Generator and interconnection protection
REG615
Compact and versatile solution for utility and industrial power distribution systems
Compact generator and extensive interconnection protection for power generation

REG615 is a dedicated generator and interconnection protection relay for protection, control, measurement and supervision of power generators and interconnection points of distributed generation units in utility and industrial power distribution systems.

Application
REG615 has been designed to be the main protection for small synchronous generators, and offer full protection during start-up and normal run for both the generator and the prime mover. REG615 can also be used as backup protection for medium-sized generators in applications where an independent and redundant protection system is required. The main protection functionality includes generator differential protection, out-of-step protection and 100% stator earth-fault protection. REG615 is typically used in small and medium-sized diesel, gas, hydroelectric, combined heat and power (CHP), and steam power plants.

To further ensure grid stability and reliability, REG615 has also been designed to be the main protection for interconnection points of distributed generation units. A low-voltage ride-through protection allows monitoring of distributed generation during low-voltage fault ride-through, in order to determine whether and when to disconnect, for instance, a solar or wind farm from the grid. A reactive power undervoltage protection does the same but specifically at the grid connection point, whereas a voltage vector shift protection, further supported by a frequency protection, detects islanding from the grid.

One of the three available standard configurations has been exclusively designed for interconnection applications and two for generator applications. All standard configurations can be tailored to meet application-specific requirements using the IEC 61850-compliant Protection and Control IED Manager PCM600.

To minimize the effects of an arc fault, REG615 can be equipped with high-speed outputs decreasing the operate time by four to six milliseconds compared to conventional binary outputs.

Human-machine interface (HMI)
As a member of the Relion® product family, REG615 shares the same Human Machine Interface (HMI) look and feel as the other Relion protection and control relays and IEDs. The same look and feel includes the location of a push button with a certain function and the menu structure.

REG615 is equipped with a large graphical display which can show customizable single-line diagrams (SLD) with position indication for the circuit breaker, disconnectors and the earthing switch. Also measured values provided by the chosen standard configuration can be displayed. The SLDs are customized using PCM600 and can have multiple pages for easy access to selected information. The SLDs can be accessed not only locally but also via the web browser-based HMI.

Standardized communication and redundancy
REG615 fully supports the IEC 61850 standard for communication and interoperability of substation automation devices, including fast GOOSE messaging, IEC 61850-9-2 LE and Edition 2, offering substantial benefits in terms of extended interoperability. The generator and interconnection relay further supports both the parallel redundancy protocol (PRP) and the high-availability seamless redundancy (HSR) protocol, together with the DNP3, IEC 60870-5-103 and Modbus® protocols. With the protocol adapter SPA-ZC 302, Profibus DVP1 can also be used. REG615 is able to use two communication protocols simultaneously.

For redundant Ethernet communication, REG615 offers either two optical or two galvanic Ethernet network interfaces. A third port with a galvanic Ethernet network interface provides connectivity of any other Ethernet device to an IEC 61850 station bus inside a switchgear bay. The redundant Ethernet solution can be built on the Ethernet-based IEC 61850, Modbus® and DNP3 protocols.

The implementation of the IEC 61850 standard in REG615 covers both vertical and horizontal communication, including GOOSE messaging with both binary and analog signals as well as parameter setting according to IEC 61850-8-1. Also IEC 61850-9-2 LE process bus with sending sampled values of both analog voltages and currents, in addition to receiving sampled values of voltages, is supported. The sampled values can be used for synchro-check as well to ensure safe interconnection of two networks. For process bus applications, which require high-accuracy time synchronization, IEEE 1588 V2 is used, with a time stamp resolution of not more than four microseconds. IEEE 1588 V2 is supported in all variants with a redundant Ethernet communication module. In addition, REG615 supports synchronization over Ethernet using SNTP or over a separate bus using IRIG-B.
Protection function overview of REG615 standard configuration C

**Main benefits**

- Withdrawable plug-in unit design for swift installation and testing
- Extensive range of protection functionality for both synchronous generators and interconnection points of distributed generation units
- Ready-made standard configurations for fast and easy setup with tailoring capabilities
- Extensive generator protection with 100% stator earth-fault, generator differential and out-of-step protection
- Advanced interconnection protection fulfilling the latest grid codes for higher grid stability and reliability
- IEC 61850 Edition 2 and Edition 1 support, including HSR and PRP, GOOSE messaging and IEC 61850-9-2 LE for less wiring and supervised communication
- IEEE 1588 V2 for high-accuracy time synchronization and maximum benefit of substation-level Ethernet communication
- Large graphical display for showing customizable SLDs, accessible either locally or through a web browser-based HMI

**615 series**

REG615 is a member of ABB’s Relion product family and part of its 615 protection and control series of relays, characterized by compactness and withdrawable plug-in unit design. In addition to REG615, the 615 series includes the following relays:

- REF615 Feeder protection and control
- RED615 Line differential protection and control
- RET615 Transformer protection and control
- REU615 Voltage protection and control
- REM615 Motor protection and control
- REV615 Capacitor bank protection and control

**Life cycle services**

ABB offers full support for all protection and control relays throughout their entire lifecycle. Our extensive life cycle services include training, customer support, maintenance and modernization.
Standard configurations

<table>
<thead>
<tr>
<th>Description</th>
<th>Standard configuration</th>
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<tbody>
<tr>
<td>Interconnection protection for distributed power generation</td>
<td>A</td>
</tr>
<tr>
<td>Generator protection with 100% stator earth fault</td>
<td>C</td>
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<tr>
<td>Generator protection with generator differential, directional overcurrent and synchrocheck</td>
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</table>

Supported functions, codes and symbols

Functionality

Protection
- Three-phase non-directional overcurrent protection, low stage
- Three-phase non-directional overcurrent protection, high stage
- Three-phase non-directional overcurrent protection, instantaneous stage
- Three-phase directional overcurrent protection, low stage
- Three-phase directional overcurrent protection, high stage
- Three-phase voltage-dependent overcurrent protection
- Non-directional earth-fault protection, high stage
- Directional earth-fault protection, low stage
- Directional earth-fault protection, high stage
- Transient/intermittent earth-fault protection
- Negative-sequence overcurrent protection
- Negative-sequence overcurrent protection for machines
- Residual overvoltage protection
- Three-phase undervoltage protection
- Three-phase overvoltage protection
- Positive-sequence undervoltage protection
- Negative-sequence overvoltage protection
- Frequency protection
- Overexcitation protection
- Three-phase thermal protection for feeders, cables and distribution transformers
- Three-phase thermal overload protection, two time constants
- Circuit breaker failure protection
- Three-phase inrush detector
- Master trip
- Arc protection
- Multi-purpose protection
- Stabilized and instantaneous differential protection for machines
- Third harmonic-based stator earth-fault protection
- Underpower protection
- Reverse power/directional overpower protection
- Three-phase underexcitation protection
- Three-phase underimpedance protection
- Out-of-step protection
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<th>IEC 60617</th>
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1, 2... = number of included instances / I/Os

() = optional
Supported functions, codes and symbols

Functionality

Interconnection functions
Directional reactive power undervoltage protection
Low-voltage ride-through protection
Voltage vector shift protection

Power Quality
Current total demand distortion
Voltage total harmonic distortion
Voltage variation
Voltage unbalance

Control
Circuit-breaker control
Disconnector control
Earthing switch control
Disconnector position indication
Earthing switch indication
Synchronism and energizing check

Condition Monitoring
Circuit-breaker condition monitoring
Trip circuit supervision
Current circuit supervision
Fuse failure supervision
Runtime counter for machines and devices

Measurement
Disturbance recorder
Load profile record
Fault record
Three-phase current measurement
Sequence current measurement
Residual current measurement
Three-phase voltage measurement
Residual voltage measurement
Sequence voltage measurement
Three-phase power and energy measurement
RTD/mA measurement
Frequency measurement

IEC 61850-9-2 LE sampled value sending
IEC 61850-9-2 LE sampled value receiving (voltage sharing)
### Supported functions, codes and symbols

#### Functionality

- **Interconnection functions**
  - Directional reactive power undervoltage protection
  - Low-voltage ride-through protection
  - Voltage vector shift protection

- **Power Quality**
  - Current total demand distortion
  - Voltage total harmonic distortion
  - Voltage variation
  - Voltage unbalance

- **Control**
  - Circuit-breaker control
  - Disconnector control
  - Earthing switch control
  - Disconnector position indication
  - Earthing switch indication
  - Synchronism and energizing check

- **Condition Monitoring**
  - Circuit-breaker condition monitoring
  - Trip circuit supervision
  - Current circuit supervision
  - Fuse failure supervision
  - Runtime counter for machines and devices

- **Measurement**
  - Disturbance recorder
  - Load profile record
  - Fault record
  - Three-phase current measurement
  - Sequence current measurement
  - Residual current measurement
  - Three-phase voltage measurement
  - Residual voltage measurement
  - Sequence voltage measurement
  - Three-phase power and energy measurement
  - RTD/mA measurement
  - Frequency measurement

- **IEC 61850-9-2 LE sampled value sending**

- **IEC 61580-9-2 LE sampled value receiving (voltage sharing)**

#### Codes and Symbols

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1) “Io measured” is always used.
2) “Io calculated” is always used.
3) Master trip is included and connected to the corresponding HSO in the configuration only when the BIO0007 module is used. If additionally the ARC option is selected, ARCSARC is connected in the configuration to the corresponding master trip input.
4) Power quality option includes current total demand distortion, voltage total harmonic distortion, voltage variation and voltage unbalance.
5) Available only with IEC 61850-9-2
6) Available only with COM0031-0037

<table>
<thead>
<tr>
<th>TR</th>
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<td>1, 2,...</td>
<td>number of included instances / I/Os</td>
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For more information, please refer to REG615 Product Guide, or contact us:

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