



SEL-587 Current Differential Relay

Two-Terminal Apparatus Current Differential Protection



Apply the SEL-587 Relay for protection of two-winding power transformers or other two-terminal apparatus.

Features and Benefits

■ Protection

Use single- or dual-slope percentage-restraint differential characteristics and overcurrent elements. Backup overcurrent protection provides high-speed operation, even with severe CT saturation, using the SEL Adaptive Overcurrent Element.

■ Control

Facilitate traditional or advanced protection schemes using SELogic® control equations with SELogic variables and timers. Remotely control overcurrent elements via serial communications.

■ Monitoring and Recording

Eliminate panel-mounted ammeters with accurate metering functions. Use front-panel display of metered secondary current magnitudes and phase angles to facilitate commissioning work. Review event reports to analyze protection scheme operations.

■ Application Settings

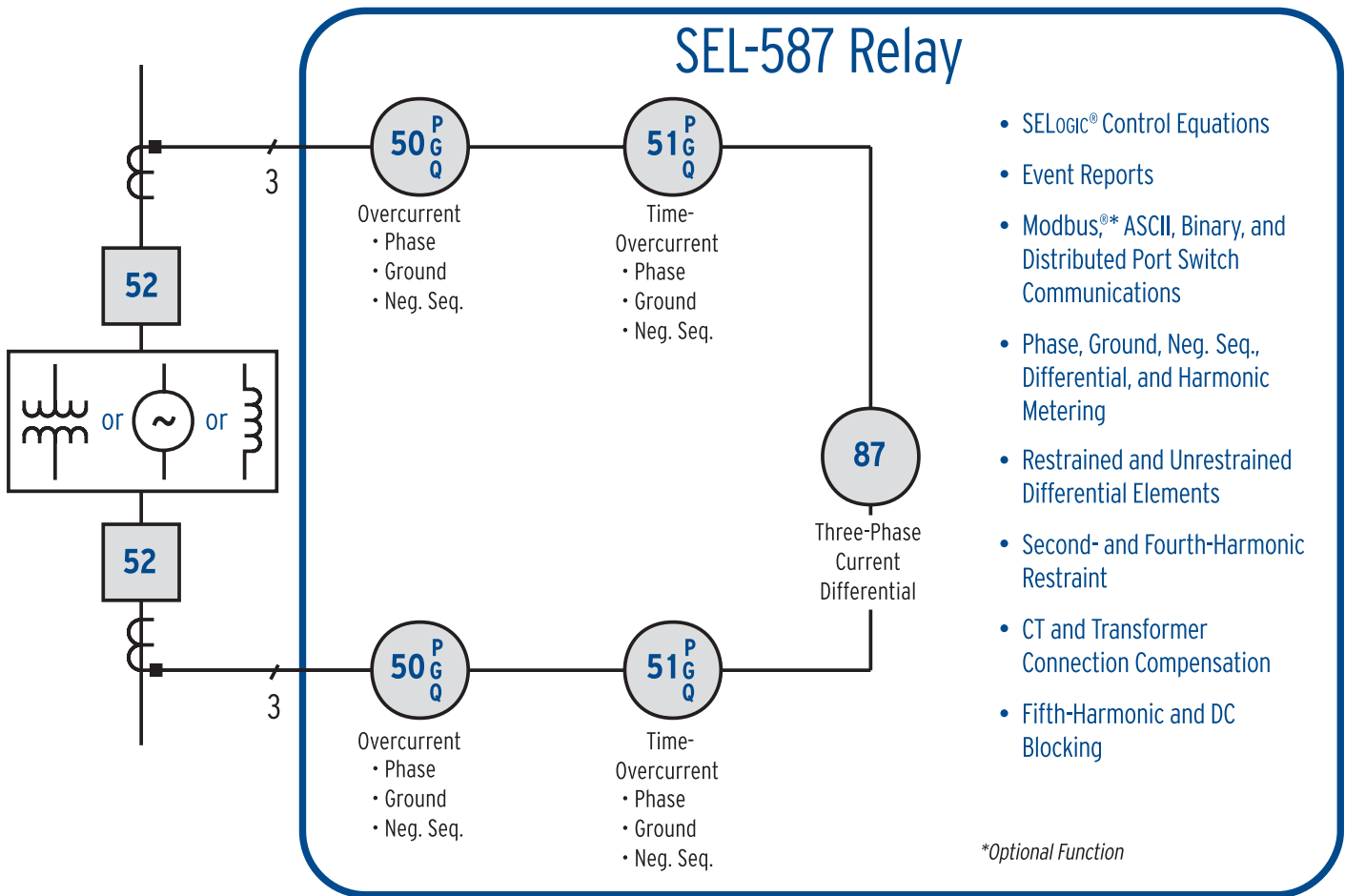
Accommodate a wide variety of transformer and CT connections, and automatically calculate the correct tap values with user-friendly relay settings. ACSELEATOR QuickSet® SEL-5030 Software simplifies settings creation and relay communications.

■ Communications

Choose from Modbus, ASCII, and binary protocols for communications with SCADA, local HMI, or modems.

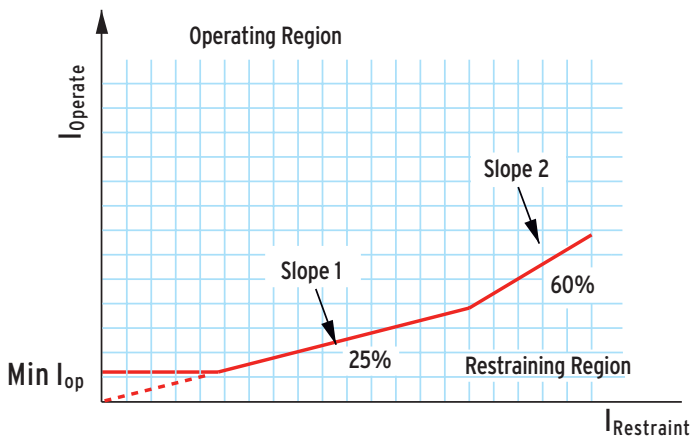
Making Electric Power Safer, More Reliable, and More Economical®

Functional Overview



Differential Protection

The SEL-587 Relay has three differential elements. These elements use operate and restraint quantities calculated from the two-winding input currents. Set the differential elements with either a single- or dual-slope percentage-restraint differential characteristic, as shown below.



The SEL-587-1 Relay provides security against conditions that may result in relay misoperation, resulting from both system and transformer events. Use the fifth-harmonic element to prevent relay misoperation during allowable overexcitation conditions. Even harmonic elements (second and fourth harmonic) provide security against inrush currents during transformer energization, complemented by the dc element, which measures the dc offset. The even harmonic element offers the choice between harmonic blocking and harmonic restraint. In the blocking mode, the user selects either blocking on an individual phase basis or on a common basis, as per application and philosophy. The second-, fourth-, and fifth-harmonic thresholds are set independently, and the dc blocking and harmonic restraint features are independently enabled.

Overcurrent Protection

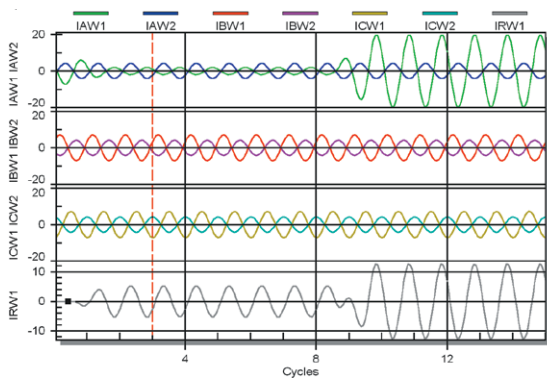
Each set of three-phase current input terminals has phase, negative-sequence, and residual overcurrent elements. Each set includes definite-time, instantaneous, and inverse-time overcurrent elements. All definite-time elements are torque controlled.

Remote Control

Remotely control one or two breakers via the SEL-587 Relay serial port interface using the relay Fast Operate command. Additionally, use the Fast Operate command to remotely control the state of one to four user-settable remote bits, which act as remote control switch elements in the relay. The remote bits are set, cleared, or pulsed via serial port commands from remote systems or human-machine interfaces (HMIs). These elements provide inputs to relay logic and control of relay output contacts. Typical applications include control switches for SCADA operations, such as trip and close, and enabling or disabling overcurrent elements.

Event Reports

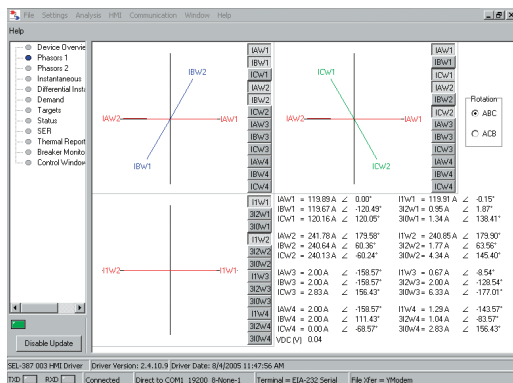
The SEL-587 Relay saves a 15-cycle report each time the relay issues a trip or some other user-selectable condition occurs. Each event report contains detailed current, relay element, input, and output data associated with the event. Use the information contained in the relay event reports to review relay operation during faults and tests.



Use acSELEATOR Analytic Assistant SEL-5601 Software to show quarter-cycle reports that include all analog and digital element values for digital evaluation of protection scheme performance.

Simplified Setup and Troubleshooting

- Use acSELEATOR QuickSet Software to customize your protection. Set and edit relay configuration, settings, and logic.
- View the HMI screens in acSELEATOR QuickSet to check wiring polarity and connections.



acSELEATOR QuickSet HMI simplifies configuration and troubleshooting.

Metering Functions

Built-in metering replaces conventional panel-mounted meters or the need for portable metering instruments.

Primary Current: IA, IB, IC, IR, 3I2

- Instantaneous
- Demand
- Peak demand
- Harmonic spectrum (second, fifth)

Secondary Current: IA, IB, IC, IR, 3I2

- Instantaneous with magnitude and angle

Differential Quantities: IOP, IRT, IF2, IF5

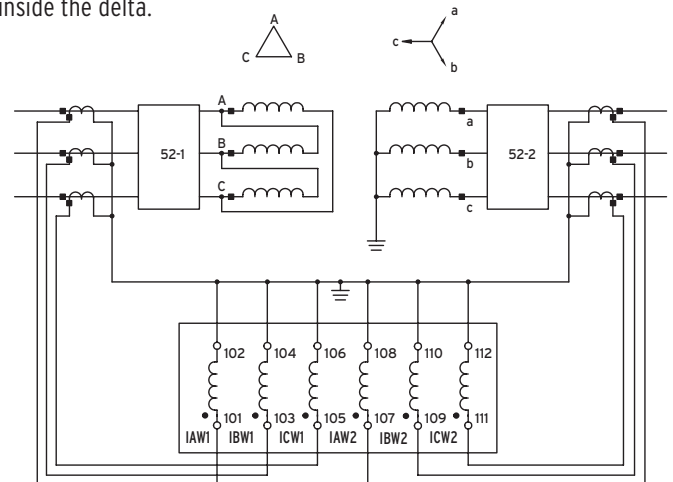
- Operate
- Restraint
- Second and fifth harmonics
- Time-delayed alarm threshold for fifth harmonic

Application Settings

Apply highly advanced differential and harmonic restraint algorithms using a minimum number of settings. The SEL-587 Relay settings compensate for power transformer phase shift and ratio scaling while accepting delta- or wye-connected CTs on either side of the transformer.

Simple CT connection type and vector group selection relate the transformer nameplate data to relay settings in familiar, understandable terminology.

In retrofit applications, continue to use existing CTs and secondary wiring without the need for wiring changes. Select CT connections from the settings menu, including delta-wye transformers with CTs inside the delta.



Relay Logic

SELogic control equations allow you to define the conditions to use internal relay elements to trigger an event report or close an output contact. Build your own tailor-made logic using AND, OR, and NOT operators.

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General Specifications

AC Current Inputs (six total)

5 A nominal

15 A continuous, 500 A for 1 second, linear to 100 A symmetrical, 625 A for 1 cycle (sinusoidal waveform)

Burden 0.16 VA @ 5 A; 1.15 VA @ 15 A

1 A nominal

3 A continuous, 100 A for 1 second, linear to 20 A symmetrical, 250 A for 1 cycle (sinusoidal waveform)

Burden 0.06 VA @ 1 A; 0.18 VA @ 3 A

60/50 Hz system frequency and ABC/ACB phase rotation are user settable

Power Supply Ratings

24 V (polarity sensitive)	16–36 Vdc
48/125 V	36–200 Vdc or 85–140 Vac
125/250 V	85–350 Vdc or 85–264 Vac
5.5 W maximum	

Output Contact Ratings (four total, standard model)

30 A make per IEEE C37.90-1989 paragraph 6.7.2; 6 A continuous carry; MOV protected

Standard Control Input and Output Ranges

24, 48, 125, or 250 Vdc level sensitive (specify voltage when ordering)

Configuration provides two inputs and four outputs (plus alarm)

Connectorized® hardware package provides access to high-current interrupting output contacts and level-sensitive inputs

Operating Temperature

–40° to +85°C (–40° to +185°F)

Serial Communications

Front panel: EIA-232 serial port

Rear panel: EIA-232 or EIA-485 serial port

Data rate of 300, 1200, 2400, 4800, 9600, 19200, 38400 bps

Time-Code Input

Demodulated IRIG-B accepted at Port 1

Mounting Options

Horizontal rack-mount and horizontal panel-mount versions available

Conformal Coating Option

Protect equipment from harsh environments and airborne contaminants, such as hydrogen sulfide, chlorine, salt, and moisture

Production Dielectric Strength Tests

V, I inputs: 2500 Vac for 10 seconds

Power supply, contact inputs, contact outputs: 3100 Vdc for 10 seconds

Type Tests and Standards

*Generic Emissions, Heavy Industrial: EN 50081-2:1994, Class A

*Generic Immunity, Heavy Industrial: EN 50082-2:1995, Class A

*Radiated and Conducted Emissions: EN 55011:1991, Class A

*Conducted Radio Frequency: EN 61000-4-6:1996, ENV 50141:1996, 10 Vrms

Cold: IEC 68-2-1:1990, Test Ad, 16 hours at –40°C

Dry Heat: IEC 68-2-2:1974, Test Bd, 16 hours at +85°C

Damp Heat, Steady State: IEC 68-2-3:1969, 40°C, 93% relative humidity

Damp Heat, Cyclic: IEC 68-2-30:1980, Test Db, 55°C, 6 cycles, 95% humidity

Dielectric Strength: IEC 255-5:1977, IEEE C37.90:1989, 2500 Vac on analogs, contact inputs, and contact outputs; 3100 Vdc on power supply; 2200 Vdc on EIA-485 communications port

Impulse: IEC 255-5:1977, 0.5 J, 5000 V

Vibration: IEC 255-21-1:1988, Class 2

Seismic: IEC 255-21-3:1993, Class 2 (conventional terminal block only)

1 MHz Burst Disturbance: IEC 255-22-1:1988, Class 3 (2500 V common and differential mode)

Electrostatic Discharge: IEC 255-22-2:1996, Level 4

Radiated Radio Frequency: IEC 255-22-3:1989, 10 V/m

Fast Transient Disturbance: IEEE C37.90.2:1995, IEC 255-22-4:1992, Level 4 (4 kV @ 2.5 kHz on power supply; 2 kV @ 5 kHz on input/output, signal, data, and control lines)

Surge Withstand Capability: IEEE C37.90.1:1989, 3000 V oscillatory, 5000 V transient

*Terminal block version only



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