Substation Automation Products

Breaker protection REQ650
Relion® 650 series
Longer life and cost efficiency for your installations

Breaker protection REQ650 provides a standalone solution for applications where the integration of the breaker failure protection or automatic reclosing function into the main line protection IED (Intelligent Electronic Device) is not preferred or suitable. This IED also offers local back-up protection, synchronizing, synchrocheck and energizing check functionality to enable well-structured and reliable protection for various applications.

REQ650 provides you with an ideal protection and control solution for circuit breaker connected objects. The breaker failure protection allows for high speed back-up tripping of surrounding breakers, and re-tripping of the own breaker in any single breaker busbar arrangement, for instance to avoid operational mistakes during testing. This function is essential in substations that require local back-up protection. Breaker protection REQ650 is also the perfect choice for refurbishment projects where old protection relays need to be replaced.
Versatile application opportunities
With its compact design and versatile functionality, REQ650 provides its users with a wide range of application opportunities.

For your existing protection systems, REQ650 enables an easy and cost-efficient way to replace remote back-up protection with local back-up protection. The original main protection can remain in operation, while one REQ650 IED installed in parallel offers the necessary back-up functionality. At the same time, the integrated disturbance recorder helps you improve your disturbance information handling.

In new substations, REQ650 enables cost-efficient back-up functionality when only basic protection and control is required. In a line bay, the phase overcurrent protection and residual overcurrent protection of REQ650 with voltage, current or dual polarization, based on zero sequence or negative sequence quantities delivers back-up for the line distance protection, provided by REL670 and REL650, for instance. The breaker failure protection of REQ650 enables complete protection redundancy for the bay. Additionally, a number of other voltage- and current-based protection functions are available for applications where electricity supply within a specified voltage limit is critical, such as in industrial processes. With its automatic reclosing and synchrocheck functions, REQ650 provides independent back-up functionality for the main line distance protection IED. In the same way, it offers independent back-up for transformer and shunt capacitor bay applications.

In double-busbar configurations, REQ650 provides breaker failure protection as well as phase and residual overcurrent functions to split busbar sections in case of heavy and critical faults. This allows for fast fault clearance to minimize damage in the substation. In meshed networks with radial lines, REQ650 can provide main protection including control functionality for the radial lines.

Long life with high availability
In aging installations, the remaining lifetime of existing protection equipment often varies considerably. In such cases a partial replacement and retrofit can provide a solution that saves both time and money.

In partial replacement the old, unreliable relays in line protection applications can be replaced with one REQ650 and combined with your well-functioning existing relays. Another possibility is to replace the breaker failure protection relay – often the weakest link in a well-functioning busbar protection system – with one REQ650 per bay. At the same time, a number of valuable additional functionalities will become available, including extensive back-up protection functionality, basic control functionality and a disturbance recorder. Furthermore, the communication capabilities of REQ650 allow you to transfer data to your control center. All in all, REQ650 helps increase both availability and the lifetime of an aging protection system.
REQ650 offers optimum ‘off-the-shelf’ ready-made application solutions for the protection and control of circuit breaker connected objects. The type-tested variants are delivered equipped and configured with complete protection functionality, and with default parameters for easy handling of products – from ordering, engineering and commissioning to reliable operation.

The 650 series IEDs introduce a number of innovations, such as a significantly reduced number of parameter settings and extended IED HMI functionality including 15 dynamic three color-indication LEDs per page, on up to three pages, and configurable push-button shortcuts for different actions. In the 650 series IEDs, most of the basic parameters are set before delivery from the factory. You only need to set the parameters specific to your application. The parameters related to the protected object are set as primary values, which significantly reduces the need to recalculate the current and voltage values. This allows the IEDs to be quickly taken into operation. The application manual includes setting examples to support the protection engineer.

Relion® – Complete confidence

Breaker protection REQ650 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.
REQ650 Technology summary:

### Features
- Fully IEC 61850 compliant
- Protection and monitoring integrated in one IED
- Extensive self-supervision including analog channels
- Four independent parameter setting groups
- Large HMI for visualization of single line diagrams and on-line measurements
- Integrated or detachable HMI with 1-5 m cable for flexible panel mounting
- Accurate time synchronization via SNTP, DNP 3.0, IEC 60870-5-103 and IRIG-B serial interface
- Ethernet interface for fast and easy communication with PC
- Signal matrix for easy configuration of binary and analog signals
- User management and authority handling

### Configured solutions
- Breaker bay with back-up protection functions, three-phase tripping
- Breaker bay connecting a sub-transmission/transmission line, with back-up protection functions, single-phase tripping, single busbar section
- Breaker bay connecting a sub-transmission/transmission line, with back-up protection functions, single-phase tripping, two busbar sections

### Most important protection functions
- Current
  - Instantaneous phase overcurrent protection
  - Instantaneous residual overcurrent protection
  - Four step directional phase overcurrent protection with definite and inverse time characteristics
  - Four step residual non-directional/directional overcurrent protection with definite and inverse time characteristics and with voltage, current or dual polarization, based on zero sequence or negative sequence quantities
  - Sensitive directional earth-fault protection
  - Thermal overload protection
  - Breaker failure protection
  - Stub protection
  - Pole discordance protection
  - Broken conductor check
  - Directional under- and overpower protection
  - Two step negative sequence based overcurrent protection
- Power functions
  - Directional under- and over power protection
- Voltage
  - Two step under- and overvoltage protection
  - Two step residual overvoltage protection
  - Loss of voltage check
- Frequency protection
  - Under- and overfrequency protection
  - Rate-of-change frequency protection
- Secondary system supervision
  - Current circuit supervision
  - Fuse failure supervision
  - Breaker close/trip circuit monitoring

### Control functions
- Selective single-phase and three-phase autorecloser
- Synchronizing, synchrocheck and energizing check
- Selectable operator place allocation

### Logic
- Versatile switch with two positions
- Selector switch with up to 32 positions
- Tripping logic
- Trip matrix logic
- Configurable logic blocks

### Monitoring
- Disturbance recorder
  - 100 disturbances
  - 40 analog 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 input quantities
- Insulation gas monitoring function
- Insulation liquid monitoring function
- Circuit breaker condition monitoring
- Station battery supervision
- Measured temperatures presented both in Celsius and Fahrenheit
- Indication of up to 135 binary signals via 15 three-color-state indication LEDs on up to three pages

### Measurements
- U, I, P, Q, S, f, and \( \cos \phi \)
- AC input quantities with accuracy better than 0.5%

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

### Communication
- IEC 61850-8-1 including GOOSE messaging
- DNP 3.0 slave protocol
- IEC 60870-5-103 serial communication

### Setting, configuration and disturbance handling
- Protection and control IED manager PCM600

### Hardware
- 19", 3U and 1/2 x 19", 6U height case
- 10 analog inputs (5 CT and 5 VT inputs)
- Universal 1A/5A CT inputs
- Communication and processor module with 12 binary inputs, TCP/IP optical, galvanic RS485, and optical serial communication ports
- Binary input/output modules with 9 inputs and 9 outputs
- Possibility to add up to two optional binary input/output modules depending on the selected configuration
- Power supply modules from 48 to 250 V DC or 100 to 240 V AC with 9 outputs, 3 of which with trip circuit supervision
- Connector types: compression type or ring-lug type

Technical details are available in the REQ650 Product Guide.