

[BASLER ELECTRIC BE1-951 Guideform Specification]

This specification describes requirements for a numeric multifunction Directional/Non Directional Overcurrent Protection System (communicating microprocessor-based relay). The relay system shall have a 7-year warranty. The relay system shall provide protection, monitoring, local and remote control, fault locating, and standard automation protocols. Relay self-checking functions shall be included. Specific requirements are as follows:

1.0 OVERCURRENT PROTECTION:

Phase Faults (50/51P-67P, 50/51Q-67Q) The relay shall include 2 phase and 2 negative sequence instantaneous overcurrent elements, and 1 phase and 1 negative sequence time overcurrent element, for detecting phase faults. Each instantaneous element shall have an adjustable definite time delay. Each overcurrent element shall be independently selectable for Forward, Reverse, or Non-Directional Operation. Positive and negative sequence voltage and current shall polarize the 67P directional elements. The 51-phase element shall also have voltage control or voltage restraint mode of operation (51V).

Ground Faults (50/51N-67N) The relay shall include 2 neutral instantaneous overcurrent elements and 2 neutral time overcurrent elements that operate on calculated residual (3I0) [OPTION: or an independent ground input] for detection of ground faults. Each instantaneous element shall have an adjustable definite time delay. Each element shall be independently selectable for Forward, Reverse, or Non-Directional Operation. Negative and Zero sequence voltage and zero sequence current shall polarize the 67N directional elements.

2.0 VOLTAGE PROTECTION:

Volts per Hertz Overexcitation (24) The relay shall include a volts/hertz protection element to protect against transformer and generator overexcitation conditions.

Phase Under/Overvoltage (27P/59P) The relay shall include a phase undervoltage and a phase overvoltage element for detecting single or multiphase voltage events. Each voltage element shall be independently configurable for "1 of 3", "2 of 3", or "3 of 3" phase operation and settable to monitor either ph-ph or ph-n voltages.

Auxiliary Under/Overvoltage (27X/59X) The relay shall include 1 under and 2 overvoltage elements that monitor phase residual voltage (3V0) for detecting grounds on a delta system, or monitors [OPTION: auxiliary voltage input] an external broken delta VT source or a neutral voltage source (capacitor bank or generator) for detecting ground faults. Elements shall monitor either fundamental or third harmonic values.

Negative Sequence Overvoltage (47) The relay shall include a negative sequence voltage element for detecting phase unbalance and reverse phase rotation.

Fuse Loss Detection (60) The relay shall include a fuse loss detection element (sensing voltage input) that protects against false tripping for a blown sensing fuse.

Under/Overfrequency (81O/U) The relay shall include 6 frequency elements (individually settable for over or under frequency detection), including undervoltage blocking, for detection of power system frequency disturbances. Each setting level shall have an independently set timer for load shedding schemes.

3.0 DIRECTIONAL POWER PROTECTION:

Directional Power (32) The relay shall include a sensitive power element that can be independently set forward or reverse.

4.0 SENSING AND CONTROL:

Automatic Reclosing Control (79) The relay shall include a four-shot recloser with zone sequence coordination and sequence controlled protective element blocking functions. The element shall include four independent reclose timers, a timer for reset after a successful reclose, a maximum cycle timer, and a reclose fail timer.

[OPTION: Synchronism Check (25)] The relay shall include an optional auxiliary voltage input connected to the bus for synch check protection. This protection shall check for phase angle difference, voltage magnitude difference, frequency difference (slip), and if the 3-phase VT source voltage frequency is greater than the auxiliary VT frequency. The function shall compensate for phase shift associated with ph-ph or ph-n VT connections on any phase. Two voltage monitor outputs shall provide independent dead/live voltage closing logic.]

Settings Groups The relay shall have 4 user-programmable settings groups.

Input/Output The relay shall have 4 optically isolated inputs, 5 general purpose output contacts, and one fail-safe normally closed alarm output contact. Each output shall be isolated and rated for tripping duty (30A for 0.2 seconds, 7A continuous).

Virtual Control Switches (43/101) The relay shall include 4 virtual selector switches (x43) and one virtual breaker control switch (101), controllable from both the HMI and communication ports.

Relay Logic The relay shall include programmable logic for each output, for all inputs, and at least ten additional virtual outputs for user programming.

Logic Timers and Logic Latches (62 and 86) The relay shall include 2 logic timers (62) and 2 nonvolatile logic latches (86) to aid in the development of custom logic.

Selectable Wye or Delta Voltage Inputs The relay shall be field selectable after purchase to operate with either wye-connected (four wire) or open-delta-connected (three wire) potential transformers.

Terminal Blocks and Wiring Other than RS-232, or optional Ethernet wiring, all connections, including RS-485 wiring and IRIG-B wiring, shall be to barrier terminal strips capable of accepting ring lug connection. RS-232 wiring shall be to DB9S female connectors on the front and rear. RS-232 wiring shall be configured to allow 1-to-1 wiring to the DTE port on a PC, without need for null-modem adaptors or proprietary cabling or connectors. [OPTION: Ethernet connection shall be made through a case mounted RJ-45 connector. Standard Ethernet cabling practices shall apply.]

HMI/DISPLAY A backlit 2 line x 16-character LCD display shall be provided integral to the relay, along with a 4 key cursor/navigation keypad. Separate target/alarm reset and settings edit pushbuttons shall be included. Keypad/pushbuttons shall include a continuous, flexible, water-resistant membrane overlay over all keys.

5.0 REPORTING AND ALARM:

Oscillography and Sequential Events Recorder (SER) The relay shall be capable of automatically recording disturbance events of 15 to 40 cycles (user-adjustable), with 4 cycles of prefault duration and user-defined triggering. The relay shall include a Sequence of Events Recording function (SER) that stores the latest 255 events.

Nonvolatile Status and Trip Target LEDs The relay shall hold all programmed target and alarm information in nonvolatile memory and provide that information locally through the HMI/LEDs, and remotely via communication ports. Relay shall have three programmable alarm bits: Major, Minor, and Logic, based upon relay logic states.

Real Time Metering The relay shall include real time metering that provides Watt, Watt-hour, VAR, VAR-hour, voltage, amp, and unbalance loading telemetry for the protected circuit.

Demand Metering The relay shall include user-settable current demands for phase, neutral, and negative sequence currents, and forward and reverse watts and VARs with magnitudes and time stamps recorded for today's peak, yesterday's peak, and peak since reset. [OPTION: A 4000 Point Load Profile Demand Log is available for data storage.]

Circuit Breaker Monitor The relay shall include breaker status and operations counter reporting, fault current interruption duty monitoring, and trip-speed monitoring. A trip coil monitor circuit shall be internally connected across the trip output to provide trip circuit continuity monitoring. No additional external wiring shall be required to implement the trip circuit monitor function.

Distance to Fault The relay shall include a distance-to-fault algorithm to provide an accurate estimate of fault location.

6.0 COMMUNICATIONS:

Relay Interface The relay shall include three independent general-purpose communication ports, including a front and rear RS-232 port and a rear RS-485 port. All communications ports, (with the exception of the optional Ethernet port) shall support ASCII protocol, and the RS-485 port and optional Ethernet port shall support Modbus™ or DNP3.0 options. An optional Ethernet port replaces the rear RS-232 port.

[OPTION: Modbus RTU Slave Communications] The relay shall incorporate Modbus RTU slave protocol internally. External converters or adaptors are not acceptable.]

[OPTION: Distributed Network Protocol (DNP)] The relay shall incorporate certified DNP 3.00 Level 2 Slave protocol communications capability internally. External converters or adaptors are not acceptable.]

IRIG-B The relay shall include an interface port for a demodulated IRIG-B time synchronization input signal. IRIG-B connection shall be to a barrier terminal strip capable of accepting ring lug terminated wiring.

PC Interface The relay shall be capable of being set by Windows®-based graphical user interface and ASCII terminal interfaces.

7.0 SETTINGS AND ANALYSIS SOFTWARE:

PC Software PC software compatible with Windows 98, NT, 2000, XP Home, XP Professional, and Me shall be included at no charge. The software shall be freely reproducible within the end user's organization without additional charge. The software must include serial communications for settings upload and download, graphical programming and display of logic equations (including pictorial display of AND and OR gates), and the ability to display and print COMTRADE oscillography and event files.

8.0 CASE OPTIONS (packaging):

[OPTION: Half 19" Rack or Panel Mount (H1 Case) The relay shall be packaged in a case no larger than 11" wide, 10" deep, and 2 rack units high. The electronics module, including all active circuitry, must be extractable as a single unit, without need to disconnect or disturb any wiring. Shorting links for current circuits shall be internal to the relay case and shall remain in the case when the electronics module is extracted.]

[OPTION: S1 Single or Double Ended (S1 or S1D) The relay shall be packaged in a case no larger than 7" wide, 10" deep, and 10" high. The electronics module, including all active circuitry, must be extractable as a single unit, without need to disconnect or disturb any wiring. Hot-pluggable test paddle(s) shall be included for in-case testing of overcurrent elements by secondary injection, without wiring changes. Shorting links for current circuits shall be internal to the relay case and shall remain in the case when the electronics module is extracted. A cover, including provisions for attachment of a seal and allowing a clear view of the LCD display, shall be included. The cover shall incorporate a means of allowing targets and alarms to be reset with the cover attached and sealed.]