Line differential protection RED650
Relion® 650 series Ver. 2.2

Application
- Phase segregated current differential protection with excellent sensitivity for high resistive faults
- For line protection applications on multi-breaker arrangements in two to three terminal applications
- Line differential protection with back-up distance protection and autoreclose functionality
- Easy integration to conventional or digital substations

Features
- Fully IEC 61850 compliant, Edition 1 and Edition 2
- Protection, monitoring and control in one IED
- Extensive self-supervision including analog channels
- Six independent parameter setting groups
- Ethernet interface for fast and easy communication with PC and SA system
- Up to four Ethernet ports to support several system topologies and redundancy methods
- Large HMI for visualization of single line diagrams
- Settings via IEC 61850 for some protections
- Cyber security support for compliance to NERC CIP and IEC 62351-8 with Centralized Account Management

Pre-configured solutions
- Pre-configured and type-tested solution including default settings for:
  - Single breaker, 2/3 line ends, 1/3 phase tripping

Most important protection functions
- Line differential protection
  - Phase segregated line differential protection for up to three line terminals
  - Power transformers can be included in the protected zone
  - IEEE C37.94 single-/ multimode optical line data communication
  - Time synchronization with the echo-method, PTP or IRIG-B
- Additional security logic
- Distance protection
  - Full-scheme distance protection with quadrilateral, Mho- or series compensation characteristics for up to six zones and with load encroachment
  - Power swing detection
  - Phase preference logic
- Voltage functions
  - Two step phase- and residual overvoltage protection with definite and inverse time characteristics
  - Two step undervoltage protection with definite and inverse time characteristics
- Current functions
  - Instantaneous phase- and residual overcurrent protection
  - Four step phase- and residual directional overcurrent protection
  - Thermal overload protection
  - Breaker failure protection
  - Pole discordance protection
- Secondary system supervision
  - Fuse failure supervision
  - Current circuit supervision
- Frequency functions
  - Under- and overfrequency protection
  - Rate-of-change frequency protection
- Scheme communication
  - Scheme communication logic
  - Current reversal and weak-end infeed logic
  - Local acceleration logic

Control functions
- Autorecloser for single breaker
- Synchronizing, synchrocheck and energizing check
- Control and interlocking for one switching device
- Selectable operator place allocation
- Software based multi-position selector switches
Logic
- Tripping and trip matrix logic
- Extensive logic block library for application customization

Monitoring
- Adjustable breaker monitoring with capability to handle multiple breaker types
- Disturbance recorder with disturbance report
  - 100 disturbances
  - 40 analog channels (30 physical and 10 derived)
  - 352 binary channels
  - All protection settings during a disturbance
- Event list for 1000 events
- Event and trip value recorders
- Fault locator
- Event counters
- Running hour meter
- Supervision of AC input quantities
- Large HMI with virtual keyboard, function push buttons, and three color LED indications with alarm descriptions

Measurements
- U, I, P, Q, S, f and cos ϕ
- Frequency measurement with accuracy of ± 2 mHz

Metering
- Energy metering function for energy statistics
- Pulse counting support for energy metering

Communication
- IEC 61850-8-1 including GOOSE messaging
- IEC 62439-3 Parallel Redundancy Protocol (PRP)
- IEC 62439-3 High-availability Seamless Redundancy (HSR)
- IEC/UCA 61850-9-2LE Process bus for up to 4 MUs
- IEC 60870-5-103, DNP 3.0, SPA, LON protocols
- Remote end communication for signal transfer
  - 64 kbps: 3 analogs & 8 binary or 192 binary

Engineering, testing, commissioning and maintenance
- Protection and control IED manager PCM600 for configuration, parameterization, Ethernet port/protocol configuration, online debugging and disturbance handling
- Forcing of binary inputs and outputs for faster and easier test and commissioning
- Flexible product naming by mapping utility IEC 61850 model to that of 650 series model

Hardware
- 1/2 x 19" 6U height case
- Power supply modules from 24 to 250 V DC ± 20 %
- TRM modules with 12 analog inputs
- Up to 3 I/O modules
- Binary input module with 16 inputs
- Binary output module with 24 outputs
- Binary input/output module with 8 inputs and 12 outputs
- Connector types: compression or ring-lug
- Accurate time-synchronization through PTP (IEC/IEEE 61850-9-3), SNTP, DNP 3.0, IEC 60870-5-103 or IRIG-B
- Remote end data communication modules for C37.94, direct fiber up to 60 km or via multiplexer
- Up to four Ethernet ports (optical LC or RJ45) that can be freely configured as single or redundant pairs

Accessories
- COMBITEST test system
- COMBIFLEX auxiliary relays
- Mounting kits

Documentation
- Role based documentation for high efficiency in engineering, commissioning, operations and maintenance
- Technical details are available in the RED650 Product Guide.