Grid automation relays REC615 and RER615
Protection of cable feeders and overhead lines with superior fault detection and location
Compact and versatile solution for making grids smarter

Grid automation protection and control relays, REC615 and RER615, are designed for remote control and monitoring, protection, fault indication, power quality analyzing and automation in medium voltage secondary distribution systems.

REC615 and RER615 offer a variety of features to enhance grid reliability and functionality.

- Multiple controllable objects (up to ten objects including two breakers)
- Powerful in compensated networks (including recloser tripping curves)
- Sophisticated protection functionality to detect, isolate and restore power in all types of networks
- Integrated power quality measurement, including voltage dips and swells logging
- Freely programmable
- Load profile and event logging
- Flexible autoreclosing function
- Six easily manageable setting groups
- Adaptable standard configurations for rapid commissioning
- Web-based parametrization tool with download possibility
- Same configuration tools as for other Relion product family relays such as the 615, 620, 630 and 640 series
- Cyber security features such as audit trail
- Withdrawable-unit design
- Large, easy-to-read LCD screen with SLD, local control and parametrization possibilities with dedicated push buttons for safe and easy operation
- Four programmable function keys to support direct access of additional control functions
- IEC 60870-5-101/104, DNP3 level 2, Modbus or IEC 61850 with GOOSE messaging communication for high-speed protection, fault isolation and restoration
- Extendable I/O with RIO600
- Environmentally-friendly design with RoHS compliance

REC615, grid automation protection and control relay, and RER615, recloser protection and control relay, are suitable for a wide variety of power distribution networks, which can include distributed power generation, secondary equipment such as medium voltage disconnectors, breakers, switches, ring main units or reclosers. REC615 and RER615 are a member of the Relion® product family. The Relion family relays have been designed to unleash the full potential of the IEC 61850 standard for communication and interoperability between substation automation devices.

Application
With REC615 and RER615, grid reliability are enhanced, ranging from basic, non-directional overload protection to extended protection functionality with power quality analyses. Thus, REC615/RER615 meets today’s requirements for smart grids and supports the protection of cable feeders and overhead lines in isolated neutral, resistance-earthed, compensated and solidly earthed networks. REC615 and RER615 are freely programmable with horizontal GOOSE communication, thus enabling sophisticated interlocking functions. The new adaptable standard configurations allow for this relay to be taken into use as soon as the application-specific parameters have been set.

REC615 and RER615 provide superior fault location, isolation and restoration (FLIR) to lower the frequency and shorten the duration of power outages. REC615 and RER615 also include advanced earth-fault detection methods that can detect developing faults in the network before they cause an outage.
Human Machine Interface
As a member of the Relion product family, REC615 and RER615 share the same Human Machine Interface (HMI) look and feel as the other Relion family relays. This has the added benefit that once you become familiar with one Relion relay, you can use them all.

REC615 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 the PCM600 IED tool 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 that has now been enriched with a number of usability enhancing features.

Four programmable function keys support direct access of additional control functions (e.g. Hotline tag, non-reclose mode, enable/disable protection function). Eleven freely configurable and programmable two-color LEDs are available to visualize the status and alarms.

Two breakers and up to eight load-break switches or one recloser can be controlled via the relay’s front panel HMI or a remote control system. To protect the relay from unauthorized access and to maintain the integrity of information, the relay is provided with a four-level, role-based user authentication system, with individual passwords for the viewer, operator, engineer and administrator levels. The access control system applies to the front panel HMI, embedded Web browser-based HMI and Protection and Control IED Manager PCM600.

Standardized communication
REC615 and RER615 support a variety of communication protocols for remote communication, such as IEC 60870-5-101/104, DNP3 level 2 and Modbus, simultaneously also supporting IEC 61850 with GOOSE messaging.
Functionality overview of REC615 standard configuration A and RER615 standard configuration A

**REC615**
- Version: 2.0
- Remote Monitoring and Control Relay
- Recloser Protection and Control
- Standard
- Configuration:
  - Standard
  - A

**RER615**
- Version: 2.0
- Remote Monitoring and Control Relay
- Recloser Protection and Control
- Standard
- Configuration:
  - Standard
  - A

**Functionality Overview**

- **Function Overview**
  - REC615:
    - Version: 2.0
    - Remote Monitoring and Control Relay
    - Recloser Protection and Control
    - Standard
    - Configuration:
      - Standard
      - A

- **REC615 Features**
  - Disturbance and fault recorder
  - Event log
  - Load profile
  - Relay self-supervision
  - Local/Remote push-button on LHMI
  - 4 programmable push-buttons with LED indication
  - 11 programmable bi-color LED
  - Time synchronization: SNTP, IRIG-B, 60870-5-101/-104, DNP3, IEEE 1588 v2
  - User management
  - Web HMI
  - Graphic programmable logics, counter and timer

- **Communication Protocols**
  - IEC 61850-8-1
  - IEC 60870-5-101 & -104
  - Modbus®, DNP3 Level 2

- **Interfaces**
  - Ethernet: TX (RJ-45), FX (LC)
  - Serial:       Serial glass fiber (ST)

- **Condition Monitoring and Supervision**
  - Fuse
  - 60
  - CBCM
  - 2x
  - I1→
  - 32P
  - HPSVPR
  - PHSVPR
  - 2x
  - TCS
  - TCM
  - OPTS
  - OPTM

- **Control and Indication**
  - 1)
  - Object Ctrl
  - 2)
  - Ind.
  - 3)
  - CB
  - DC
  - 8
  - 2
  - ES –
  - 8
  - 1)
  - Check availability of binary inputs/outputs from technical documentation
  - 2)
  - Control and indication function for primary object
  - 3)
  - Status indication function for primary object

- **Measurement**
  - I, U, Io, Uo, P, Q, E, pf, f
  - Limit value supervision
  - Load profile record
  - Power Quality function (optional)

- **Analog Interface Types**
  - Current transformer
  - Voltage transformer
  - Conventional transformer inputs

- **Remarks**
  - Optional function
  - No. of instances

- **Protection**
  - Io>
  - 51N-1
  - Io>→
  - 67N-1
  - 2x
  - Io>>
  - 51N-2
  - Io>>→
  - 67N-2

- **Measurments**
  - 3U>
  - 59
  - 3U<
  - 27
  - 3x
  - U1<
  - 47U+
  - 3x
  - U2>
  - 47O-
  - f>/f<, df/dt
  - 81

- **Additional Functions**
  - MVI4
  - MAP
  - 6x
  - MVI4
  - MAP
  - SCA4
  - 8x
  - FLOC
  - 21FL
  - UFLS/R
  - 81LSH
  - 12x
  - Uo>
  - 59G
  - I>→IEF
  - 67NIEF
  - 62

- **Configuration**
  - Standard
  - A

- **Available Features**
  - Distance and fault recoder
  - Event logging
  - Local/Remote push-button on LHMI
  - Redundant protocols
  - User management
  - Web HMI
  - Graphic programmable logics, counter and timer
**FUNCTION OVERVIEW**

**REC615**
- **Version**: 2.0
  - **REMOTE MONITORING AND CONTROL RELAY**
  - **STANDARD CONFIGURATION**: B

**RER615**
- **Version**: 2.0
  - **RECLOSER PROTECTION AND CONTROL**
  - **STANDARD CONFIGURATION**: D

**LOCAL HMI**
- Disturbance and fault recorder
- Event log
- Load profile
- Relay self-supervision
- Local/Remote push-button on LHMI
- 4 programmable push-buttons with LED indication
- 11 programmable bi-color LED
- Time synchronization: SNTP, IRIG-B, 60870-5-101/-104, DNP3, IEEE 1588 v2
- User management
- Web HMI
- Graphic programmable logics, counter and timer

**CONDITION MONITORING AND SUPERVISION**
- FUSEF 60
- CBCM
- CBCM
- TCM
- TCM
- OPTS
- OPTM

**COMMUNICATION**
- Protocols: IEC 61850-8-1
- IEC 60870-5-101 & -104
- Modbus®, DNP3 Level 2
- Interfaces: Ethernet: TX (RJ-45), FX (LC)
- Serial: Serial glass fiber (ST), RS485, RS232/485, IRIG-B
- Redundant protocols: HSR, PRP

**CONTROL AND INDICATION**
1. Check availability of binary inputs/outputs from technical documentation
2. Control and indication function for primary object
3. Status indication function for primary object
4. Power Quality function (optional)

**MEASUREMENT**
- 1, U, Io, Uo, P, Q, E, pf, f
- Limit value supervision
- Load profile record
- Power Quality function (optional)

**ANALOG INTERFACE TYPES**
- Current transformer
- Voltage sensor

**REMARKS**
- Optional function
- Calculated value

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Functionality overview of REC615 standard configuration B and RER615 standard configuration D
## Standard configurations

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Code</th>
<th>REC615 / RER615</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protection</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Three-phase non-directional overcurrent protection, low stage</td>
<td>PHLPTOC 3I&gt; 51P-1</td>
<td>(1) (1) (1)</td>
</tr>
<tr>
<td>Three-phase non-directional overcurrent protection, high stage</td>
<td>FPHLPTOC 3I&gt; 51P-1</td>
<td>(1) (1) (1)</td>
</tr>
<tr>
<td>Three-phase non-directional overcurrent protection, instantaneous stage</td>
<td>PHHPTOC 3I&gt;&gt;&gt; 50P/51P</td>
<td>1 1 1 1 1 2</td>
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<tr>
<td>Three-phase directional overcurrent protection, low stage</td>
<td>DPHLPDOC 3I&gt; 67-1</td>
<td>(2) (2) (2) (2) 2</td>
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<tr>
<td>Three-phase directional overcurrent protection, high stage</td>
<td>DPHHPDOC 3I&gt;&gt;&gt; 67-2</td>
<td>(1) (1) (1) (1) 2</td>
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<tr>
<td>Non-directional earth-fault protection, low stage</td>
<td>EFLPTOC Io&gt; 51N-1</td>
<td>(1) (1) (1) (1)</td>
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<td>Non-directional earth-fault protection, high stage</td>
<td>FEFLPTOC Io&gt; 51N-1</td>
<td>(1) (1) (1) (1)</td>
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<tr>
<td>Non-directional earth-fault protection, instantaneous stage</td>
<td>EFIPTOC Io&gt;&gt;&gt; 50N/51N</td>
<td>1 1 1 1 1 1 1 1</td>
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<tr>
<td>Directional earth-fault protection, low stage</td>
<td>DEFLPDEF Io&gt; 67N-1</td>
<td>(2) (2) (2) (2) 2</td>
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<tr>
<td>Directional earth-fault protection, high stage</td>
<td>DEFHPDEF Io&gt; 67N-1</td>
<td>(1) (1) (1) (1) 2</td>
</tr>
<tr>
<td>Transient / intermittent earth-fault protection</td>
<td>INTRIPTEF Io&gt; IEF 67NIEF</td>
<td>(1) (1) (1) (1)</td>
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<tr>
<td>Admittance based earth-fault protection</td>
<td>EFADM Yo&gt; 21YN</td>
<td>(3) (3) (3) (3)</td>
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<tr>
<td>Wattmetric based earth-fault protection</td>
<td>WPWDE Po&gt; 32N</td>
<td>(3) (3) (3) (3)</td>
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<tr>
<td>Harmonics based earth-fault protection</td>
<td>HAEPPTOC Io&gt;HA 51NHA</td>
<td>(1) (1) (1) (1)</td>
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<tr>
<td>Multi-frequency Admittance based earth fault protection</td>
<td>MFADPSDE Io&gt; Y 67YN</td>
<td>(1) (1) (1) (1) (1) (1)</td>
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<tr>
<td>Negative-sequence overcurrent protection</td>
<td>NSPTOC I2&gt; 46</td>
<td>2 2 2 2</td>
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<tr>
<td>Phase discontinuity protection</td>
<td>PDNSPTOC I2/I1+ 46PD</td>
<td>1 1 1 1 1 1</td>
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<tr>
<td>Residual overvoltage protection</td>
<td>ROVPTOV Uo&gt; 59G</td>
<td>(1) (1) (1) (1) 2</td>
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<tr>
<td>Three-phase undervoltage protection</td>
<td>PHPTUV 3U&lt; 27</td>
<td>(3) (3) (3) (3) (3)</td>
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<tr>
<td>Three-phase overvoltage protection</td>
<td>PHPTOV 3U&gt; 59</td>
<td>(3) (3) (3) (3) (3)</td>
</tr>
<tr>
<td>Positive-sequence undervoltage protection</td>
<td>PSPTUV U1&lt; 47U+</td>
<td>(1) (1) (1) (1)</td>
</tr>
<tr>
<td>Negative-sequence overvoltage protection</td>
<td>NSPTOV U2&gt; 47O-</td>
<td>(1) (1) (1)</td>
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<tr>
<td>Loss of phase (undercurrent)</td>
<td>NSPTUC 3I&gt; (1) 37 (1)</td>
<td>2</td>
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<tr>
<td>Frequency protection</td>
<td>FRFRQ f&gt;/f&lt;,df/dt 81</td>
<td>(2) (2) (2) (2) (2)</td>
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<tr>
<td>Three-phase thermal protection for feeders, cables and distribution transformers</td>
<td>T1PTTR 3I&gt; 49F</td>
<td>1 1 1 1 1 1</td>
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<tr>
<td>Circuit breaker failure protection</td>
<td>CCBRBF 3I&gt;/Io&gt;BF 51BF/51NBF</td>
<td>2 2 2 2</td>
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<td>Three-phase inrush detector</td>
<td>INRPHAR 3I2f&gt; 68</td>
<td>1 1 1 1 1 1</td>
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<td>Master trip</td>
<td>TRPPTRC Master Trip 94/86</td>
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<td>Multi-purpose protection</td>
<td>MAPGAPC MAP MAP</td>
<td>6 6 6 6 6</td>
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<tr>
<td>Load shedding and restoration</td>
<td>LSHPFRQ UFLS/R 81L5H</td>
<td>(1) (1) (1) (1) 1</td>
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<td>Fault locator</td>
<td>SCEFRFLO FLOC 21FL</td>
<td>(1) (1) (1) (1)</td>
</tr>
<tr>
<td>Phase power directional function</td>
<td>DPSRFIR I1&gt; 32P</td>
<td>1 1 1 1 1 1</td>
</tr>
</tbody>
</table>

### Power Quality

| Current total demand distortion | CMHAI PQM3I PQM3I | (1) (1) (1) |
| Voltage total harmonic distortion | VMHAI PQM3U PQM3V | (1) (1) (1) |
| Voltage variation | PHQVVR PQMU PQMV | (1) (1) (1) |
| Voltage unbalance | VSQVUB PQUUB PQUUB | (1) (1) (1) |
### Standard Configurations

**Configuration Code**

- **REC615 / RER615**

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Code</th>
<th>IEC 61850</th>
<th>IEC 60617</th>
<th>IEC-ANSI</th>
<th>A / A</th>
<th>B / D</th>
<th>C / -</th>
<th>E / E</th>
<th>F / -</th>
<th>G &amp; H / -</th>
</tr>
</thead>
</table>

#### Control

- Circuit-breaker control: CBXCBR
- Disconnector control: DCXSWI
- Disconnector position indication: DCSXSWI
- Earthing switch indication: ESSXSWI
- Auto-reclosing: DARREC
- Synchronization and energizing check: SECRSYN
- Automatic transfer switch, instance: ATSABTC

#### Condition Monitoring Control

- Circuit-breaker condition monitoring: SSSCBR
- Trip circuit supervision: TCSSCBR
- Fuse failure supervision: SEQSPVC
- Runtime counter for machines and devices: MDSOPT
- Voltage Presence: PHSVPR

#### Measurement and Logging

- Three-phase current measurement: CMMXU
- Sequence current measurement: CSMSQI
- Residual current measurement: RESCMXU
- Three-phase voltage measurement: VMXU
- Residual voltage measurement: RESVMXU
- Sequence voltage measurement: VSMXU
- Three-phase power and energy measurement: PEMMXU
- Single-phase power and energy measurement: SPEMMXU
- Frequency measurement: FMMXU
- Load profile: LDPRLEC

#### Other

- Minimum pulse timer (2 pcs): TPGAPC
- Minimum pulse timer (2 pcs, second resolution): TPGAPC
- Minimum pulse timer (2 pcs, minute resolution): TPGAPC
- Pulse timer (8 pcs): PTGAPC
- Time delay off (8 pcs): TOFGAPC
- Time delay on (8 pcs): TONGAPC
- Set reset (8 pcs): SRGAPC
- Move (8 pcs): MGVAPC
- Generic control point (16 pcs): SPCCAPC
- Remote generic control points: SPCRGAPC
- Local generic control points: SPCRLCAPC
- Generic up-down counters: UDCCNTR
- Analog value scaling function: SCACAPC
- Integer value moving function: MIVAPC
- Daily timer function: DTMGAPC
- Programmable buttons (4 buttons): FKERY4GIO1

#### Logging functions

- Disturbance recorder: RDER
- Fault recorder: FTLRFRCC

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1) Uo calculated; 2) UoB calculated; 3) Voltage group B; 4) I0 calculated; 5) I0B calculated; 6) Current group B;
7) Specific functional package to be selected for functional package 1 (G,H), 2 (C,D) and 3 (D)

Note that all directional protection functions can also be used in non-directional mode.

The instances of a protection function represent the number of identical function blocks available in the standard configuration.