SEL-700 Series Family Comparison

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<tr>
<th>Applications</th>
<th>SEL-700G</th>
<th>SEL-710-5</th>
<th>SEL-751</th>
<th>SEL-787-2/-3/-4</th>
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</thead>
<tbody>
<tr>
<td>100% Stator Ground Protection</td>
<td></td>
<td></td>
<td></td>
<td>Y</td>
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<tr>
<td>Generator Intertie Protection</td>
<td></td>
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<td></td>
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<tr>
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<td>Integrated Synchronizer</td>
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<td>Broken Rotor Bar Detection</td>
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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.
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.

Simple Management Software

Use acSELerator QuickSet® SEL-5030 Software to Set, Monitor, and Control the SEL700 Series Protective Relays

With QuickSet, you can:
• Communicate with the SEL-700 series relays through any ASCII terminal or use the QuickSet graphical user interface.
• Develop settings offline with a menu-driven interface and completely documented help screens. You can speed up installation by copying existing settings files and modifying application-specific items.
• Simplify the settings procedure with rules-based architecture to automatically check interrelated settings. Out-of-range or conflicting settings are highlighted for correction.
• Use the acSELerator® HMI synchroscope to view the real-time synchronization process.
• Initiate the generator synchronization process using an HMI pushbutton.

Use acSELerator Software to Retrieve and Display Event Reports Recorded by the SEL-700

With acSELerator software, you can:
• Display event report oscillograms. You can view each report as a plot of magnitude versus time and select analog and digital points to build a custom display.
• Display phase and symmetrical component phasors. Displaying the phasor view of electrical data helps you better understand asymmetrical, three-phase faults. You can build a custom plot using per-phase and symmetrical component sequence currents and voltages.
• Retrieve event reports using serial or Ethernet communications links.
SEL-787-2/-3/-4
Transformer Protection Relay

Multwinding 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 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 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 20 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. SELLOGIC® 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 Modbus®, communications, advanced SELLOGIC control equations, and IEEE C37.118 synchrophasors. IEC 61850, Modbus®, TCP/IP, the Simple Network Time Protocol (SNTP), and DNP3 LAN/WAN, DN34 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-700G
Generator Protection Relay

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
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 generation 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-700G
Generator Protection Relay
**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.

**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 4 or 8 AFD inputs capable of reading both point and loop sensors.

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**SEL-751**  
**Feeder Protection Relay**

**Sensitive Earth Fault (SEF) Protection**  
Improve ground protection with the 200 mA neutral input. You can protect ungrounded, solidly grounded, Petersen coil-grounded, or other impedance-grounded systems with a sensitive G7N or G5N element for directional or nondirectional ground overcurrent protection, respectively.

**Feeder Protection**  
Provide comprehensive protection, including time-overcurrent, directional overcurrent, over-/under-voltage, 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 (HIF) that might not be detected by conventional overcurrent elements, providing an added level of protection. AST algorithms detect arcing produced by many HIF faults 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 milliseconds 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. A satellite-synchronized time source, like the SEL-2401 or SEL-2407 Satellite-Synchronized Clocks, can provide convenient alignment of event information from multiple devices.
**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.

Motor Thermal Overload Protection

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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 4 or 8 AFD inputs capable of reading both point and loop sensors.

**SEL-751**

Feeder Protection Relay

Sensitive Earth Fault (SEF) Protection

Improve ground protection with the 200 mA neutral input. You can protect ungrounded, solidly grounded, Petersen coil-grounded, or other impedance-grounded systems with a sensitive 67N or 50N element for directional or nondirectional ground overcurrent protection, respectively.

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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 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 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 20 to 70 Hz. Use the over-/underfrequency and over-/undervoltage elements to implement load shedding and other control schemes.

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Beyond Basic Transformer Protection
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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 synchronization 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
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Automatic Generator Control
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 generation 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.
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• Simplify the settings procedure with rules-based architecture to automatically check interrelated settings. Out-of-range or conflicting settings are highlighted for correction.
• Use the acSELerator® HMI synchroscope to view the real-time synchronization process.
• Initiate the generator synchronization process using an HMI pushbutton.

Use acSELerator Software to Retrieve and Display Event Reports Recorded by the SEL-700

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• Display phase and symmetrical component phasors. Displaying the phasor view of electrical data helps you better understand asymmetrical, three-phase faults. You can build a custom plot using per-phase and symmetrical component sequence currents and voltages.
• Retrieve event reports using serial or Ethernet communications links.
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Communications: SEL (Fast Meter, Fast Operate, and Fast SER), Modbus TCP, Modbus RTU, IEC 61850 Edition 2, IEC 60870-5-103, SNET, PRP, DNP3, Mirrored Bits, and IEC 60870-5-103 Synchrophasors

Display Options: 5-inch color touchscreen, 480 × 800 resolution; 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

Refer to SEL-700G product flyer for supported models

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.
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