Transformer protection RET650
Relion® 650 series Ver. 2.2

Application
• Two or three winding transformer differential protection with current, voltage and frequency back-up protection functions
• Operates over a wide frequency range in order to accommodate power system frequency variations during disturbances or generator start-up/shutdown
• Low impedance differential protection function is fast, offers high sensitivity for low-level internal faults and places low requirements on CTs
• Additionally supports transformer voltage control
• Easy integration to conventional or digital substations

Features
• Fully IEC 61850 compliant, Edition 1 and Edition 2
• Protection, monitoring and control of several primary objects integrated 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 solutions including default settings for:
  - Single breaker, 2 winding transformer
  - Single breaker, 2/3 winding transformer

Most important protection functions
• Transformer differential protection
  - High sensitivity for interturn faults
  - Fast differential protection
  - Automatic CT ratio matching and vector group compensation
  - Waveform and second harmonic restraint for transformer inrush
  - Fifth harmonic restraint for overexcitation
• 3-phase high impedance differential protection
• Restricted earth-fault protection
  - Extremely fast operation
  - Low impedance based
• 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
  - Overexcitation protection
• 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

Control functions
• Automatic voltage control for a single transformer
• Setpoint voltage can be controlled via IEC 61850
• Synchronizing, synchrocheck and energizing check
• Control for up to three circuit breakers
• 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
• 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

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 module with 12 analog inputs
• Up to three I/O modules
• Binary input module with 16 inputs
• Binary input/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
• 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 RET650 Product Guide.