



SEL-387 Relay Guideform Specifications

The microprocessor-based relay shall provide a combination of functions including protection, monitoring, control, and automation. Relay self-checking functions shall be included. Specific requirements are listed below:

Percentage Differential Protection. The relay shall incorporate restrained differential protection for up to four windings with fixed or variable percentage, using one or two settable slopes with adjustable intersection point and minimum pickup values.

Harmonic and DC Elements. The relay shall incorporate second-, fourth-, and fifth-harmonic and dc elements, with the choice of either harmonic blocking or harmonic restraint to prevent restrained differential element operation during inrush or overexcitation conditions; an independent fifth-harmonic alarm element shall be included to warn user of overexcitation condition.

Unrestrained Differential Protection. The relay shall include unrestrained differential protection to produce rapid tripping for severe internal faults.

Overcurrent Fault Protection. The relay shall incorporate four groups of three-phase current inputs that can be independently enabled for overcurrent protection. Eleven overcurrent elements per group shall be included to provide phase, negative-sequence, residual, and combined terminal protection.

CT Phase Angle Compensation. The relay shall incorporate full “round-the-clock” current compensation, in 30-degree increments, to accommodate virtually any type of transformer and CT winding connection.

Combined Currents. The relay shall incorporate elements to provide inverse-time phase and residual overcurrent protection based on summation of currents from Windings 1 and 2 and Windings 3 and 4.

Status and Trip Target LEDs. The relay shall include 16 status and trip target LEDs.

Restricted Earth Fault Protection. The relay shall incorporate restricted earth fault (REF) protection for the detection of ground faults in wye-connected windings.

Communication. The relay shall include three EIA-232 and one EIA-485 serial ports to provide flexible communication to external computers and control systems. The relay shall operate at a speed of 300–19200 baud. Three-level password protection shall be included to provide remote security communication.

Distributed Network Protocol (DNP). The relay shall incorporate certified DNP 3.0 Level 2 Slave protocol communications capability. The DNP capability shall include automatic dial-out for settings-based DNP events and virtual terminal support with full ASCII capability.

Relay Logic. The relay shall include programmable logic functions for a wide range of user-configurable protection, monitoring, and control schemes.

Auxiliary Inputs/Outputs. The relay shall include fully programmable optoisolated inputs and output contacts.

Trip and Close Variables. The relay shall include five trip variables and four close variables to permit separate control of up to four breakers and a separate lockout device.

Setting Groups. The relay shall include six selectable setting groups to permit easier adaptation to changes in application.

Metering. The relay shall include metering capabilities for real-time phase and differential quantities, as well as phase demand and peak demand current values. Harmonic content from the fundamental to the 15th harmonic for all 12 phase currents shall also be included.

Transformer Thermal Monitor. The relay shall incorporate a transformer thermal monitor based on IEEE C57.91: 1995. The model shall include capability for entering known transformer thermal constants as well as default constants. Three loss-of-insulation-life alarms shall be provided, including loss of life per day, total loss of life, and insulation aging factor. Up to four temperature inputs shall be accommodated by the relay.

Circuit Breaker Monitor. The relay shall include four breaker wear monitors with user-definable wear curves, operation counters, and accumulated interrupted currents per phase.

Substation Battery Monitor. The relay shall measure and report the substation battery voltage presented to the relay power supply terminals. Four selectable threshold parameters shall be provided for alarm and control purposes.

Through-Fault Event Monitor. The relay shall provide for the capability of reporting fault current level, duration, and date/time for overcurrent events through the differential protection zone. A settable I^2t alarm indicates an excess of accumulated through-fault energy.

Event Reporting and Sequential Events Recorder (SER). The relay shall be capable of automatically recording disturbance events of 15, 30, or 60 cycles with settable prefault duration and user-defined triggering. Events shall be stored in nonvolatile memory. The relay shall include an SER that stores the latest 512 entries.

Automation. The relay shall include 16 local control elements, 16 remote control logic points, 16 latching logic points, and 16 display messages in conjunction with a local display panel included in the relay. The relay shall have the capability to display custom messages.

Internal Real-Time Clock. The relay shall include a real-time clock, with battery backup, synchronizable to demodulated IRIG-B input, to provide accurate time stamps for event records.

Low-Level Testing. The relay shall include a low-level test interface to permit relay testing with low energy test equipment.