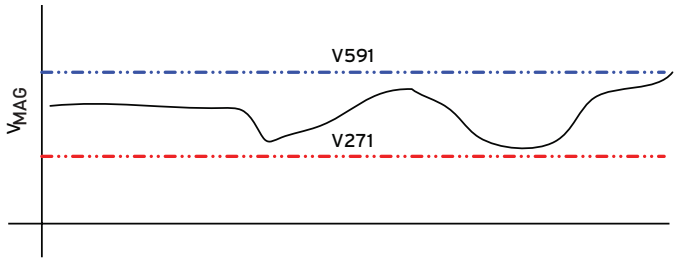
Grounded capacitor banks

Protect grounded capacitor banks, including wye, double-wye, and H-bank configurations, with the SEL-487V Capacitor Protection and Control System. The relay's directional over-current, voltage unbalance, current unbalance, and voltage differential capabilities offer protection for an assortment of applications. Voltage differential protection provides responsive and efficient protection for applications with a large number of capacitor units where regular unbalance protection may not be sensitive enough to detect faults.



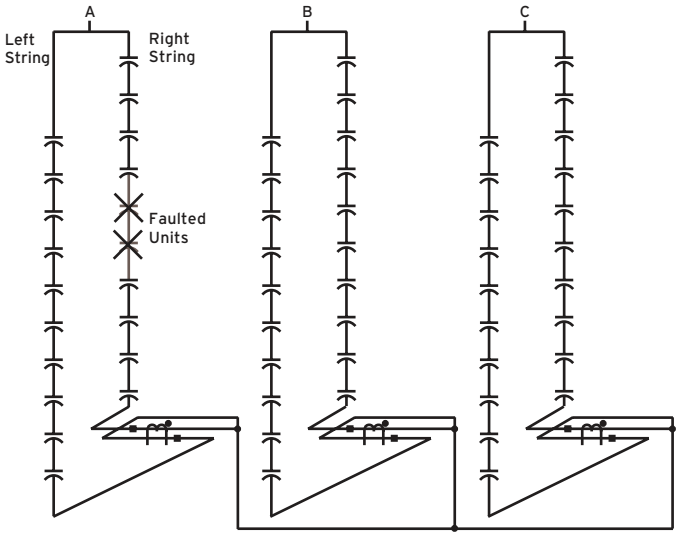
Capacitor bank control

Control your capacitor banks without wiring and installing additional devices. The SEL-487V-1 Capacitor Protection and Control System has deadband control to keep the system voltage, VAR, or power factor within limits of your choosing. Or, for applications where the reactive power load varies predictably, you can use time-of-day or day-of-week scheduling to switch units in and out. Universal sequencing logic provides flexibility for switching multistaged banks based on the accumulated time in service or other specified conditions. To prevent excessive operation and wear, voltage instability logic detects when the relay is switching the units in a hunting fashion and stops operations or raises an alarm until the issue is resolved.



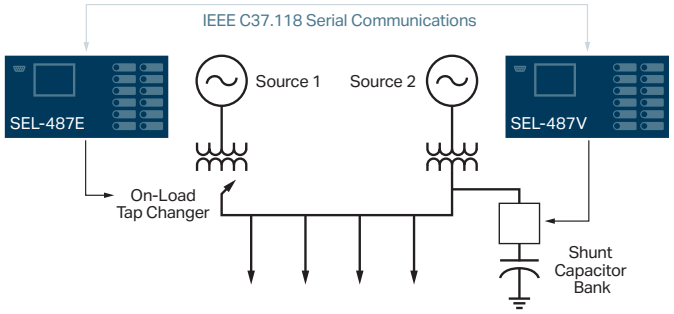
Faulted-phase location

Assist crews in finding the faulted capacitor unit by using the patented faulted-phase and section identification logic in the SEL-487V Capacitor Protection and Control System. The logic works in any protection scheme that uses current unbalance or voltage differential protection. After a fault, the relay will provide indications of which phase the fault occurred on as well as a discrete indication of the location relative to the tap (top/bottom, left/right). This information saves valuable time in finding the fault and getting the unit back in service.



Real-time control

Enhance system coordination and situational awareness with the IEEE C37.118-compliant synchrophasors and the real-time control system available in SEL-400 series relays (except the SEL-487B Bus Differential and Breaker Failure Relay). These relays can process up to two sets of remote phasor data over serial communications for use in SELOGIC control equations. This information supports control decisions based on remote and local data. For example, an SEL-487E Transformer Protection Relay and SEL-487V Capacitor Protection and Control System can exchange data to coordinate between a transformer and capacitor bank and maintain the system at an optimum voltage profile.



SEL-787-2/-3/-4

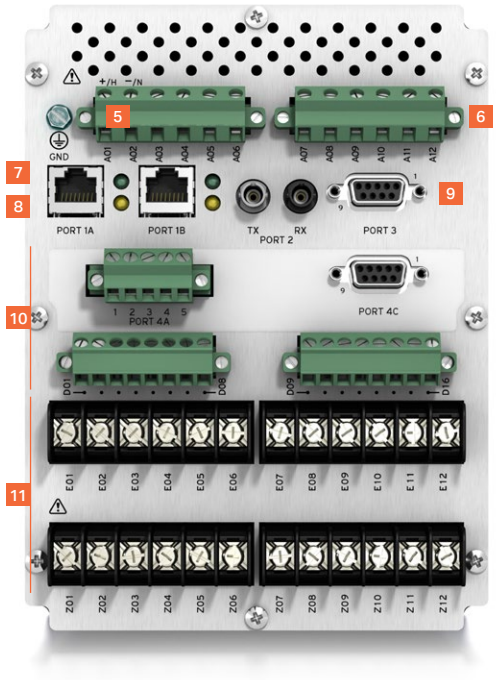
Transformer Protection Relay

Starting price
$3,060 USD

selinc.com/products/787-3-4 | Select models typically ship in 2 days

The SEL-787 provides protection and monitoring for most two-, three-, and four-winding transformers. It offers advanced automation and flexibility, asset management data, and easy retrofitting of most electromechanical relays. The 5-inch, 800 × 480 color touchscreen display option allows you to directly set, monitor, and control your system from the relay front panel.

The SEL-787-2E/-21/-2X models offer two-winding differential protection, and the SEL-787-3E/-3S models offer three-winding differential protection. In addition, select model options include comprehensive transformer protection with a single-phase restricted earth fault (REF) input or a single-phase voltage input. The SEL-787-4X provides current-based, four-winding differential protection.



1. The 5-inch, 800 × 480 color touchscreen display offers direct navigation via a capacitive touchscreen.
2. Folders and applications provide quick access to bay screens, metering and monitoring data, reports, settings, and more.
3. Programmable front-panel LEDs with user-configurable labels alert operators to faulted phases, the relay's status, and element operation.
4. Programmable operator pushbuttons with user-configurable labels allow front-panel customization.
5. Power supply options include 24–48 Vdc or 110–250 Vdc/110–240 Vac.
6. 2 digital inputs (DI) and 3 digital outputs (DO).
7. A wide variety of communications protocols and media for flexibility to communicate with other devices and control systems.
8. An integrated web server enables direct relay access for metering and monitoring data without the need for external PC software.
9. EIA-232 serial port (P3) and fiber-optic EIA-232 serial port (P2) with IRIG-B input.
10. Positions for optional I/O cards (see the table on the next page).
11. Positions for current and voltage options (see the table on the next page).

Differential protection

Select the SEL-787 for standard dual-slope differential protection with harmonic blocking and restraint for as many as four terminals. The SEL-787 offers as many as three independent REF elements for sensitive ground-fault detection for grounded-wye transformers. The relay also comes with a variety of overcurrent elements for backup protection, including phase, negative-sequence, residual-ground, and neutral-ground elements. Breaker failure protection for as many as four 3-pole breakers is also standard.

Transformer monitoring

Measure and track accumulated through-fault current levels, and use optional 4 to 20 mA inputs or resistance temperature detector (RTD) thermal inputs to monitor ambient, load tap changer (LTC) tank, or transformer oil temperatures.

Synchronism check/station dc battery monitor

Program the VS/VBAT voltage channel in the SEL-787-3S to perform a synchronism check across a circuit breaker or to monitor dc voltage levels of the substation battery.

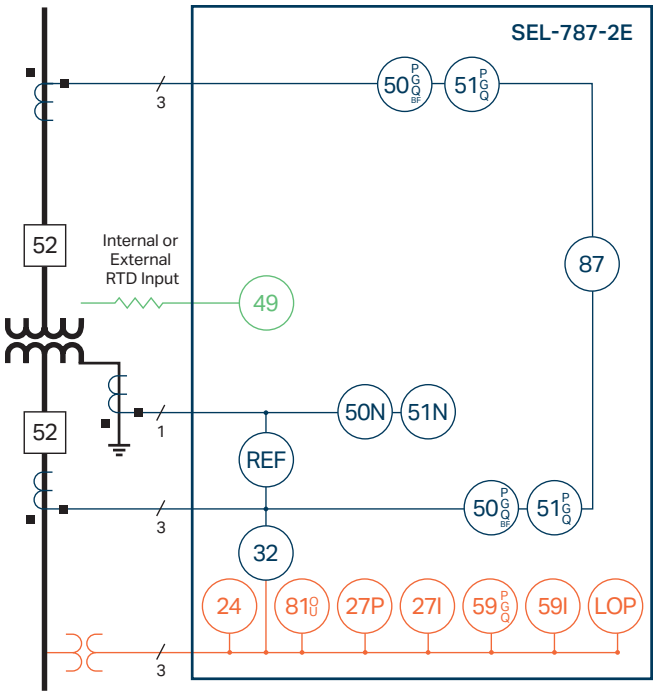
Metering and reporting

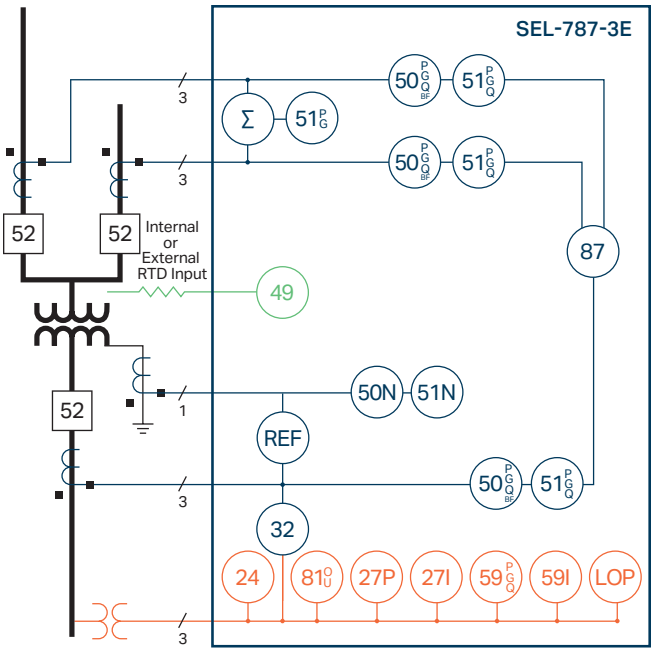
Eliminate separately mounted metering devices with the built-in metering functions. You can analyze Sequential Events Recorder (SER) reports and oscillographic event reports for rapid commissioning, testing, and post-fault diagnostics. The unsolicited SER protocol allows station-wide collection of binary SER messages.

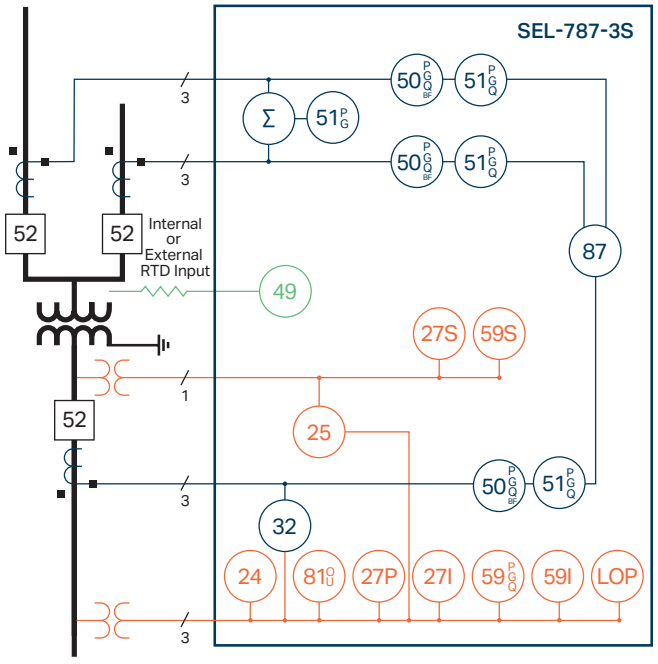
Current and Voltage Input Cards	Model
6 currents (Slot Z)	SEL-787-2X
6 currents (Slot Z) and 1 neutral current (Slot E)	SEL-787-21
6 currents (Slot Z) and 1 neutral current, 3 voltages (Slot E)	SEL-787-2E
6 currents (Slot Z) and 3 currents, 1 neutral current, 3 voltages (Slot E)	SEL-787-3E
6 currents (Slot Z) and 3 currents, 3 voltages, 1 voltage (battery or synchronism check) (Slot E)	SEL-787-3S
6 currents (Slot Z) and 6 currents (Slot E)	SEL-787-4X

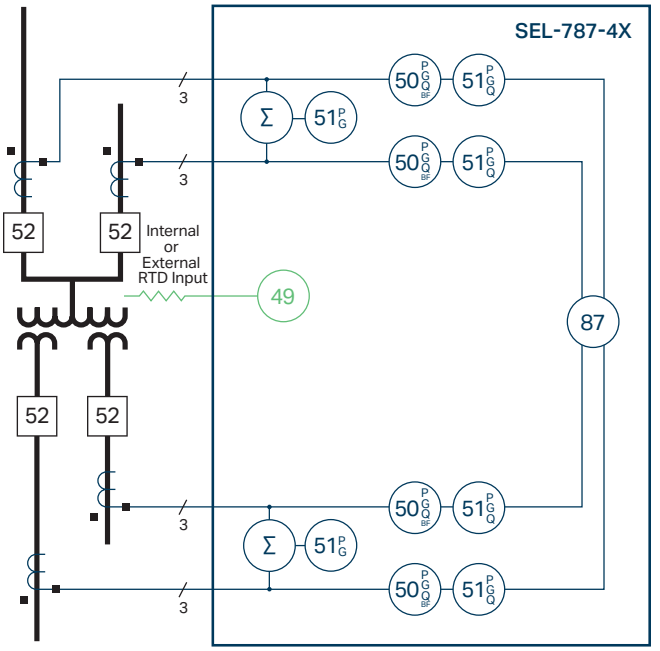
Optional Communications and I/O Cards
Serial communications card (EIA-232/-485)
3 DI/4 DO/1 4–20 mA analog output (AO)
4 DI/4 DO
8 DO
8 DI
14 DI
4 DI/3 DO (2 Form C, 1 Form B)
4 analog inputs (AI)/4 AO
10 RTD input

SEL-787-2/-3/-4 Model Features









Windings	SEL-787-2X	SEL-787-21	SEL-787-2E	SEL-787-3E	SEL-787-3S	SEL-787-4X
Windings Protected	2	2	2	3	3	4
CT/PT Inputs						
Phase Voltage Inputs	0	0	3	3	3	0
Differential Current Inputs	6	6	6	9	9	12
Neutral Current	0	1	1	1	0	0
VS/VBAT Channel	0	0	0	0	1	0

Protection Elements		SEL-787-2X	SEL-787-21	SEL-787-2E	SEL-787-3E	SEL-787-3S	SEL-787-4X
24	Volts/Hertz			■	■	■	
25	Synchronism Check					■	
27I	Inverse-Time Undervoltage (Phase, Phase-to-Phase, Sequential, Vsync)			■	■	■	
27P	Undervoltage (Phase) With Inverse Characteristic			■	■	■	
27PP	Phase-to-Phase Undervoltage			■	■	■	
27S	VS Channel Undervoltage					■	
32	Directional Power			■	■	■	
49	RTDs	■	■	■	■	■	■
50N	Neutral Overcurrent		■	■	■		
50 (P,G,Q,BF)	Overcurrent (Phase, Ground, Negative Sequence, Breaker Failure)	■	■	■	■	■	■
51 (P,G,Q)	Time Overcurrent (Phase, Ground, Negative Sequence)	■	■	■	■	■	■
51N	Neutral Time Overcurrent		■	■	■		
51PC	Combined Winding Phase Time Overcurrent				■	■	■
51GC	Combined Winding Ground Time Overcurrent				■	■	■
59 (P,G,Q)	Overvoltage (Phase, Ground, Negative Sequence)			■	■	■	
59I	Inverse Time, Overvoltage (Phase, Phase-to-Phase, Sequential, Vsync)			■	■	■	
59S	Overvoltage (Synchronism or Battery Voltage)					■	
81 (O,U)	Over-/Underfrequency			■	■	■	
87	Phase Differential	■	■	■	■	■	■

Differential and REF Elements	SEL-787-2X	SEL-787-21	SEL-787-2E	SEL-787-3E	SEL-787-3S	SEL-787-4X
Differential Protection Windings (Standard)	2	2	2	3	3	4
REF Elements (Standard)	0	1	1	1	0	0
Differential Protection Windings (Winding 3 Configured for REF)				2	2	3
REF Elements (Winding 3 Configured for REF)				2	2	2

Additional Functions		SEL-787-2X	SEL-787-21	SEL-787-2E	SEL-787-3E	SEL-787-3S	SEL-787-4X
85RIO	SEL Mirrored Bits Communications	■	■	■	■	■	■
BF	Breaker Failure	■	■	■	■	■	■
BW	Breaker Wear Monitoring	■	■	■	■	■	■
DFR	Event Reports	■	■	■	■	■	■
ENV	SEL-2600 RTD Module*	■	■	■	■	■	■
LDP	Load Data Profiling	■	■	■	■	■	■
LGC	SELogic® Control Equations	■	■	■	■	■	■
LOP	Loss of Potential			■	■	■	
MET	High-Accuracy Metering	■	■	■	■	■	■
RTD	10 Internal or 12 External (see ENV) RTD Inputs*	■	■	■	■	■	■
REF	Restricted Earth Fault		■	■	■	■	■
RTU	Remote Terminal Unit	■	■	■	■	■	■
SER	Sequential Events Recorder	■	■	■	■	■	■
TFE	Through-Fault Event Monitor	■	■	■	■	■	■
PMU	Synchronized Phasor Measurement	■	■	■	■	■	■
WEB	Web Server	■	■	■	■	■	■

*Optional feature

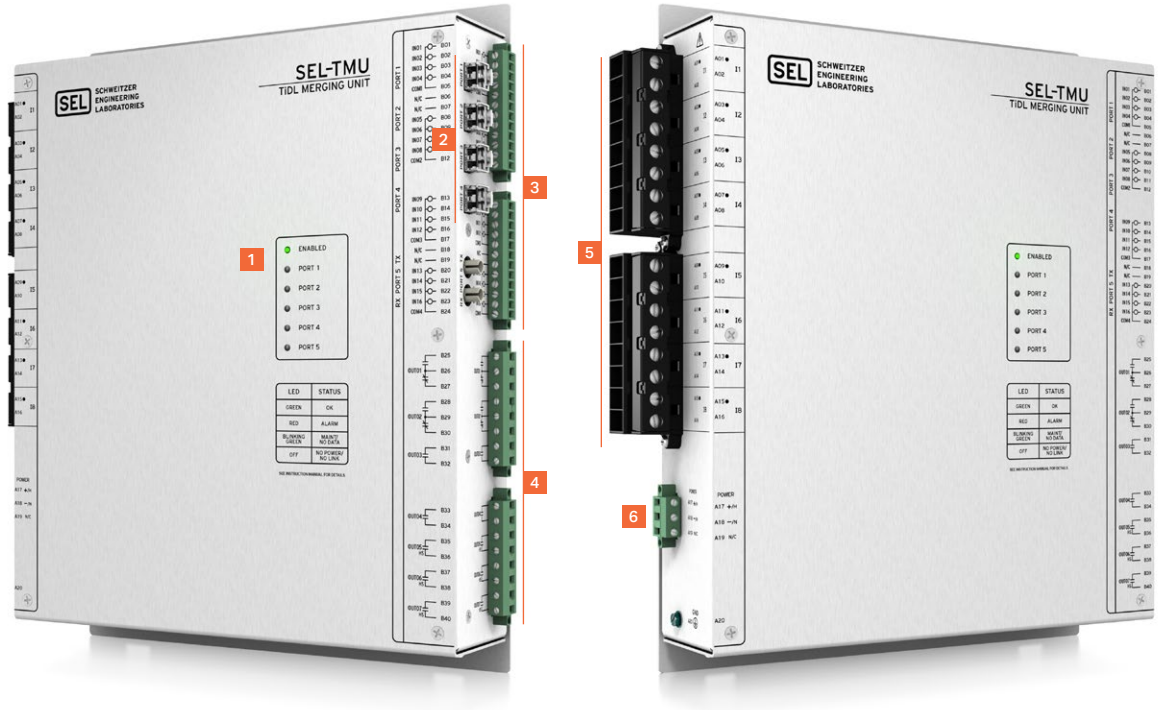
SEL-TMU

TiDL® Merging Unit NEW

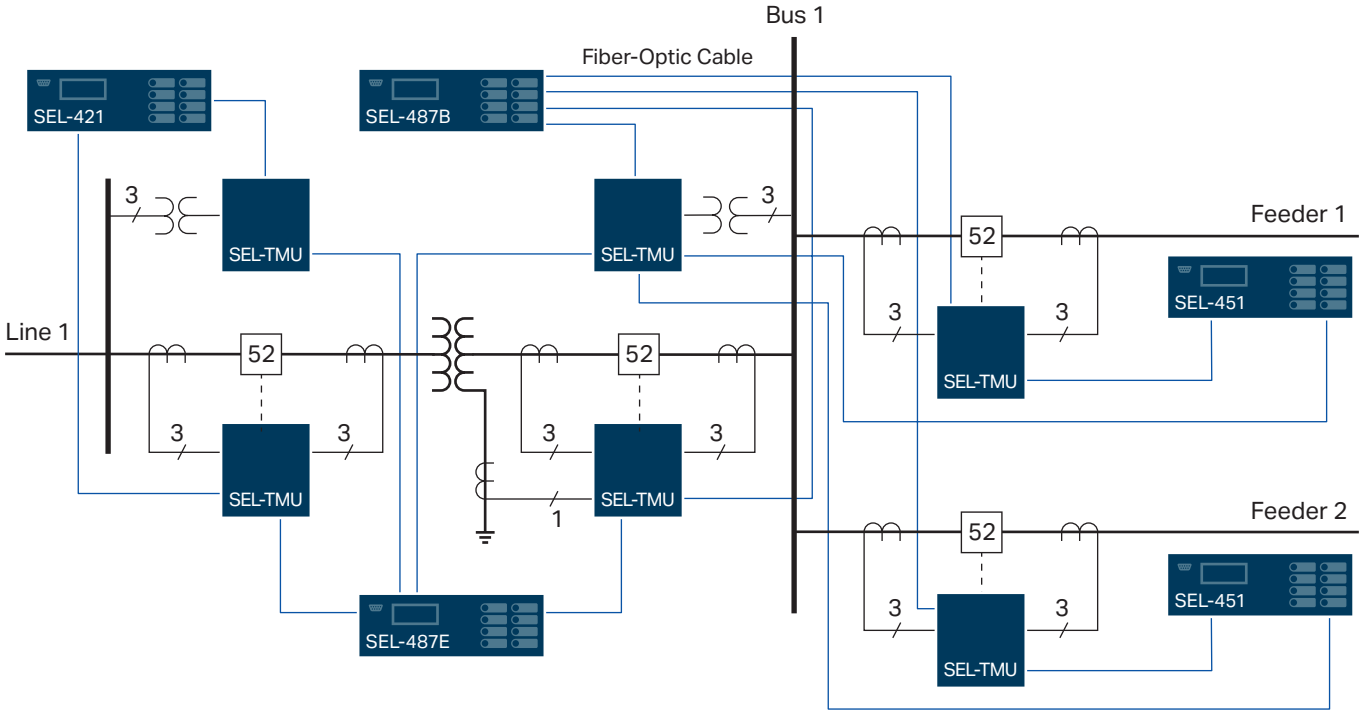
Starting price
$2,900 USD

selinc.com/products/TMU | Select models typically ship in 2 days

The SEL-TMU is a remote data acquisition device designed for use in a SEL Time-Domain Link (TiDL) technology network. It digitizes analog signals from primary equipment and then transmits them via fiber-optic cable to an SEL TiDL relay in the control house. TiDL-enabled relays include the SEL-421 Protection, Automation, and Control System; SEL-451 Protection, Automation, and Bay Control System; SEL-487B Bus Differential and Breaker Failure Relay; and SEL-487E Transformer Protection Relay. The SEL-TMU data stream is automatically and independently synchronized to each connected SEL TiDL relay, eliminating the need for an external time source. The direct, point-to-point architecture also alleviates the need for networked switches. An SEL-TMU can communicate with up to four SEL TiDL relays, allowing data sharing. It is a simple plug-and-play device, with network configuration and commissioning performed by the connected SEL TiDL relays.



1. The LED interface indicates the status of each port and the overall hardware health.
2. Small form-factor pluggable (SFP) fiber ports allow the SEL-TMU to communicate with up to four TiDL-enabled relays.
3. The 16 universal contact inputs operate over a range of 24–250 Vdc.
4. Flexible contact outputs support tripping, signaling, or switching applications.
5. Choose a module with 8 current inputs or with 4 current inputs and 4 voltage inputs.
6. The power supply operates over a wide range: 48–250 Vdc, 100–240 Vac.



An SEL-TMU works in various protection applications with TiDL-enabled relays.

SEL-401

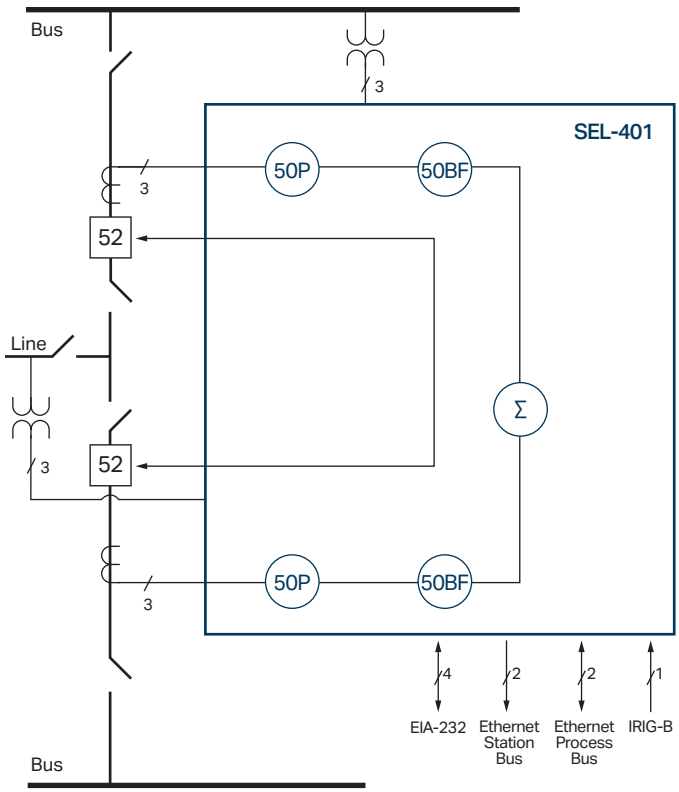
Protection, Automation, and Control Merging Unit

Starting price
$5,190 USD

selinc.com/products/401

The SEL-401 is a merging unit with built-in overcurrent and breaker failure protection. You can apply the SEL-401 in substations with IEC 61850-9-2 Sampled Values (SV) systems to sample analog data, such as currents and voltages, then publish those data to a fiber-based Ethernet network for use in other IEDs, such as SEL-400 series relays with SV capability. The SEL-401 publishes up to seven SV data streams to the process bus network, where data are synchronized using IEEE 1588 Precision Time Protocol Version 2 (PTPv2) or an IRIG-B time input. The SEL-401 also provides local protection. You can use the built-in phase-overcurrent and breaker failure protection as a backup in case of communications system failures.

1. Control and settings are divided into seven relay access levels for increased security. The merging unit has separate breaker, protection, automation, and output access levels, among others. You can set unique passwords for each access level.
2. The front-panel display provides status indication and control of as many as ten disconnects. The merging unit offers control for up to two breakers and provides status indication for up to three breakers.
3. User-selectable mimic screens are displayed on the front panel in one-line diagram format. The one-line diagram includes user-configurable labels for disconnect switches, breakers, and the bay name, and it displays as many as six analog quantities.
4. Easy-to-use keypad aids simple navigation and set-point adjustment.
5. Up to 24 programmable target LEDs with user-configurable labels alert operators in the substation to faulted phases, the merging unit's status, and element operation.
6. Programmable operator pushbuttons with user-configurable labels offer front-panel customization.
7. Vertical or horizontal, panel-mount or rack-mount hardware package. The size options available are 4U, 5U, or 6U and allow you to order up to three I/O boards (shown as 4U horizontal rack mount with two I/O boards).
8. Select fiber-optic, copper, or mixed Ethernet. One pair is reserved for the process bus. The other pair is reserved for the station bus. Ethernet communications protocols include FTP, Telnet, synchrophasors, DNP3 LAN/WAN, the Parallel Redundancy Protocol (PRP), IEEE 1588 PTPv2, IEC 61850-9-2, and IEC 61850 Edition 2.
9. Three EIA-232 serial ports for Mirrored Bits® communications, SCADA, and engineering access provide flexibility to communicate with other devices and control systems. The ports include demodulated IRIG-B for precise-time input.
10. Six current and six voltage analog inputs, orderable in standard terminal blocks (shown) or a Connectorized® hardware configuration.
11. Power supply options include 24–48 Vdc; 48–125 Vdc or 110–120 Vac; or 125–250 Vdc or 110–240 Vac.



ANSI Functions

50P	Phase Overcurrent
50BF	Dual Breaker Failure Overcurrent

Additional Functions

85 RIO	SEL Mirrored Bits Communications
BRM	Breaker Wear Monitor
DFR	Event Reports
DNP3	Distributed Network Protocol
HMI	Operator Interface
IEC 61850	Manufacturing Message Specification (MMS), GOOSE, Sampled Values (9-2LE)
LGC	Expanded SELogic® Control Equations
MET	High-Accuracy Metering
PMU	Synchrophasors
PTP	IEEE 1588 PTPv2
SBM	Station Battery Monitor
SER	Sequential Events Recorder
SIP	Software-Invertible Polarities

SEL-421-7

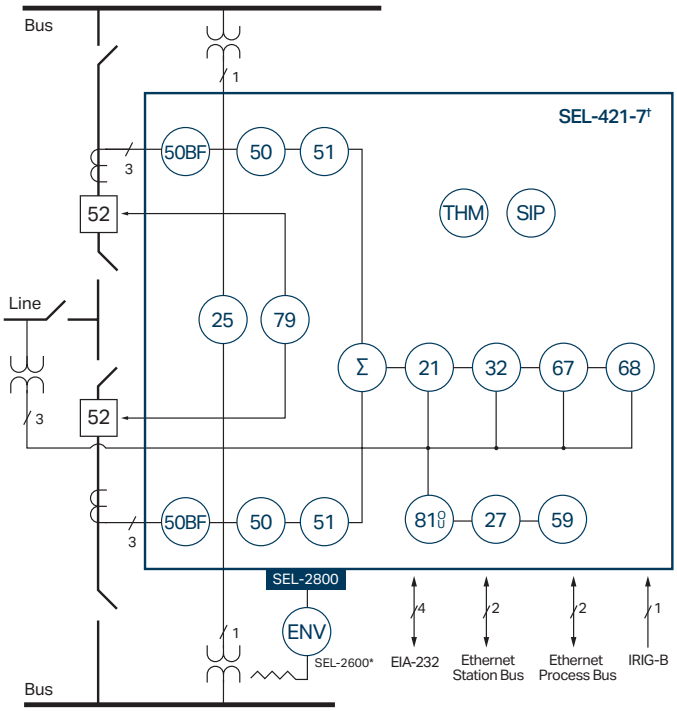
Protection, Automation, and Control Merging Unit

Starting price
$10,630 USD

selinc.com/products/421

The SEL-421-7 is a merging unit that combines advanced high-speed transmission line protection with the flexibility of IEC 61850-9-2 Sampled Values (SV) and the UCA 61850-9-2LE guideline. It digitizes analog signals from primary equipment and then publishes as many as seven SV data streams to relays in the control house via an Ethernet network. The data are synchronized using IEEE 1588 Precision Time Protocol Version 2 (PTPv2) or an IRIG-B time input. In the event of lost communications on the IEC 61850 network, the SEL-421-7 can provide standalone protection.

1. EIA-232 front serial port is quick and convenient for system setup and local access.
2. The front-panel display allows operators to control and view the status of disconnects and breakers.
3. The user-selectable mimic screens show the system configuration in one-line diagram format.
4. Easy-to-use keypad aids simple navigation.
5. Front-panel LEDs indicate custom alarms and provide fast and simple information to assist dispatchers and line crews with rapid power restoration.
6. Programmable operator pushbuttons with user-configurable labels allow front-panel customization.
7. Chassis options (for up to three I/O boards) and mounting options accommodate hardware needs.
8. Select fiber-optic, copper, or mixed Ethernet with separate ports for SV data and engineering access.
9. Six current and six voltage analog inputs support signal digitization and local protection schemes.
10. 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.



ANSI Functions

21	Phase and Ground Distance
25	Synchronism Check
27	Undervoltage
32	Directional Power
50	Overcurrent
50BF	Dual Breaker Failure Overcurrent
51	Time Overcurrent
59	Overvoltage
67	Directional Overcurrent
68	Out-of-Step Block/Trip
79	Single-/Three-Pole Frequency
81 (O,U)	Over-/Underfrequency
85 RIO	SEL Mirrored Bits® Communications
DFR	Event Reports
ENV	SEL-2600 RTD Module*
HMI	Operator Interface
LGC	Expanded SELogic® Control Equations
MET	High-Accuracy Metering
PMU	Synchrophasors
SER	Sequential Events Recorder

Additional Functions

BRM	Breaker Wear Monitor
LDE	Load Encroachment
LOC	Fault Locator
SBM	Station Battery Monitor
SIP	Software-Invertible Polarities
SV	IEC 61850-9-2 Sampled Values Technology*†
THM	IEC 60255-Compliant Thermal Model
TiDL®	Time-Domain Link Technology*

*Optional feature

†SV subscriber relays have no analog input boards and instead receive voltages and current through Ethernet.

Note: Both copper and fiber-optic Ethernet ports are available.

SEL-487V

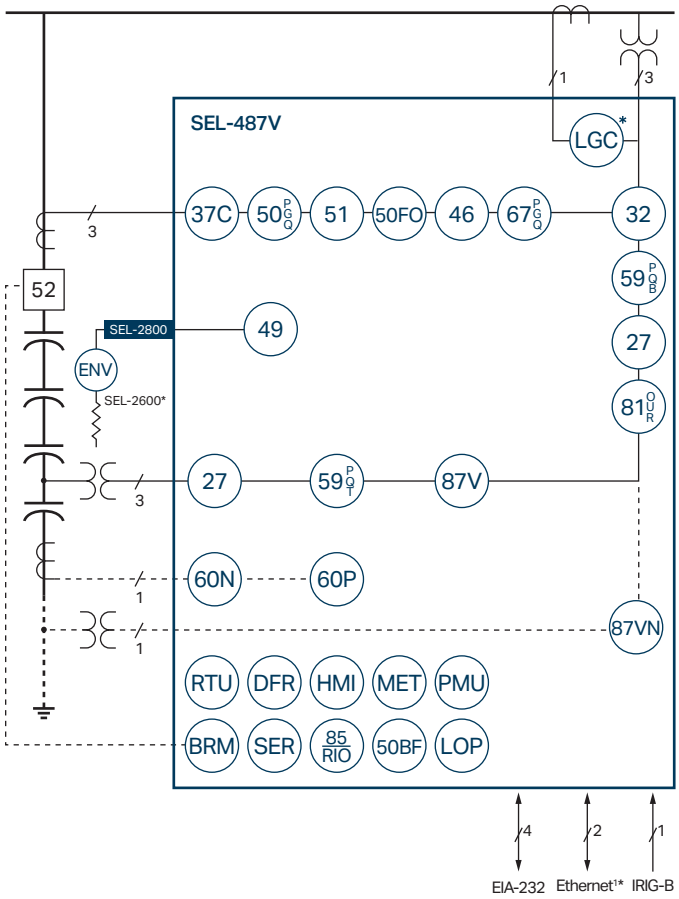
Capacitor Protection and Control System

Starting price
$4,350 USD

selinc.com/products/487V

Use the SEL-487V for all your capacitor bank needs to simplify relay setting and application while reducing inventory. The versatile SEL-487V can handle grounded and ungrounded, single- and double-wye capacitor bank applications. It provides sensitive voltage differential and current unbalance protection and compensates for small voltage differential variations in individual capacitor elements from manufacturing, PT, or instrument transformer measurement errors. Application-based settings simplify setup and installation while fault-finding logic locates faulty capacitor units to speed up necessary maintenance. Synchrophasor technology provides situational awareness and real-time control.

1. EIA-232 front serial port is convenient for system setup and local access.
2. LCD allows you to control and view the status of disconnects and breakers.
3. Easy-to-use keypad aids simple navigation.
4. Front-panel LEDs indicate custom alarms and provide information to assist dispatchers and line crews with rapid power restoration.
5. Programmable operator pushbuttons with user-configurable labels allow front-panel customization.
6. Choose from a vertical or horizontal, panel-mount or rack-mount chassis and different size options.
7. Use one front and three rear EIA-232 ports for Mirrored Bits® communications, DNP3, SCADA, and engineering access.
8. Communications protocols include FTP, Telnet, synchrophasors, DNP3 LAN/WAN, the Parallel Redundancy Protocol (PRP), and IEC 61850.
9. Six current and six voltage channels support applications for grounded and ungrounded, single- and double-wye capacitor configurations.
10. Power supply options include 48–125 Vdc or 110–120 Vac; or 125–250 Vdc or 110–240 Vac.



ANSI Functions

27	Undervoltage
32	Real and Reactive Power
37C	Undercurrent
46	Current Unbalance
49	Programmable Thermal Control and Logic
50BF	Breaker Failure Overcurrent
50FO	Flashover Overcurrent
50 (P,G,Q)	Overcurrent (Phase, Ground, Negative Sequence)
51	Time Overcurrent (Selectable)
59 (P,Q,B,T)	Overvoltage (Phase, Negative Sequence, Bank, Inverse Time)
60N	Neutral Current Unbalance
60P	Phase Current Unbalance
67 (P,G,Q)	Directional Overcurrent (Phase, Ground, Negative Sequence)
81 (O,U,R)	Frequency (Over, Under, Rate)
85 RIO	SEL Mirrored Bits Communications
87V	Phase Voltage Differential
87VN	Neutral Voltage Differential
DFR	Event Reports
ENV	SEL-2600 RTD Module*
HMI	Operator Interface
LGC	Capacitor Bank Control*
LOP	Loss of Potential
MET	High-Accuracy Metering
PMU	Synchrophasors
RTU	Remote Terminal Unit
SER	Sequential Events Recorder

Additional Functions

BRM	Breaker Wear Monitor
LDP	Load Data Profiling*

*Optional feature [1] Copper or fiber-optic

SEL-487E

Transformer Protection Relay

Starting price
$6,990 USD

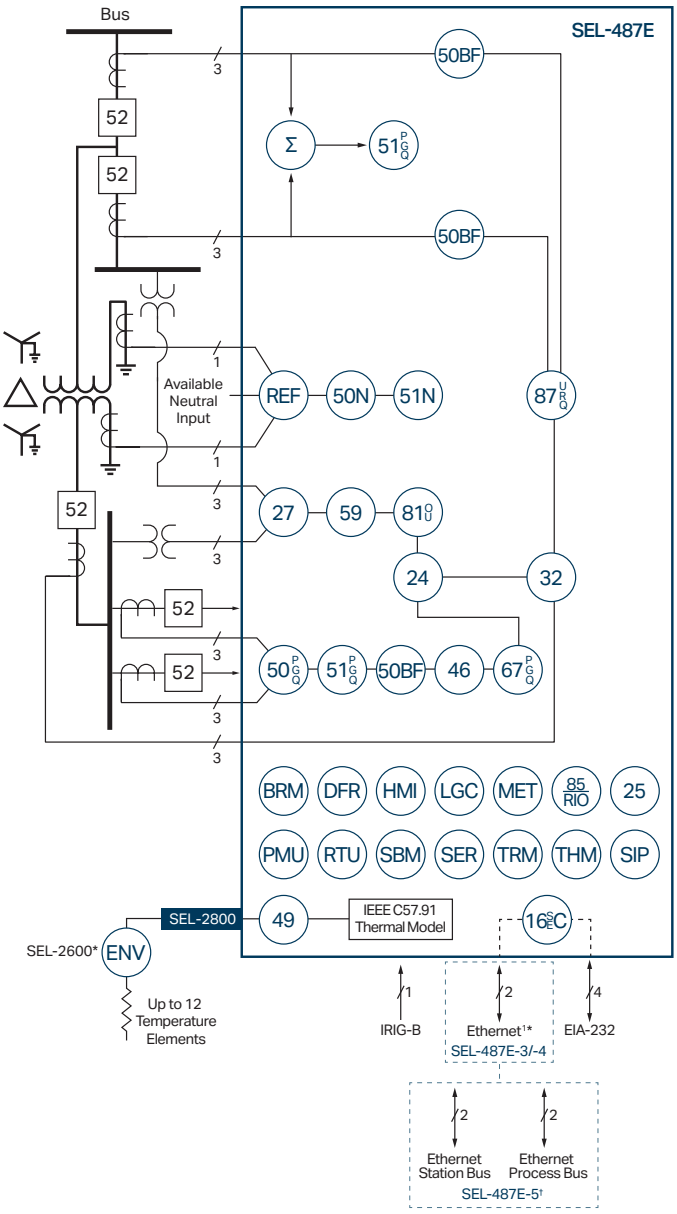
selinc.com/products/487E

The SEL-487E provides protection and monitoring for most transformer applications. The relay offers up to five three-phase restraint inputs, three independent restricted earth fault (REF) protection elements, and two three-phase voltage inputs, all with synchrophasors. The SEL-487E limits transformer damage by responding to internal fault conditions in less than 1.5 cycles and helps avoid catastrophic transformer failure by detecting turn-to-turn faults involving as little as 2 percent of the total winding. Through-fault and thermal monitoring allow you to track transformer wear and schedule maintenance as necessary. Breaker wear monitoring reduces inefficient and costly breaker maintenance, saving time and money. Optional Time-Domain Link (TiDL®) technology and SEL Sampled Values (SV) technology using IEC 61850-9-2 transform the way you modernize your substation.

1. EIA-232 front serial port is quick and convenient for system setup and local access.
2. LCD allows you to control and view the status of disconnects and breakers.
3. Easy-to-use keypad aids simple navigation.
4. Front-panel LEDs indicate custom alarms and provide fast and simple information to assist dispatchers and line crews with rapid power restoration.
5. Programmable operator pushbuttons with user-configurable labels allow front-panel customization.
6. Choose from a vertical (5U only) or horizontal, panel-mount or rack-mount chassis and different size options.
7. 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 Edition 2.*
8. Use one front and three rear EIA-232 ports for Mirrored Bits® communications, DNP3, SCADA, and engineering access.
9. 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.
10. 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.
11. 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.

*Optional feature

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



ANSI 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 RTD Module*
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

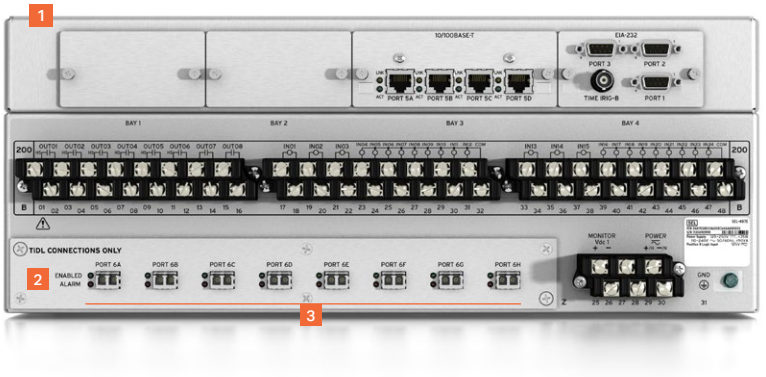
BRM	Breaker Wear Monitor
LDP	Load Data Profiling
SBM	Station Battery Monitor
SIP	Software-Invertible Polarities
SV	IEC 61850-9-2 Sampled Values Technology*†
THM	IEC 60255-Compliant Thermal Model
TiDL	Time-Domain Link Technology*
TRM	Transformer Monitor

*Optional feature †Copper or fiber-optic

†TiDL and SV relays receive current and voltage values from remote merging units.

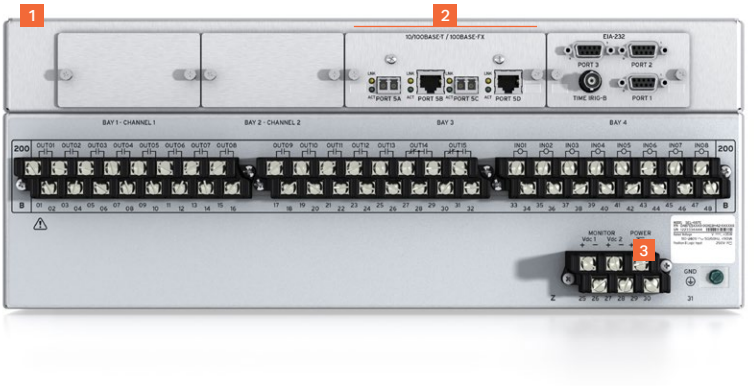
SEL-487E TiDL Option

1. 4U chassis with horizontal mounting options (panel or rack) accommodates your application needs.
2. LEDs indicate the connection status to an SEL-TMU TiDL Merging Unit on a per-port basis.
3. Eight 100 Mbps fiber-optic ports allow the TiDL-enabled relay to connect with eight remote SEL-TMU nodes and to receive remote analog and digital data.



SEL-487E SV Option

1. The 4U chassis has various mounting options to accommodate hardware needs.
2. Select fiber-optic, copper, or mixed Ethernet with separate ports for SV data and engineering access.
3. 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.

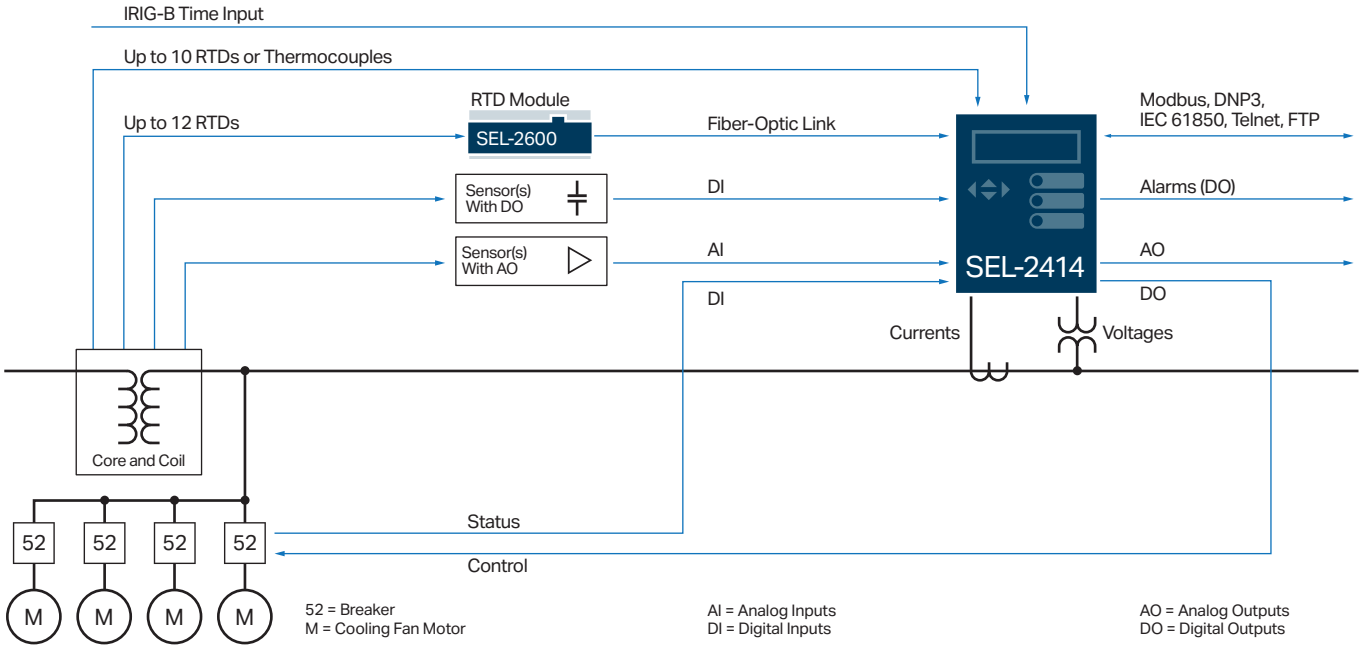


SEL-2414
Transformer Monitor

Starting price
$1,200 USD

selinc.com/products/2414

The SEL-2414 provides standalone or distributed monitoring and control of transformers. With flexible communications options, it can connect to a SCADA or automation system. Multiple I/O options are available to help you monitor your system, from detecting oil levels and sudden pressure to alerting alarm systems or control functions. The SEL-2414 withstands harsh physical and electrical environments and is built and tested to meet mission-critical IEEE and IEC protective relay standards.



Input diagram for typical transformer monitoring, cooling, and control applications.

SEL-487B

Bus Differential and Breaker Failure Relay

Starting price
$7,070 USD

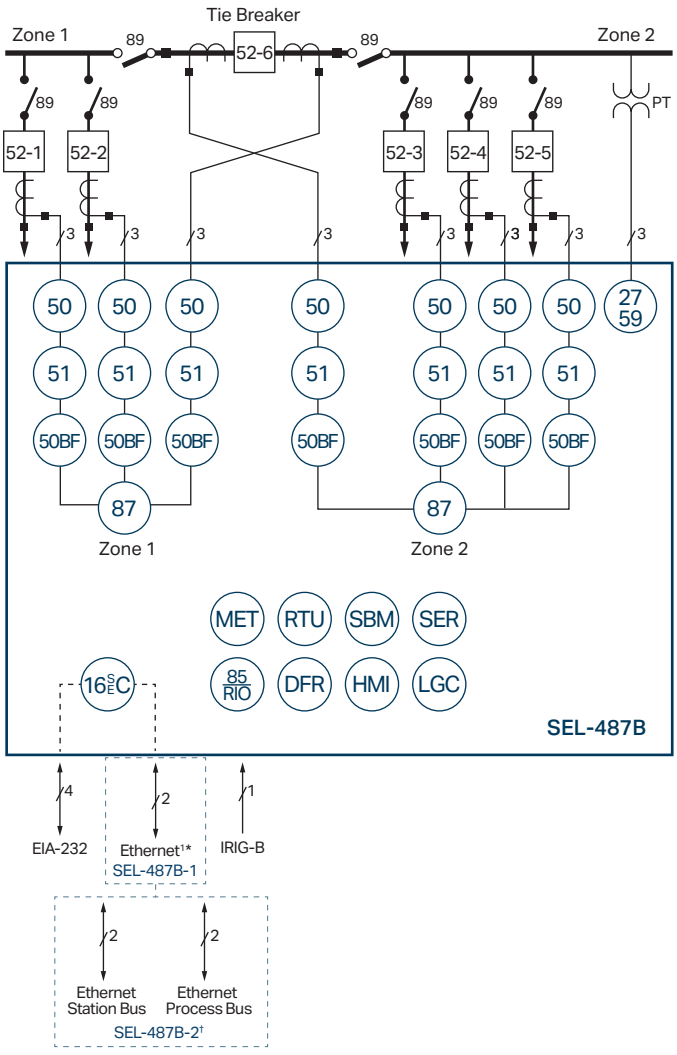
selinc.com/products/487B

The SEL-487B provides optimized, low-impedance bus differential fault detection by using high-speed, subcycle protection coupled with high-security operation for external faults. Superior protection performance and integrated station automation features provide a seamless solution for new and retrofit applications. Optional Time-Domain Link (TiDL®) technology and SEL Sampled Values (SV) technology transform the way you modernize your substation. The SEL-487B with TiDL technology is a simple way to provide distributed busbar protection. The TiDL architecture simplifies network engineering and fiber-optic cable routing in the field and makes the commissioning process quick and easy.

1. EIA-232 front serial port is quick and convenient for system setup and local access.
2. LCD automatically scrolls between custom displays.
3. Easy-to-use keypad aids simple navigation.
4. Front-panel LEDs indicate custom alarms and provide fast and simple information to assist dispatchers and line crews with rapid power restoration.
5. Programmable operator pushbuttons with user-configurable labels allow for front-panel customization.
6. Choose from a horizontal panel-mount or rack-mount chassis and different size options.
7. Use one front and three rear EIA-232 ports for Mirrored Bits® communications, DNP3, SCADA, and engineering access.
8. Communications protocols include FTP, Telnet, DNP3 LAN/WAN, the Parallel Redundancy Protocol (PRP), the IEEE 1588 Precision Time Protocol Version 2 (PTPv2),** and IEC 61850 Edition 2.*
9. 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.
10. 21 current and 3 voltage channels accommodate different busbar configurations.

*Optional feature

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



ANSI Functions

16 SEC	Access Security (Serial, Ethernet)
27/59	Over-/Undervoltage
50	Overcurrent
50BF	Breaker Failure Overcurrent
51	Time Overcurrent
85 RIO	SEL Mirrored Bits Communications
87	Current Differential
DFR	Event Reports
HMI	Operator Interface
LGC	Expanded SELogic® Control Equations
MET	High-Accuracy Metering
RTU	Remote Terminal Unit
SER	Sequential Events Recorder

Additional Functions

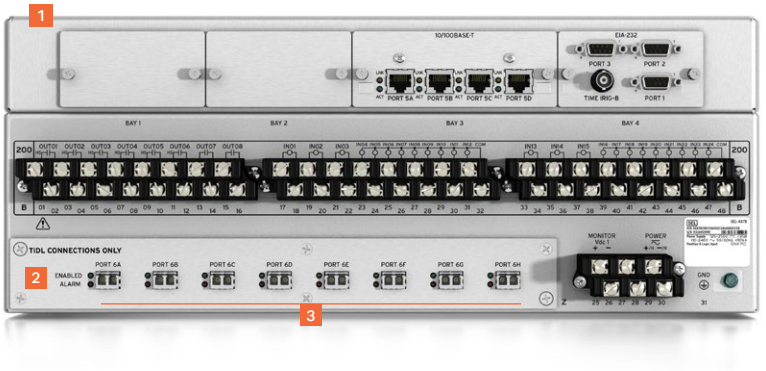
SBM	Station Battery Monitor
SV	IEC 61850-9-2 Sampled Values Technology*†
TiDL	Time-Domain Link Technology*

*Optional feature †Copper or fiber-optic

†TiDL and SV relays receive current and voltage values from remote merging units.

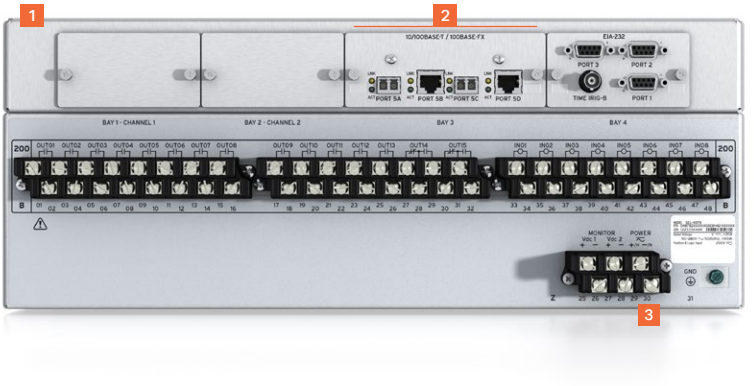
SEL-487B TiDL Option

1. 4U chassis with horizontal mounting options (panel or rack) accommodates your application needs.
2. LEDs indicate the connection status to an SEL-TMU TiDL Merging Unit on a per-port basis.
3. Eight 100 Mbps fiber-optic ports allow the TiDL-enabled relay to connect with eight remote SEL-TMU nodes and to receive remote analog and digital data.



SEL-487B SV Option

1. The 4U chassis has various mounting options to accommodate hardware needs.
2. Select fiber-optic, copper, or mixed Ethernet with separate ports for SV data and engineering access.
3. 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.



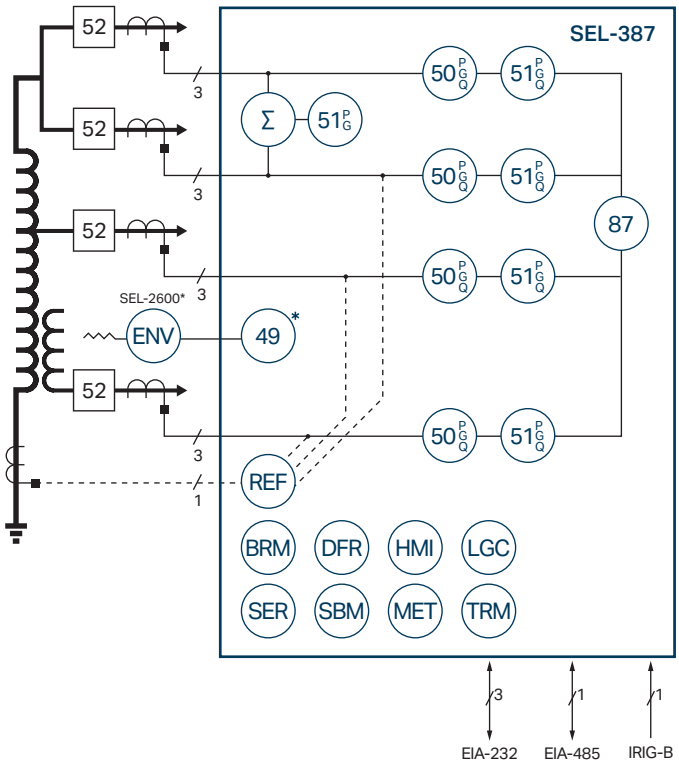
SEL-387/387A

Current Differential and Overcurrent Relays

Starting price
SEL-387: $5,440 USD
SEL-387A: $3,810 USD

selinc.com/products/387 or selinc.com/products/387A

The SEL-387 provides protection, control, and metering for transformers, buses, breakers, and feeders. Features include four three-phase current inputs with independent restrained and unrestrained differential protection, programmable single- or dual-slope differential characteristics, a circuit breaker monitor, a battery voltage monitor, and enhanced SELOGIC® control equations. The SEL-387A offers restrained and unrestrained differential protection for two terminals. Second-, fourth-, and fifth-harmonic elements, enhanced by the dc element, provide security during transformer energization and overexcitation conditions in a user-defined choice of either harmonic restraint or harmonic blocking. Overcurrent elements provide backup protection that contributes to the versatility of the SEL-387A.



ANSI Functions

49	Thermal Monitoring*
50 (P,G,Q)	Overcurrent (Phase, Ground, Negative Sequence)
51 (P,G,Q)	Time Overcurrent (Phase, Ground, Negative Sequence)
87	Current Differential
DFR	Event Reports
ENV	SEL-2600 RTD Module*
HMI	Operator Interface
LGC	SELOGIC Control Equations
MET	High-Accuracy Metering
REF	Restricted Earth Fault
SER	Sequential Events Recorder

Additional Functions

BRM	Breaker Wear Monitor
SBM	Station Battery Monitor
TRM	Transformer Monitor

*Optional feature

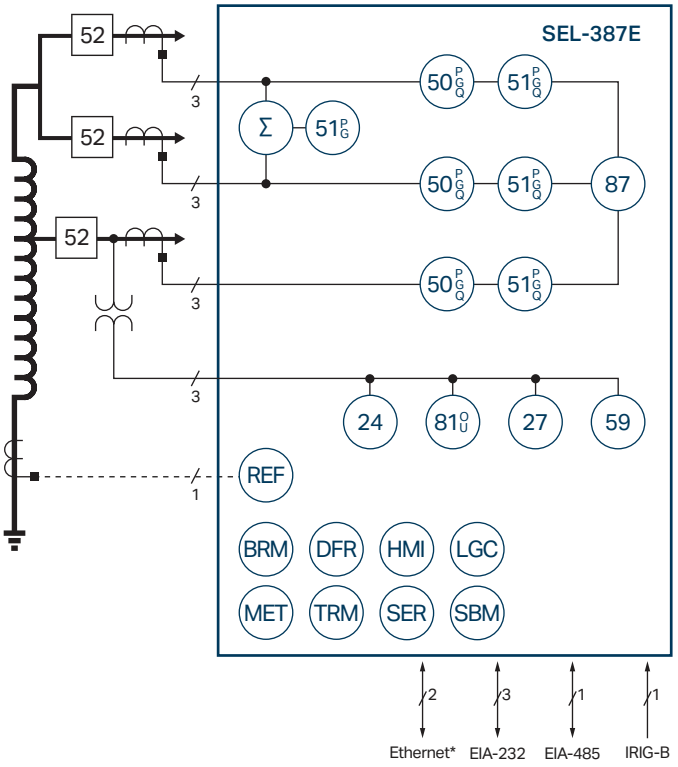
SEL-387E

Current Differential and Voltage Relay

Starting price
$5,990 USD

selinc.com/products/387E

The SEL-387E protects two- or three-winding power transformers. Voltage inputs for power metering, overexcitation protection, and over-/underfrequency load shedding provide versatile solutions for power system equipment protection. Automation features reduce total project construction and operation costs through elimination of traditional external control switches, meters, and indicating lamps.



ANSI Functions

24	Volts/Hertz
27	Undervoltage
50 (P,G,Q)	Overcurrent (Phase, Ground, Negative Sequence)
51 (P,G,Q)	Time Overcurrent (Phase, Ground, Negative Sequence)
59	Overvoltage
81 (O,U)	Over-/Underfrequency
87	Current Differential
DFR	Event Reports
HMI	Operator Interface
LGC	SELOGIC® Control Equations
MET	High-Accuracy Metering
REF	Restricted Earth Fault
SER	Sequential Events Recorder

Additional Functions

BRM	Breaker Wear Monitor
SBM	Station Battery Monitor
TRM	Transformer Monitor

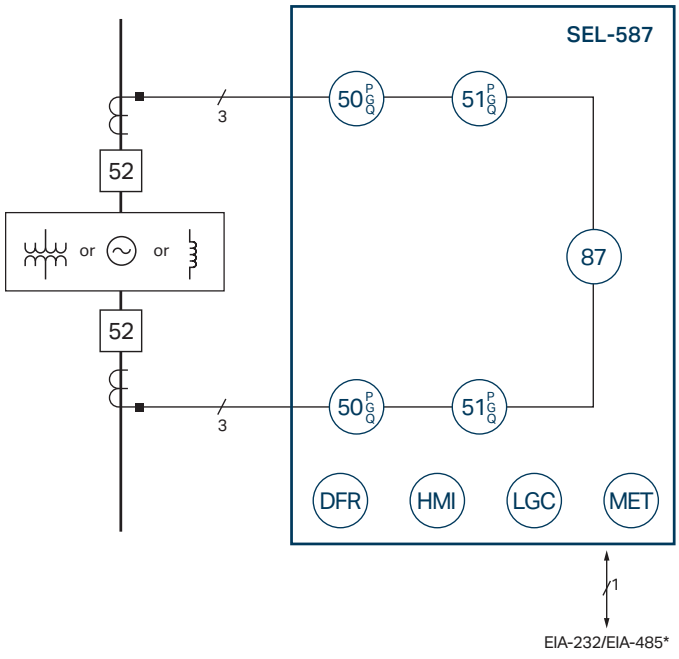
*Optional feature

SEL-587
Current Differential Relay

Starting price
$2,160 USD

selinc.com/products/587

The SEL-587 provides current differential protection with programmable single- or dual-slope percentage restraint for two-winding transformers, reactors, generators, large motors, and other two-terminal equipment. You can expand beyond basic transformer protection by applying individual winding phase, ground, and negative-sequence overcurrent elements. The SEL-587 also provides event reports for quick post-event analysis.



ANSI Functions

50 (P,G,Q)	Overcurrent (Phase, Ground, Negative Sequence)
51 (P,G,Q)	Time Overcurrent (Phase, Ground, Negative Sequence)
87	Current Differential
DFR	Event Reports
HMI	Operator Interface
LGC	SELOGIC® Control Equations
MET	High-Accuracy Metering

*Optional feature

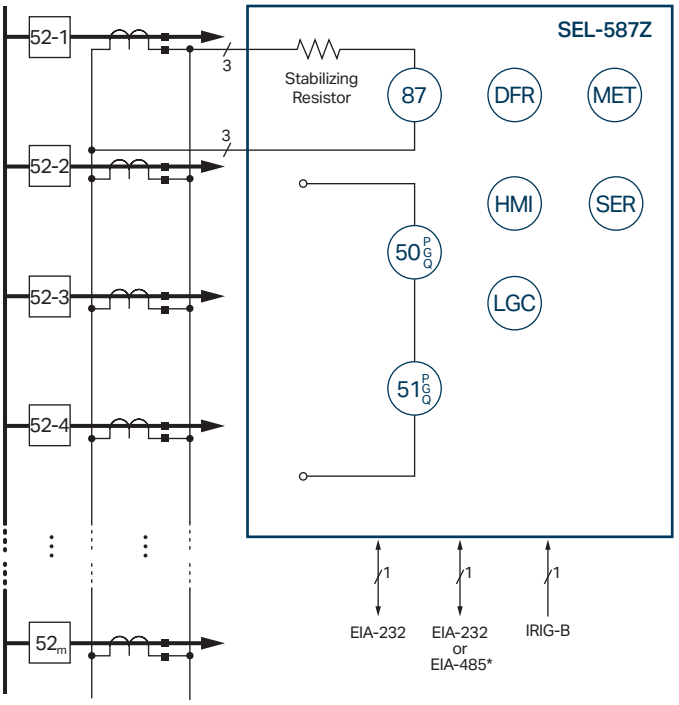
SEL-587Z

High-Impedance Differential Relay

Starting price
$4,080 USD

selinc.com/products/587Z | Select models typically ship in 2 days

The SEL-587Z is an economical and flexible relay that combines proven high-impedance analog technology with the advantages of microprocessor technology. Designed primarily for high-impedance bus protection, the relay is also suitable for restricted earth fault applications on transformers with grounded-wye windings. The high-impedance differential elements provide fast tripping for in-zone faults while offering security during heavy through faults and CT saturation. The relay includes the resistors and metal-oxide varistors (MOVs) required for high-impedance differential protection. You can use the independent overcurrent elements to complement the high-impedance differential elements. Event reports and the Sequential Events Recorder (SER) simplify post-event analysis.



ANSI Functions

50 (P,G,Q)	Overcurrent (Phase, Ground, Negative Sequence)
51 (P,G,Q)	Time Overcurrent (Phase, Ground, Negative Sequence)
87	Three-Phase High-Impedance Differential Elements
DFR	Event Reports
LGC	SELOGIC® Control Equations
HMI	Operator Interface
MET	High-Accuracy Metering
SER	Sequential Events Recorder

*Optional feature

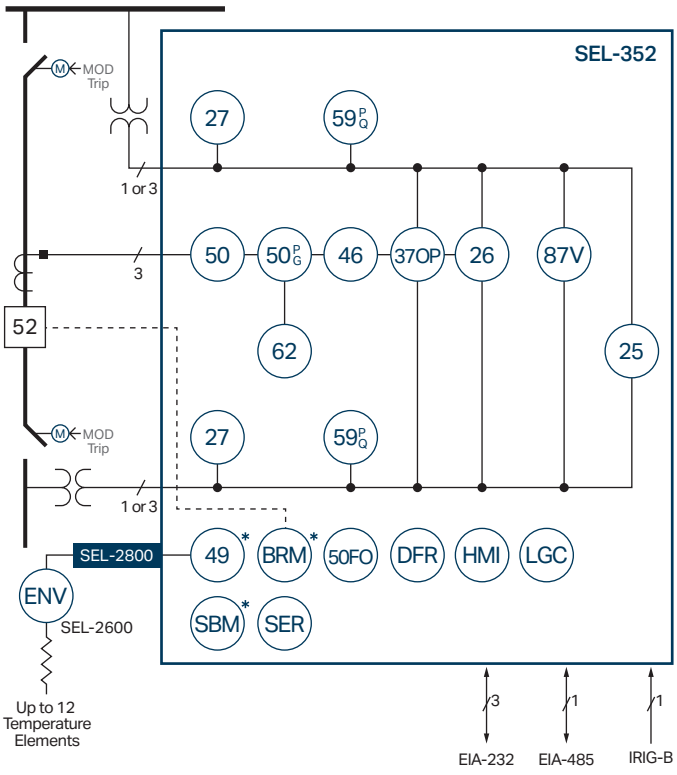
SEL-352

Breaker Failure Relay

Starting price
$3,700 USD

selinc.com/products/352

The SEL-352 provides breaker failure protection, breaker control, and breaker monitoring. A cost-saving data recorder and sophisticated breaker monitor and controller reduce maintenance and supervise manual operations. With flexible SELOGIC® control equations, you can use the SEL-352 for a variety of applications.



ANSI Functions

25	Synchronism Check
26	Insertion Resistor Thermal
27	Undervoltage
37OP	Breaker Overpower
46	Current Unbalance
49	Thermal*
50	RMS Overcurrent
50FO	Flashover Overcurrent
50 (P,G)	Overcurrent (Phase, Ground)
59 (P,Q)	Overvoltage (Phase, Negative Sequence)
62	Breaker Failure Timer
87V	Voltage Differential
DFR	Event Reports
ENV	SEL-2600 RTD Module*
HMI	Operator Interface
LGC	SELOGIC Control Equations
SER	Sequential Events Recorder

Additional Functions

BRM	Breaker Wear Monitor*
SBM	Station Battery Monitor*

*Optional feature