



Substation Automation Products

# Generator protection REG670 Relion<sup>®</sup> 670 series

# A new protection standard for your valuable assets

Stepping-up performance is made easy with the REG670 IED (Intelligent Electronic Device). It provides protection and monitoring for generators, prime movers and step-up transformers in hydro-, pump-storage-, gas-, combined cycle-, steam- and cogeneration stations. With excellent performance, flexibility and scalability it fulfills the demanding requirements of every corner of the world for both new installations and retrofits.

Based on ABB's extensive experience, REG670 takes generator protection to a new performance level. Its functions incorporate intelligent fault criteria to ensure unrivalled selectivity and sensitivity.

A generator protection system with REG670 meets the requirements for maximum dependability and availability. The generator differential protection features extremely fast detection criteria, with a typical operate time of 15 ms – and yet the IED maintains high security. The internal/external fault discriminator is based on negative sequence differential values, enabling a fast and selective decision to operate. The detection criteria can be used to create intelligent, application specific functions to enhance your protection system to meet very specific requirements, for instance, when the operating conditions of the plant change.

The unique main protection functions of REG670 are able to selectively detect and clear all fault types over 100% of the stator winding. The stator earth-fault protection includes the evaluation of the fundamental and 3rd harmonic frequencies.



## Increase grid reliability – invest in complete control of your valuable assets

- REG670 takes generator protection to a new performance level
- REG670 provides flexible protection and monitoring solutions for any type of generating station
- REG670 also protects the step up transformers in generating stations
- REG670 minimizes the consequences of faults
- REG670 optimizes your investment now and in the future

The 3rd harmonic based 100% stator earth fault protection is utilizing the differential principle, which provides high sensitivity and security. Together with the advanced setting calculation, this ensures [correct operation even during low load conditions](#).

REG670 places [low requirements on instrument transformers](#), which, together with the fast and accurate protection functions, reduces primary equipment demands and investment costs.

### Unique functional integration

REG670 integrates [parallel algorithms](#) with advanced logic and communication. [Up to 24 analog inputs permit integration of main and back-up protection in one IED](#). Alternatively, [additional objects, such as transformers, can be included in the generator protection scope](#). This enables full duplication of the protection in main one and main two. All this reduces the number of IEDs needed to protect the entire generating station, [increasing availability](#) at the same time. This in turn [simplifies the installation and reduces its lifecycle cost](#) from commissioning to maintenance and spare parts.

The transformer differential protection integrated in REG670 provides extremely fast differential protection with automatic ratio matching and vector group compensation. Additionally, it takes the tap-changer position into consideration for optimized sensitivity. Utilizing the same transformer differential protection as used in Transformer protection IED RET670 allows REG670 to be a [complete protection solution for generator units](#).

### Versatile communication capabilities

REG670 allows you to use several communication protocols in parallel to communicate with the plant control system, monitoring system or relay protection engineering office. It is [designed for IEC 61850](#), implementing all the aspects of this standard and thus ensuring open, future-proof and flexible system architectures, with state-of-the art performance. These capabilities also provide [new opportunities for utilizing signaling and tripping schemes in generator protection](#). Additionally, they enable the transfer of binary and analog data to any subscriber.



### Features

- Fully IEC 61850 compliant
- Generator and transformer protection integrated in one IED
- Protection and monitoring integrated in one IED
- Extensive self-supervision including analog channels
- Six independent parameter setting groups
- Signal matrix for easy configuration of binary and analog signals
- Ethernet interface for fast and easy communication with PC
- Large HMI for visualization of single line diagrams

### Pre-configured solutions

- Pre-configured and type tested solutions including default settings for:
  - Generator main and back-up protection with 12 analog inputs
  - Generator main and back-up protection with 24 analog inputs
  - Generator and block transformer main and back-up protection with 24 analog inputs

### Most important protection functions

- Generator differential protection
  - Differential currents calculated based on fundamental frequency and negative sequence
  - Percentage bias restraint
  - Internal/external fault discriminator (negative sequence based)
  - Higher harmonic block for 2nd and 5th
  - DC offset
- Transformer differential protection
  - Percentage bias restraint
  - Waveform and second harmonic restraint for transformer inrush
  - Fifth harmonic restraint for overexcitation
  - Automatic CT ratio matching and vector group compensation
  - High sensitivity for interturn faults
  - Open CT detection incorporated
  - Suitable for split phase differential protection
- High impedance differential protection
- Restricted earth-fault protection
  - Extremely fast operation
  - High and low impedance based
- Back-up underimpedance protection
  - Full-scheme distance protection with Mho characteristic
- Pole slip protection
  - Detection of slips in power system from 0.2Hz to 8Hz
  - Discrimination between generating and motoring direction of rotor phase angle
  - Discrimination between local and external power swing center
  - Trip after a set number of slips
  - Trip within a set rotor angle
- Loss of/under excitation
  - Positive sequence measurement
  - Two zones Z1 and Z2 with independent block and trip
  - Directional element for zone restriction
- Directional power protection
  - Reverse power, low forward, active and reactive power protection
  - Phase angle compensation
  - Two steps (alarm/trip)
- Current
  - Instantaneous phase- and residual overcurrent protection
  - Four-step phase- and residual directional/non-directional overcurrent protection with definite and inverse time characteristics
  - Negative phase sequence
  - Split phase overcurrent protection
  - Thermal overload protection
  - Breaker failure protection
  - Pole discordance protection
- Power functions
  - Under and Over direction protection
- Voltage
  - Two step phase- and residual over-voltage protection with definite and inverse time characteristics
  - Two step undervoltage protection with definite and inverse time characteristics

- Overexcitation protection
- 100% stator earth-fault
  - 95% based on fundamental frequency
  - 100% by 3rd harmonic restraint characteristic
  - Accurate for all load conditions
- Rotor E/F together with Combiflex RXTTE4 injection unit
- Secondary system supervision
  - Fuse failure supervision
  - Current circuit supervision
- Frequency functions
  - Over- and under frequency protection
  - Rate-of-change frequency protection
- Multipurpose function
  - General current and voltage protection
  - Voltage controlled/restraint over current protection
  - Inadvertent energizing/dead machine protection

### Logic

- Tripping logic
- Trip matrix logic
- Configurable logic blocks

### Monitoring

- Disturbance recorder
  - 100 disturbances
  - 40 Analogue channels 30 physical and 10 derived
  - 96 Binary channels
- Event list for 1000 events
- Disturbance report
- Event and trip value recorders
- Event counters
- Supervision of AC and mA input quantities
- Small and large HMI
- LED indications with 6 red and 9 yellow LEDs

### Measurements

- U, I, P, Q, S, f, and  $\cos\phi$
- Accuracy of AC input quantities, class 1,0 or 0,5
- Inputs for mA measuring

### Metering

- Pulse counting support for energy metering

### Communication

- IEC 61850-8-1 including GOOSE messaging
- IEC 60870-5-103
- LON
- SPA
- DNP 3.0
- Remote end communication for transfer of 192 binary signals

### Setting, configuration and disturbance handling

- Protection and Control IED Manager PCM 600

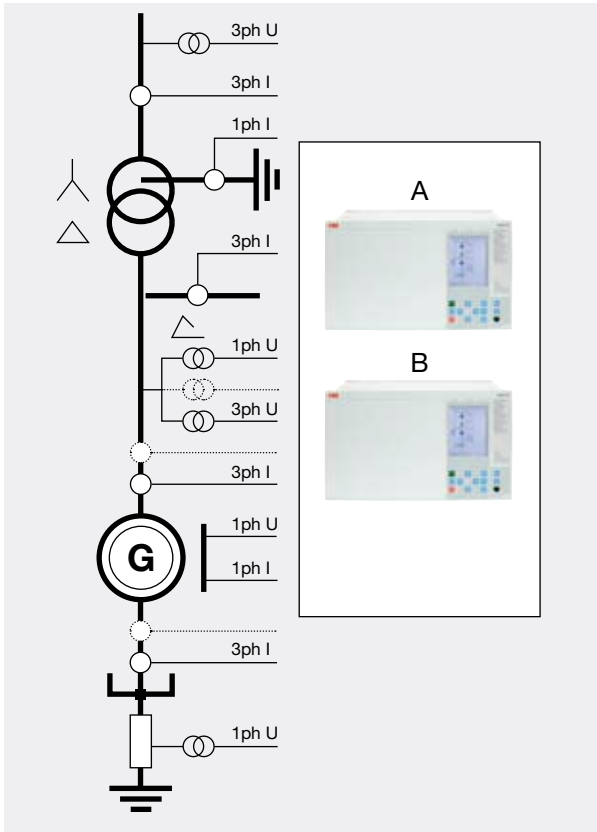
### Hardware

- Full 19" case, 6U height with 24 analog inputs and up to 11 I/O modules
- Half 19" case, 6U height with 12 analog inputs and up to 3 I/O modules
- Power supply modules from 24 to 250 V DC  $\pm$  20%
- Binary input module with 16 inputs
- Binary output module with 24 outputs
- Binary input/output module with 8 inputs and 12 outputs
- mA input module with 6 transducer channels
- GPS or IRIG-B time synchronization module
- Remote end data communication modules
- Accessories

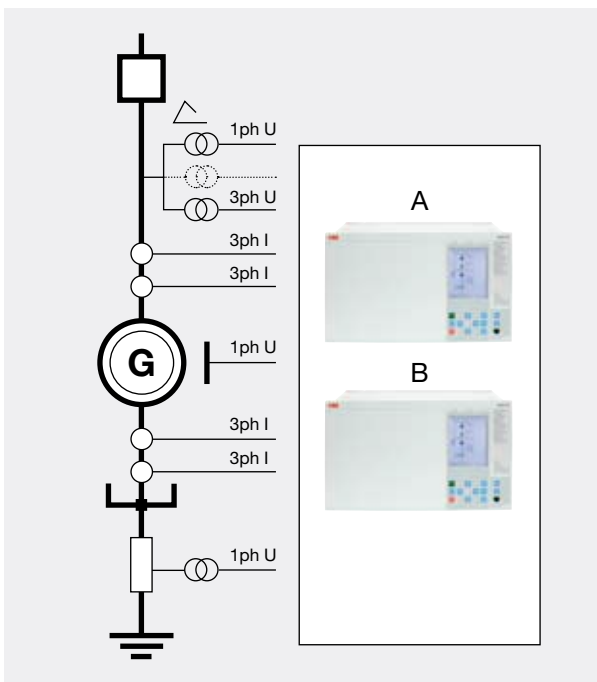
Technical details are available in the REG670 Product Guide.

# Application examples

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REG670 is able to protect the entire generator block, including generator and the generator transformer.



REG670 IED with 24 analog inputs for advanced generator protection offers overall differential protection and split-phase protection.

## Easy to handle IEDs

The IEDs are delivered [pre-configured and type-tested for easy handling of products](#) – from ordering, engineering and commissioning, to reliable operation. If needed, additional I/O boards, communication options or application functions can easily be added to meet the specific requirements of your generating station. Furthermore, [several instances of protection functions are readily included](#) in the REG670 IEDs, and you only need to set parameters related to the power system objects during commissioning.

The [large integrated HMI provides easy access to important information](#). You can read measurements and view the status of the power system objects directly via a single line diagram on the IED HMI. This allows the operator to verify that the IED is correctly connected to the instrument transformers and that the protection functions are activated. For security reasons, the HMI requires user authentication. In practice this means that different information access levels and changing settings via the HMI can be authorized for different personnel categories.

REG670 belongs to ABB's 670 series of IEDs that provide outstanding protection, monitoring and control capabilities for all transmission applications. You can [utilize the same technology](#) also for protecting lines, busbars and transformers in the substations connected to your generating station. All the products in 670 series are based on a common hardware platform and software library. This enables [increased efficiency](#) because there is a single common procedure of working with all the products, and the same tool is used for all setting, configuration and disturbance handling.

## Fast and efficient system integration

REG670 IEDs are more than just devices. They utilize ABB's unique connectivity package concept, which simplifies the system engineering and reduces the risks of errors in system integration. An IED connectivity package contains a complete description of the specific IED, consisting of data signals, parameters, addresses and IED documentation.

## Relion® – Complete confidence

Generator protection REG670 is a member of the Relion® protection and control product family. The Relion product family offers the widest range of products for the protection, control, measurement and supervision of power systems. To ensure interoperable and future-proof solutions, Relion products have been designed to implement the core values of the IEC 61850 standard. With ABB's leading-edge technology, global application knowledge and experienced support network, you can be completely confident that your system performs reliably – in any situation.

# Contact us

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