

## Sample specification REL 670

The IED shall be suitable for protection, control and monitoring of short and long overhead lines and cables for all voltage levels in solidly or high impedance earth networks.

The IED shall also be suitable for protection of heavily loaded lines and multi-terminal lines with requirement for single and/or three phase tripping.

The IED shall be based on advanced and proven algorithms and an easy and efficient upgrade of the IED functionality shall be possible.

A tool for userfriendly engineering and disturbance handling shall be available.

It shall be possible to integrate protection and control functionality for several primary objects in one IED e.g. back-up protection for power transformers and reactors.

Which means that sufficient numbers of individual analog inputs shall be available in the IED.

The IED shall have complete functionality for single or multibreaker arrangements.

At least five independent parameter setting groups shall be included.

No special requirements shall be raised on the design of the magnetic or capacitive VTs feeding the IED.

The IED shall have extensive self-supervision including analog channels.

In order to achieve cost effective engineering, testing and commissioning shall pre-configured, ready to use IEDs for different applications be available.

If needed, it shall be easy to modify the configuration.

At new installations or at extensions and replacements in existing installations shall it be possible to integrate the IED into a substation automation or monitoring system or use the IED as a stand-alone multifunction unit.

It shall be possible to equip the IED with a large HMI for local operation of breakers and disconnectors and visualization of single line diagrams with positions indications of included breakers and disconnectors.

A high speed full-scheme distance protection with at least five zones shall be included.

The distance protection shall have a characteristic that will give load encroachment discrimination and load current compensation of the reactance line in the first zone in order to avoid overreach.

It should be possible to set each distance protection zone in forward, reverse or non-directional mode.

Each zone shall have individual settings of reactive and resistive reach.

No trip for reverse faults accepted for a forward looking zone as long as the requirements on the CTs are fulfilled.

Separate phase selection and automatic switch into fault logic shall be included.

Phase segregated tripping function for high resistance faults shall be available.

For communication with the distance protection at the remote end shall permissive, blocking and intertrip scheme communication logic be included.

Logic for Loss of load and Local acceleration in co-operation with autoreclosing for applications when no communication channel is available shall also be possible to include.

Power swing detection function and current reversal and weak-end infeed logic shall be available.

A high impedance differential protection for tee-feeders shall be possible to include in the IED.

It shall be possible to include back-up protection such as instantaneous overcurrent functions for phase and earth faults and time delayed directional/non-directional overcurrent functions with inverse and definite time characteristic with at least three steps for phase and earth-faults.

Scheme communication logic and current reversal and week-end infeed logic for directional residual overcurrent protection shall be possible to include.

Other current functions such as thermal overload with alarm and trip steps and breaker failure protection with short reset time shall also be possible to include in the IED.

Stub protection for multi-breaker arrangements and breaker pole discordance protection shall be available.

Over and undervoltage protection with at least two steps, over and underfrequency functions and rate-of-change frequency functions shall also be possible to include in the IED.

For secondary system supervision shall fuse failure and current circuit supervision be available.

The IED shall be provided with programmable logic for tripping and indications as well as a high number of logic blocks and timers for user adaptation.

Apparatus control for control and supervision of breakers, disconnectors and earthing switches with interlocking modules for different switchgear arrangements should be possible to include.

Synchro/energizing check and synchronizing function as well as autoreclosing function for high-speed and/or delayed auto-reclosing for single or multibreaker arrangements shall be available.

Monitoring functions such as service values for U, I, with at least 0,25 % accuracy, P, Q, S, with at least 0,5 % accuracy, frequency and power factor shall be included. Supervision of mA input signals from transducers shall be possible to include.

Pulse counter logic for counting of external generated binary pulses from an energy meter shall be available.

A disturbance recorder which can handle at least 15 analog channels and at least 60 binary signals and that can record the last 50 disturbances shall be included.

It should be possible to record the sum of selected analog currents.

An event recorder that can handle up to 150 time tagged events per disturbance and that can record the last 50 disturbances shall also be included.

It shall be possible to retrieve the disturbance and event recorder information based on Comtrade format from a remote location.

An accurate fault locator with compensation for load current and mutual zero sequence impedance for double circuit lines shall be available.

The IED shall be provided with a front mounted human machine interface (HMI) and a galvanic isolated front port for connection of a personal computer.

The HMI shall include LEDs for status indication and at least 15 configurable LEDs for alarm indication.

The IED shall be provided with communication interface for connection to substation automation system and substation monitoring system.

IEC 61850-8-1 and IEC 60870-5-103 communication protocol shall be available. The IED shall meet the IEC 61850 standard in every respect and interoperability with other manufactures IEDs and tools shall be verified.

Binary signal transfer to remote end of at least 24 signals in each direction should be included.

It shall be possible to select different mounting alternatives such as rack, flush or wall mounting.

Depending of the required numbers of I/O modules in the IED shall 1/1 x 19", 3/4 x 19" and 1/2 x 19" cases be available.

Power supply modules from 24 to 250 DC +/- 20 % shall be available.

GPS time synchronization module with GPS receiver used for time synchronization shall be available.

A test switch for mounting in connection with the IED should be available.

One CD-ROM with manuals and Getting started guide shall always be included for each IED.