

# SEL-700 Series Protective Relays

## Product Family



Rugged, comprehensive, and reliable protection for your power system

- High-speed, secure, and dependable fault detection and location for a wide range of protection applications.
- A 5-inch, 800 × 480 color touchscreen display for direct monitoring and control of your system.
- Hardware proven to operate reliably in extreme conditions.
- Common platform architecture that simplifies setup, configuration, commissioning, and maintenance.
- Advanced communications allow you to integrate relays with various control systems and devices.





## SEL-700 Series— Reliable Protection

The SEL-700 series protective relays reliably protect and control your power system, from generators and transformers to feeders and motors.

SEL relays offer high-speed, secure, accurate, and dependable fault locating along with comprehensive automation and control functions. A wide variety of communications protocols and media provide the flexibility to communicate with other devices and control systems.

Our proven hardware is designed and tested to operate in extreme conditions, including the presence of vibration, electromagnetic interference, and other adverse environmental conditions common in power system environments. Optional conformal coating provides extra protection in caustic environments.

With our ten-year, worldwide, no-questions-asked warranty and unmatched technical support, SEL-700 series relays provide performance you can count on.

# SEL-700G

## Generator Protection Relay

The SEL-700G provides a comprehensive protection and synchronization solution for synchronous generators. With a built-in autosynchronizer, flexible I/O, and advanced communications, you can eliminate the complexity and cost of standalone synchronizer packages.

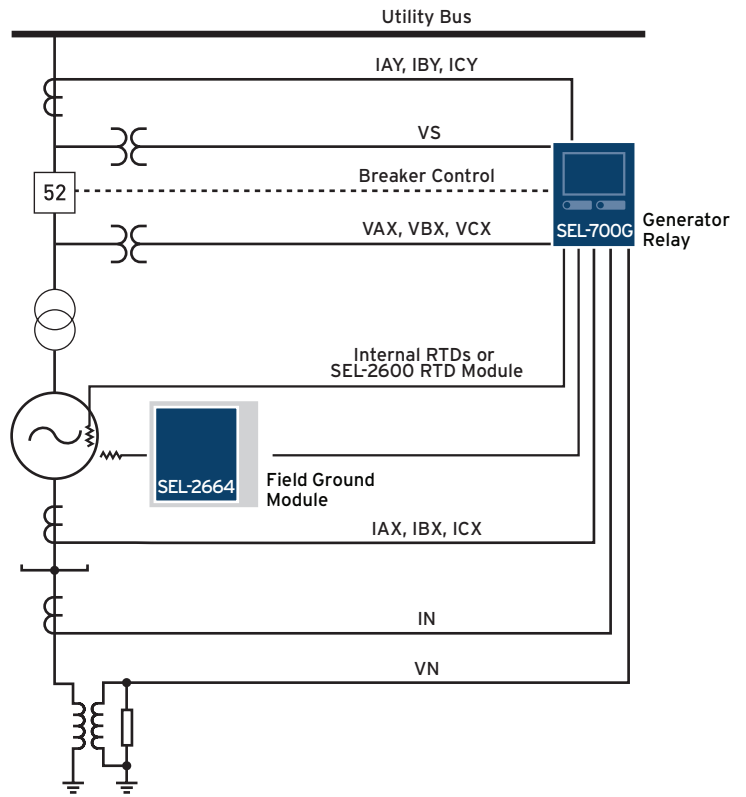


### Unit Protection

Apply sensitive percentage-restrained current differential elements and an unrestrained element, along with synchronism-check and volts-per-hertz elements, across the entire unit to protect both the generator and the step-up transformer. Harmonic-blocking elements protect the unit transformer bushing and end windings while maintaining security for inrush and through-fault conditions.

### Stator/Field Ground Protection

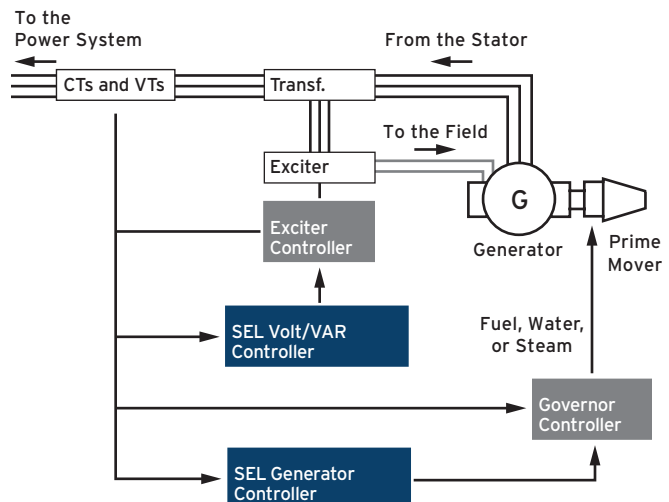
Adding the optional neutral voltage connection provides 100 percent stator ground protection for most machines, based on fundamental-frequency and third-harmonic neutral voltage measurements. Connecting the neutral current input provides protection for solidly grounded or resistance-grounded machines. State-of-the-art voltage injection provided by the optional SEL-2664 Field Ground Module allows you to monitor field ground insulation resistance. You can protect generators from damage by responding to low field ground insulation resistance warnings.



### Automatic Generator Control

The SEL POWERMAX® Power Management and Control System regulates generator power outputs and manages utility interties to maximize system stability, minimize electrical disturbances, and mitigate load-shedding requirements. The SEL-700G in combination with POWERMAX can balance generator loading, control tie line power flow, and maintain bus voltage.

The automatic MVAR and voltage control maintains MVAR flows on interties and system bus voltages by controlling load tap changers, generator field and large synchronous motor exciters, synchronous and static condensers, and capacitor banks.





# SEL-710-5

## Motor Protection Relay

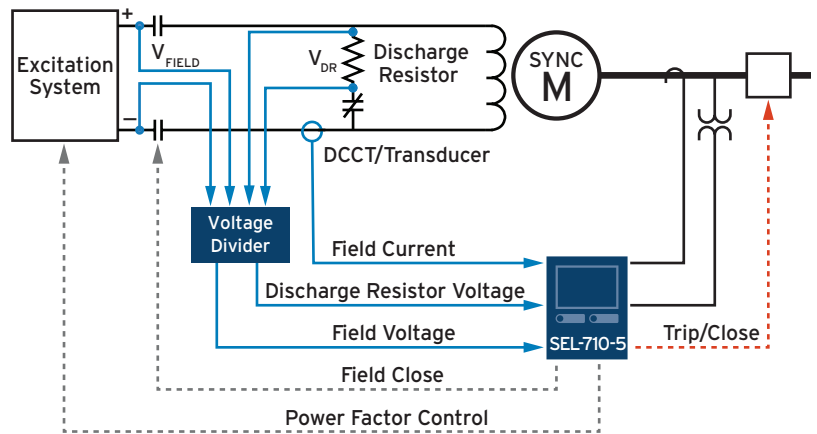
### Motor Protection

Protect a wide variety of low- and medium-voltage three-phase induction and synchronous motors using the SEL-710-5. Phase and neutral current elements feed accurate thermal models that track motor thermal characteristics during the stop/start/run cycles of the motor. The slip-dependent thermal model (AccuTrack™) allows independent thermal protection of both the rotor and stator.



### Synchronous Motor Protection

Select the SEL-710-5 with the synchronous motor protection option to start and protect synchronous motors. You can monitor field voltage and current and effectively respond to loss-of-field, field resistance, out-of-step, power factor, and reactive power issues.



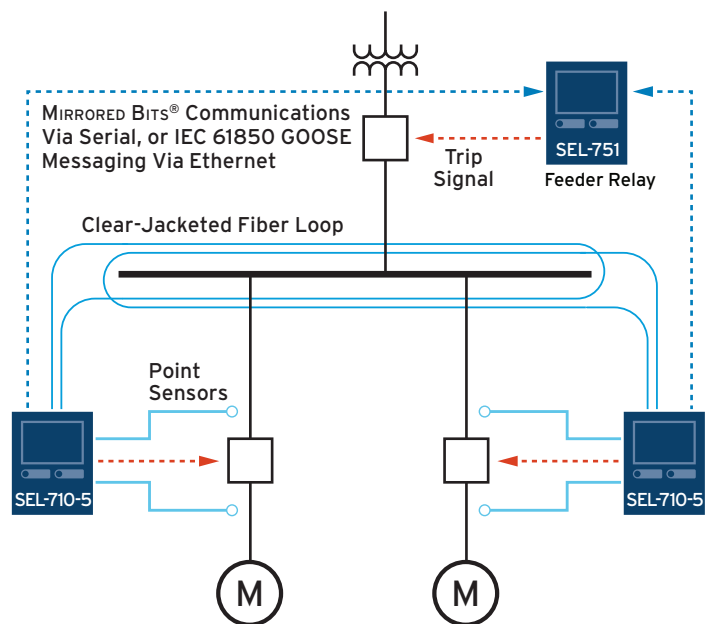
In this brush-type synchronous motor application, the SEL-710-5 connects directly to the excitation system to control the power factor.

### Motor Thermal Overload Protection

The SEL-710-5 provides locked-rotor, running overload, and negative-sequence current unbalance protection. It accurately tracks the heating effects of load current and current unbalance during the motor's operating conditions (starting and running) using the AccuTrack Thermal Model.

### Arc-Flash Mitigation

Select optional arc-flash detection (AFD) inputs for overcurrent-supervised arc-flash protection. You can reduce incident energy further by selecting high-speed, high-current interrupting output contacts to achieve secure, reliable, and fast arc-flash tripping. Arc-flash mitigation options in the SEL-710-5 offer either four or eight AFD inputs capable of reading point, window, and loop sensors.



Overcurrent-supervised AFD and advanced communications combine to improve safety and power system reliability.

# SEL-751

## Feeder Protection Relay



### LEA Sensor Inputs

Apply the SEL-751 in medium- and low-voltage applications that use low-energy current/voltage sensors. Low-energy analog (LEA) sensors for measurement of primary voltages and currents are gaining popularity, owing to their excellent linearity and wide dynamic range characteristics, reduced size, and reduced weight as well as the enhanced personnel safety they provide. The LEA current/voltage input card supports three current channels that are either Rogowski coil or low-power current inputs, three LEA voltage sensor inputs, and one 200 mA neutral input. LEA current and voltage channels accept an RJ45 connector input, and the 200 mA neutral channel accepts a terminal block input.

### Feeder Protection

Provide comprehensive protection, including time-overcurrent, directional overcurrent, over-/undervoltage, autoreclosing, frequency, and much more.

### High-Impedance Fault Detection

Detect downed conductors, even on poorly conducting surfaces, with Arc Sense™ technology (AST). AST detects and clears high-impedance faults (HIFs) that might not be detected by conventional overcurrent elements, providing an added level of protection. AST algorithms detect arcing produced by many HIFs and will alarm or trip the breaker.

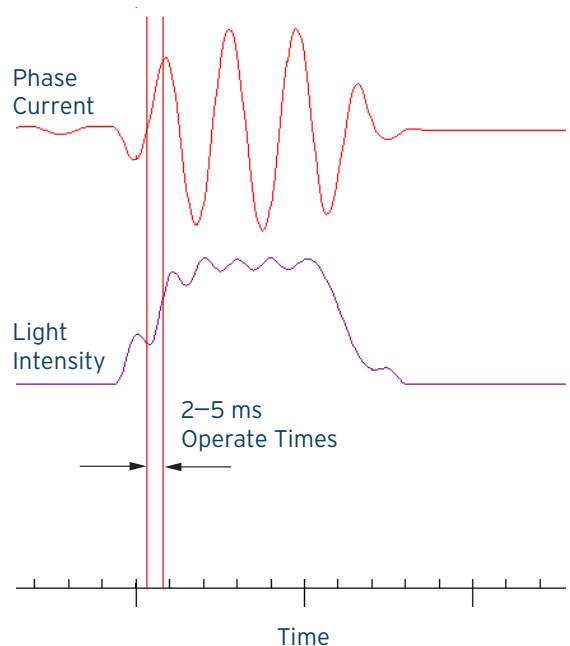
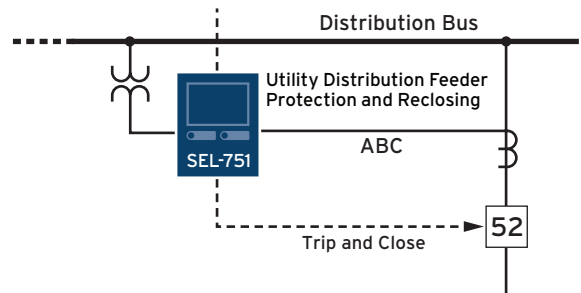
### Reduce Arc-Flash Hazards

Combine light-sensing technology with fast overcurrent protection to provide high-speed AFD in as fast as 2 ms without false tripping.

Fast and secure arc-flash protection reduces the incident energy of arc-flash events. SEL-751 relays also have integration and communications features for secure remote access to help you keep out of the danger zone while gathering important real-time and historical data from the relays. You can coordinate protection for faster clearing times and stay outside the danger zone with wireless or remote communications.

### Event Analysis

Conduct post-event analysis more efficiently with the detailed event records available in the SEL-751. You can combine oscillographic and digital information to find the root cause. An SEL satellite-synchronized clock (e.g., SEL-2401 or SEL-2407®) can provide convenient alignment of event information from multiple devices.



# SEL-787-2/-3/-4

## Transformer Protection Relay

### Multiwinding Protection

Select the SEL-787 for standard dual-slope differential protection with harmonic blocking and restraint for two-, three-, and four-winding transformers. The SEL-787 offers as many as three independent restricted earth fault (REF) elements for sensitive ground-fault detection of 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 three-pole breakers is also standard.

### Transformer Monitoring

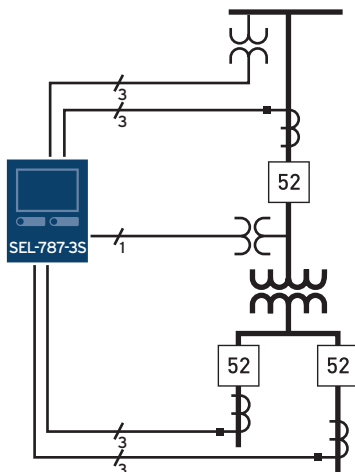
Measure and track accumulated through-fault current levels, and use optional 4 to 20 mA inputs or resistant temperature detector (RTD) thermal inputs to monitor ambient, load tap changer (LTC) tank, or transformer oil temperatures.

### Frequency Tracking

Choose the SEL-787-3E and SEL-787-3S for generator step-up and variable-frequency applications. These relays have voltage inputs to provide volts/hertz protection with frequency tracking from 15 to 70 Hz. Use the over-/underfrequency and over-/undervoltage elements to implement load shedding and other control schemes.

### 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.



### Beyond Basic Transformer Protection

Achieve comprehensive transformer protection with the optional single-phase sensitive REF input and the three-phase voltage inputs. You can eliminate separately mounted metering devices with the built-in metering functions in the SEL-787, including harmonics, power, phase voltages and currents, neutral currents, and sequence voltages and currents.

### Local/Remote Operator Controls

Employ eight programmable front-panel pushbuttons, each with two programmable tricolor LEDs, for a wide variety of uses, including easy trip/close control and status indication for all the breakers. With the operator control interface pushbuttons, you can easily implement local and remote operator control schemes using 32 local and 32 remote control bits. SELogic® control equations and slide-in, configurable front-panel labels allow you to change the function and identification of target LEDs and operator control pushbuttons and LEDs.

### Integration and Automation

Select from an array of communications features and protocols to support all your integration and automation solutions. Standard features include MIRRORING BITS® communications, advanced SELogic control equations, and IEEE C37.118 synchrophasors. IEC 61850, Modbus TCP/IP, the Simple Network Time Protocol (SNTP), DNP3 LAN/WAN, DNP3 serial, and IEC 60870-103 are optional. Elective communications ports include EIA-232 or EIA-485 and single or dual, copper or fiber-optic Ethernet ports. Several digital/analog I/O options are also available for advanced integration. Spanish language support is optional in the PC software, ASCII ports, and HMI.

# SEL-700 Series Family Comparison

	SEL-700G	SEL-710-5	SEL-751	SEL-787-2/-3/-4
Applications	Generator	Motor	Feeder	Transformer
100% Stator Ground Protection	• <sup>1</sup>			
Generator Intertie Protection	• <sup>1</sup>		•	
Induction Motor Protection		•		
Synchronous Motor Protection		•		
Breaker Failure Protection	• <sup>1</sup>	•	•	•
Distribution Feeder Protection	• <sup>1</sup>		•	
Arc-Flash Mitigation		•	•	
Synchronism Check	• <sup>1</sup>		•	
Integrated Synchronizer	• <sup>1</sup>			
Motor Bus Transfer	•			
Broken Rotor Bar Detection		•		
Thermal Monitoring	•	•	•	•
Underfrequency Load Shedding			•	•
Undervoltage Load Shedding			•	•
RTD Inputs	•	•	•	•
Synchrophasors (IEEE C37.118)	•		•	•
Web Server	•	•	•	•
Communications	SEL (Fast Meter, Fast Operate, and Fast SER), Modbus TCP/IP, Rapid Spanning Tree Protocol (RSTP), Modbus RTU, EtherNet/IP, IEC 61850 Edition 2, IEC 60870-5-103, the IEEE-1588 Precision Time Protocol (PTP) (firmware-based), SNTP, the Parallel Redundancy Protocol (PRP), DNP3, MIRRORRED BITS, and IEEE C37.118 synchrophasors			
Display Options	5-inch color touchscreen display, 800 × 480 pixels; 2-line, 2 × 16 character LED			
Monitoring and Reporting	Event reports (multicycle data) and Sequential Events Recorder (SER)			
Operating Temperature	−40° to +85°C (−40° to +185°F)			
Warranty	10 years, no questions asked			

<sup>1</sup>Refer to SEL-700G product flyer for supported models.

**SEL** SCHWEITZER ENGINEERING LABORATORIES

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