Grid automation REC615

Product presentation

ENGINEERED
TO OUTRUN

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Features and benefits

- Applications
- Hardware
- What’s new?

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Key takeaways

01.

Introduction and why

- Changes in the power network
- Enhancing grid reliability

03.

Ordering and maintenance

- Ordering and modification
- Easy maintenance

01

Introduction and why

Grid automation REC615

Grid automation relay for protection and control, monitoring, fault indication, automation, and power quality analysis in medium-voltage secondary distribution systems.

Including networks with distributed power generation, with secondary equipment such as medium-voltage disconnectors, switches, ring main units and reclosers.

Relion®

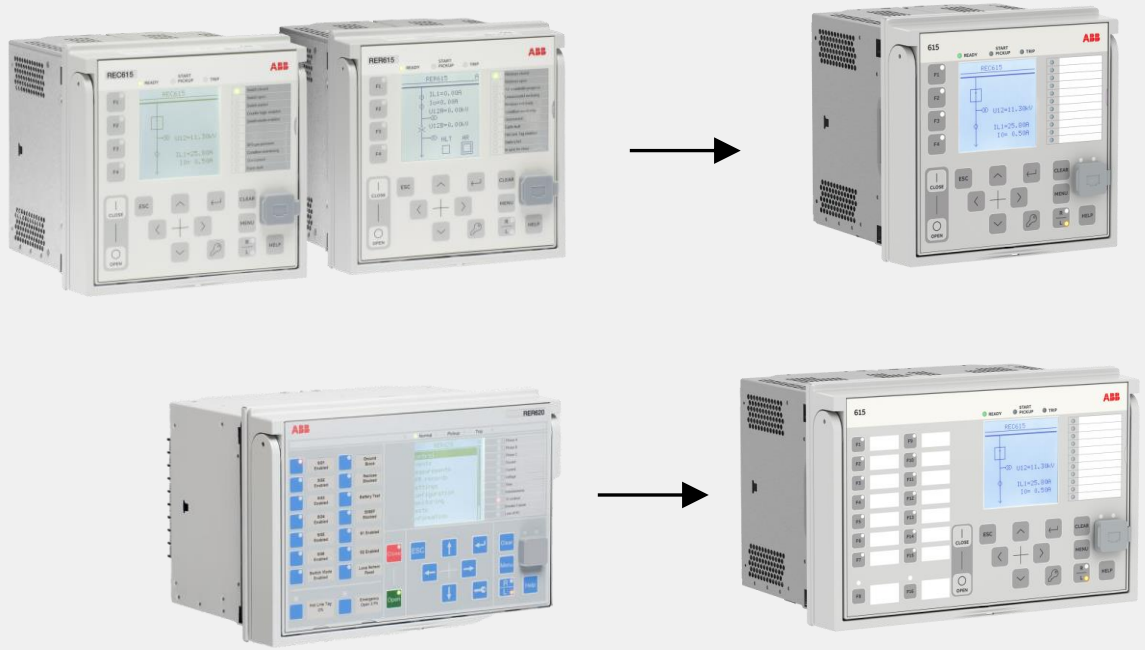
REC615

Next step for protection and control in grid automation applications

The story continues as
Grid automation REC615

One relay in two sizes

- ABB’s previous grid automation relays merged into one.
  - Remote monitoring and control REC615
  - Recloser protection and control RER615
  - Advanced recloser protection and control RER620
- **Grid automation REC615** is available in two sizes – standard and wide
- Global coverage – IEC, ANSI, CN standards and conventions



Challenges for network operators

- Increasing efficiency and supply quality requirements
- Commercial consequences of power outages are becoming more and more severe
- Growing distributed power generation and interconnection of renewable energy sources
- Charging stations for electrical vehicles, continuously increasing power consumption
- Support needed for demand response programs and energy storages
- Aging infrastructure with different generations of primary and secondary substations
- Cyber security risks

Challenges for network operators

Network operators need to improve:

- Power quality
- Supply reliability
- Cost-efficiency
- Customer satisfaction

To meet these demands, operators need to introduce automation throughout the entire network

Drivers for advanced grid management

Power quality

Increasing demands for better power quality and supply

Reduce SAIDI and SAIFI

Underground cabling

To improve quality utilities are increasing underground cabling

Requires compensation due to increased earth fault current

Network compensation

Compensation decreases earth fault current and improves safety

Demanding application for protection and fault indication

Fault handling

Accurate fault detection with intelligent protection and indication functions

Minimizing fault consequences quickly

02

Features and benefits

Grid automation REC615

One relay in two sizes

- A relay for protection, control, measurement and supervision of power distribution applications, especially for smart secondary substation applications
- Have inherited features from Relion REX615
- Protection, measurement and control functionality needed in smart grid-enabled networks
- Compact, withdrawable-unit design
- Extensive earth-fault protection portfolio including
  - Touch voltage-based earth fault current protection (IFPTOC)
  - Multifrequency admittance-based earth-fault protection (MFA)

Grid Automation REC615

Relion® product family

Grid automation REC615 is a member of ABB's Relion® product family

The most comprehensive protection relay product family on the market

Designed to implement the core values of the IEC 61850 standard to ensure interoperable and future-proof solutions

Grid automation REC615

Main application area

Urban remote controllable secondary substation applications

- with integrated protection and advanced fault passage indication for both cable and overhead lines
- in all types of networks such as solidly earthed, resistance earthed, isolated or compensated networks
- Control support for up to 4 circuit breakers and 8 disconnectors and position indication of 8 earth switches

Designed for remote control

- IEC 60870-5-104
- IEC 60870-5-101
- Modbus®
- DNP3

Native support for IEC 61850

GOOSE messaging for high-speed protection, fault isolation and restoration

Grid automation REC615

- Flexible control of single-phase and three-phase reclosers
- Freely programmable
- Flexible auto-reclosing function
- Integrated power quality measurement, including voltage dips and swells logging
- Load profile and event logging
- 4 or 16 programmable function keys on the local human machine interface (LHMI) support direct access of additional control functions (e.g. Hotline tag, non-reclose mode, enable/disable protection function).

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Native support for standardized network and substation communication

Support for remote protocols

- IEC 60870-5-104
- IEC 60870-5-101
- DNP3 TCP/IP and serial
- Modbus TCP/IP and RTU/ASCII

Support for Modbus master

- Data collection from Modbus slave devices
- Data transfer to SCADA using remote protocols

Native support for IEC 61850 communication

- Selectable Edition 2/Edition 1 modes
- IEC 61850 allows horizontal communication between devices → Fast GOOSE

Optical or galvanic redundant Ethernet solution

- High availability seamless redundancy (HSR)
- Parallel redundancy protocol (PRP)

GOOSE – Generic Object Oriented Substation Event
SCADA - Supervisory Control and Data Acquisition

Grid automation REC615

Main benefits

- Reliable and cost-efficient grid automation high-end product for smart power distribution solutions
- Wide functionality, large range of applications
- Sophisticated protection functionality to detect, isolate and restore power in cable networks and overhead line networks
- Integrated power quality measurement, including voltage dips and swells logging
- Adaptable configurations for rapid engineering and commissioning
- Large, easy-to-read LCD with SLD, local control and parameterization capability with dedicated push buttons for safe and easy operation
- Web-based parameterization tool with download capability
- Cyber security features such as audit trail

LCD – Liquid Chrystal Display
SLD – Single Line Diagram

Supporting the green transition

Minimized environmental impact for a greener tomorrow

Sustainable design, production, operation, maintenance and end-of-life management

End-of-life instructions for safe disposal and maximized recyclability

Embedding sustainability across the relay life cycle

Applications

Integrated automation solutions to enhance grid reliability

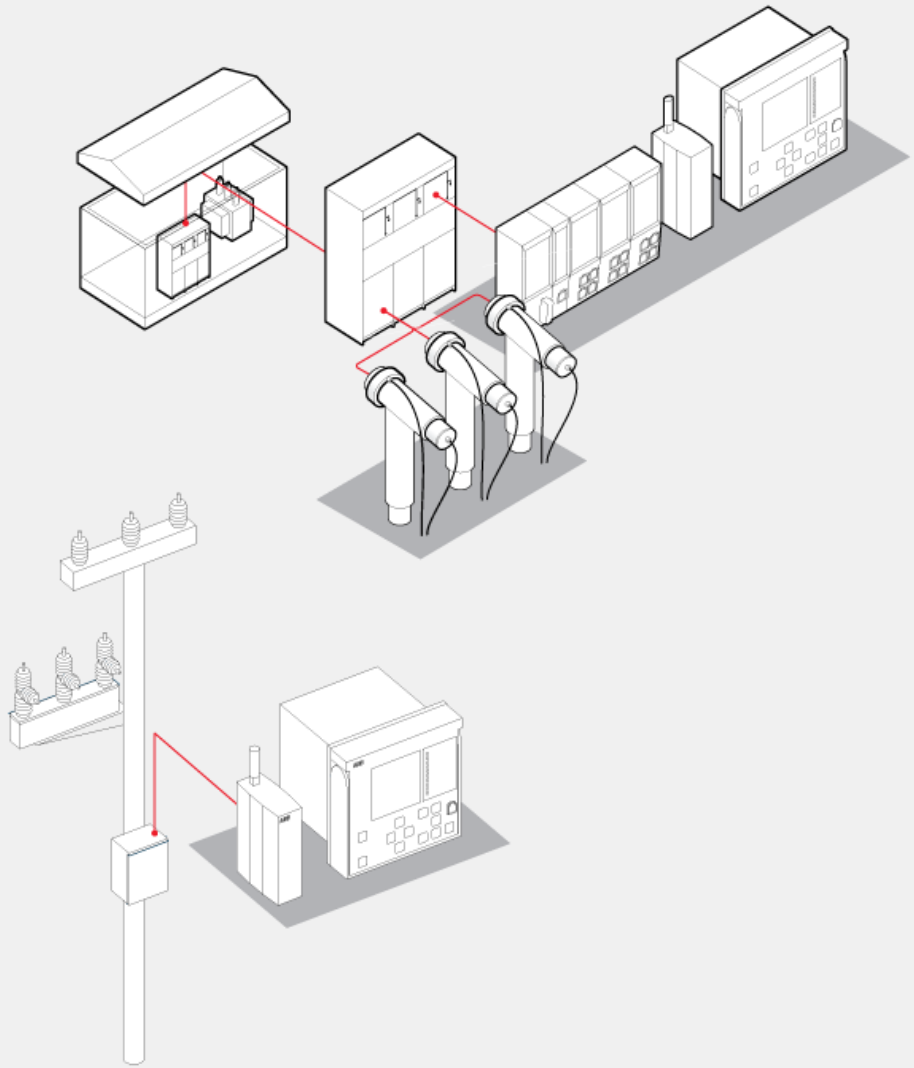
- Scalable solutions from basic monitoring to advanced protection functionality for new and existing installations
- Smooth integration into the distribution management system (DMS) or SCADA
- Advanced power flow and fault management: the same unequalled fault passage indication (FPI) accuracy on both primary and secondary substation level

For cable networks

- Grid automation REC615
- Wireless modem
- Remote I/O unit RIO600
- Compact secondary substation (CSS)

For overhead lines

- Grid automation REC615
- Wireless modem
- Recloser
- Load break switch

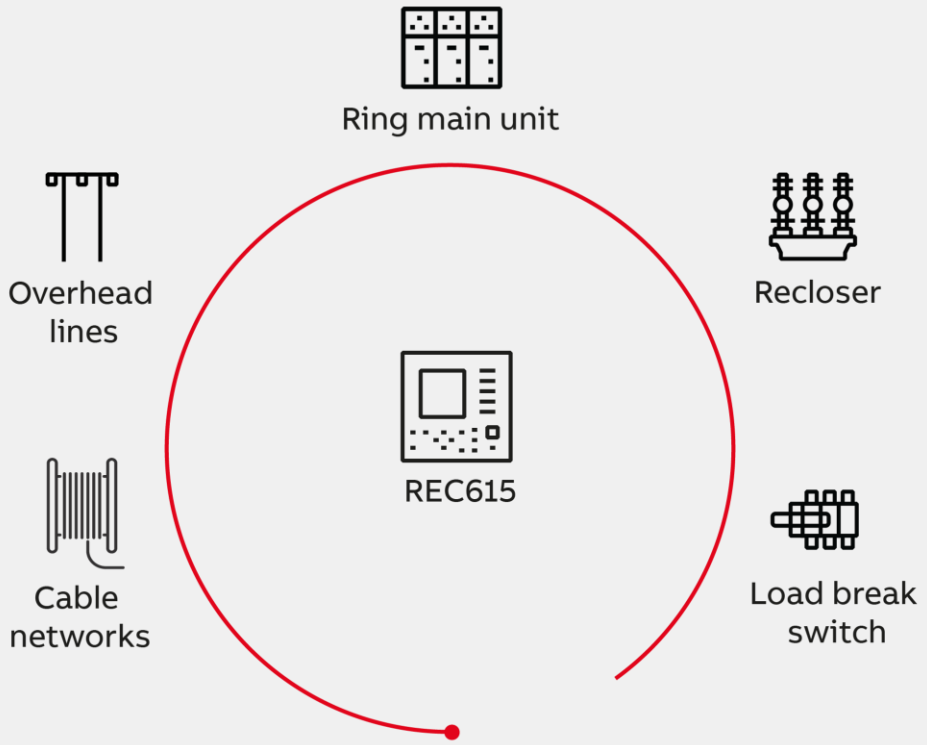


Application package concept

Maximum convenience and flexibility

7 application packages to support a large variety of applications

- Wide application coverage for grid automation applications
- Large selection of ready-made application packages to choose from
- Possibility to flexibly combine application packages to meet application-specific requirements



Application coverage
Application packages

Base functionality*
- Apparatus control
- Supervision
- Measurements and power quality
- Recorders
- Logic functions

Current protection
- Basic current protection
- Residual voltage protection
- Thermal overload protection
- Loss-of-phase
- Circuit-breaker failure prot.
- Switch-onto-fault
- Autoreclosing

Earth fault protection extension
- Earth-fault protection extension including:
- Multifrequency admittance-based earth-fault protection
- Touch-voltage based earth-fault current protection
- Transient protection
- Fault pass indication

Feeder protection extension
- Directional overcurrent protection
- Power protection
- Voltage vector shift protection

Fault location
- Location of short circuits and earth-faults

Voltage protection
- Voltage protection
- Frequency protection
- Synchronism and energizing check
- Load shedding and restoration
- Voltage presence

Feeder protection single-phase
- Protection functions with single-phase trip option
- Single-phase reclosing
- Control functions with single-/three-phase operation
- Supervision of single-/three-phase circuit-breaker

Automation extension
- Automatic bus transfer
- Recloser loop control

* Always included

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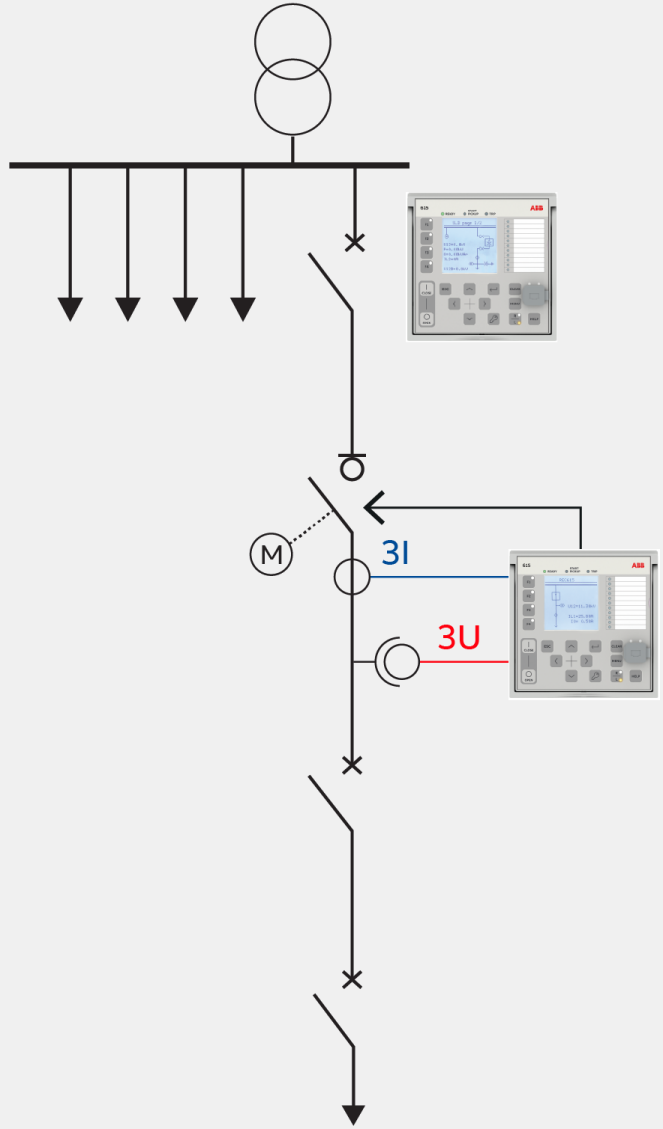
Application examples 1/7

LBS application as intelligent sectionalizer

- LBS (Sectos) as an intelligent limited purpose switch for sectionalizing
- Remote control of LBS
- Advanced fault passage indication (FPI) utilizing protection relay technology
- Embedded communication to SCADA via for example IEC 60870-5-104
- Voltage presence indication
- Graphical display in the local HMI
- Power measurement
  - P, Q, S, cosϕ
- Power quality functionality



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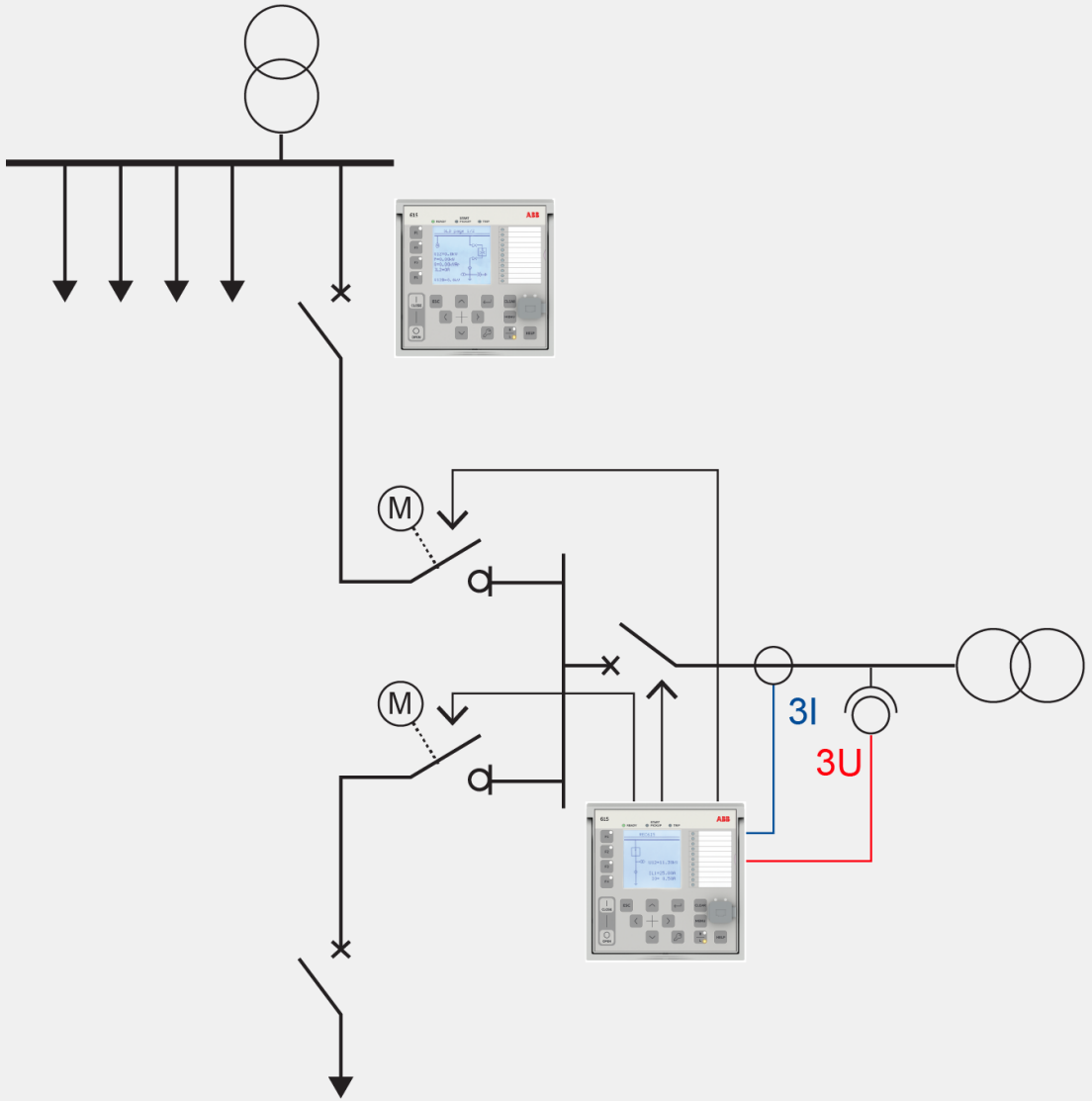
Application examples 2/7

RMU with outgoing CB for distribution transformer

- RMU (Ring Main Unit) with outgoing circuit breaker for distribution transformer
- Remote controllable load break switches for cable feeders and current based protection functions for distribution transformers
- Embedded communication to SCADA via for example IEC 60870-5-104
- Automatic transfer switch function
- Voltage presence function
- Graphical display in the local HMI
- Power measurement
  - P, Q, S, cosϕ
- Power quality functions



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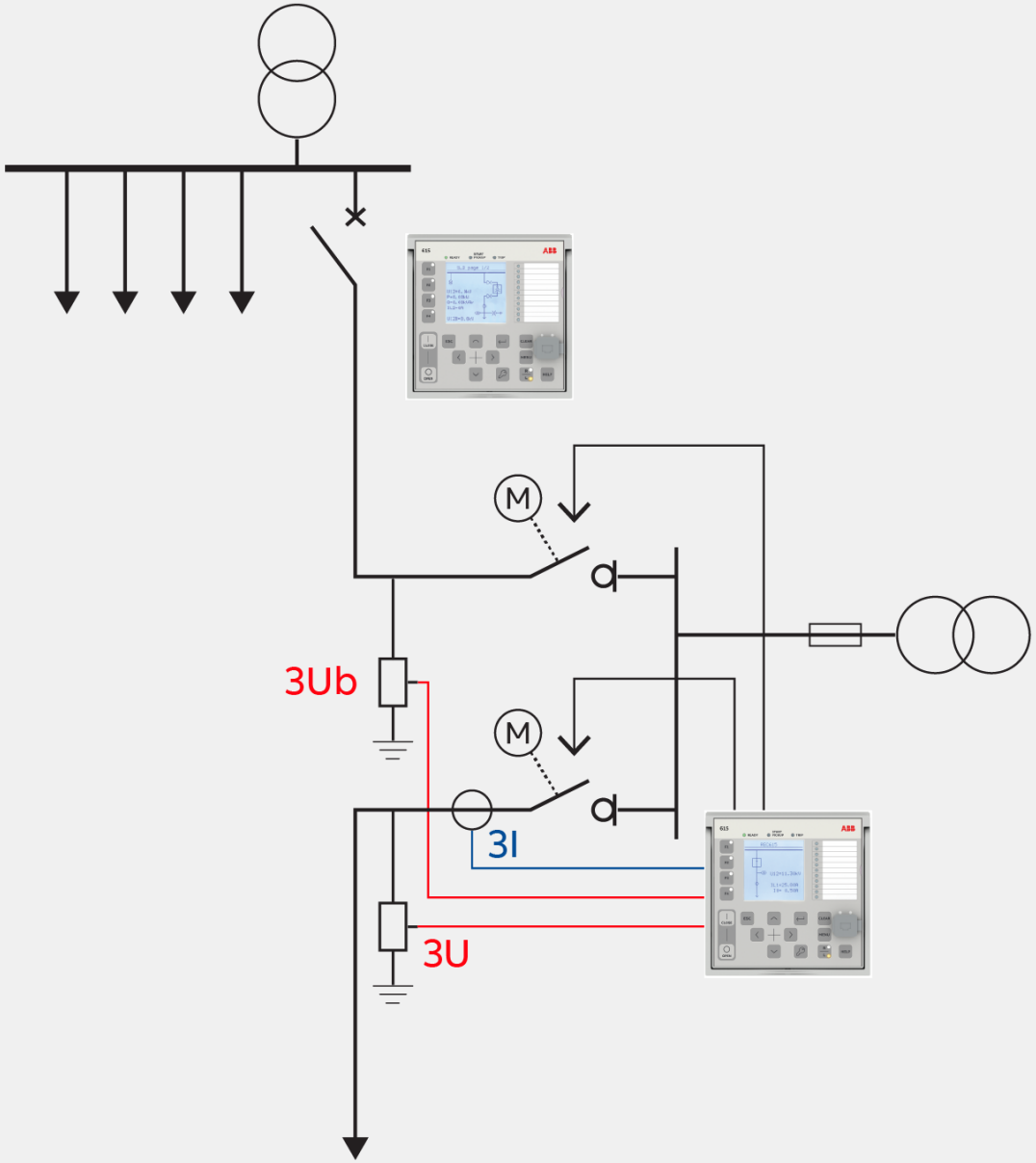
Application examples 3/7

RMU controller with synchrocheck functionality

- RMU controller with synchrocheck functionality
- Remote controllable load break switches for cable feeders in radial networks needing synchrocheck functionality for reliable closing of the loop
- Accurate fault passage indication and disturbance recording on outgoing feeder
- Embedded communication to SCADA via for example IEC 60870-5-104
- Automatic transfer switch function
- Graphical display in the local HMI
- Power measurement
  - P, Q, S, cosϕ
- Power quality functionality



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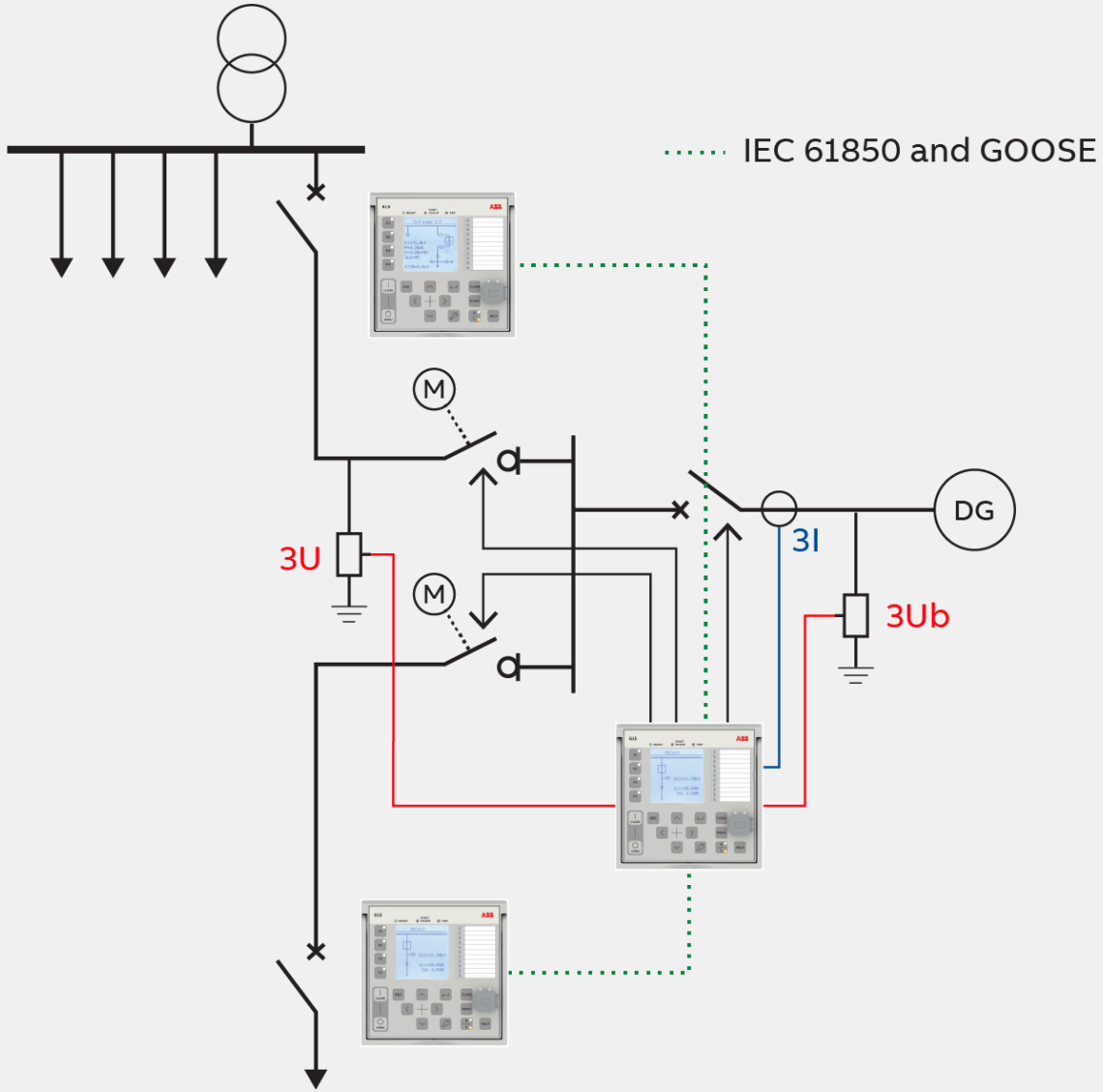
Application examples 4/7

Remote control and protection of DG plant

- REC615 safely protects distributed generation (DG) from various faults with advanced protection functions.
- Early indication of loss-of-mains by using IEC 61850 and GOOSE communication
- Safe reconnection is enabled by using synchrocheck functionality

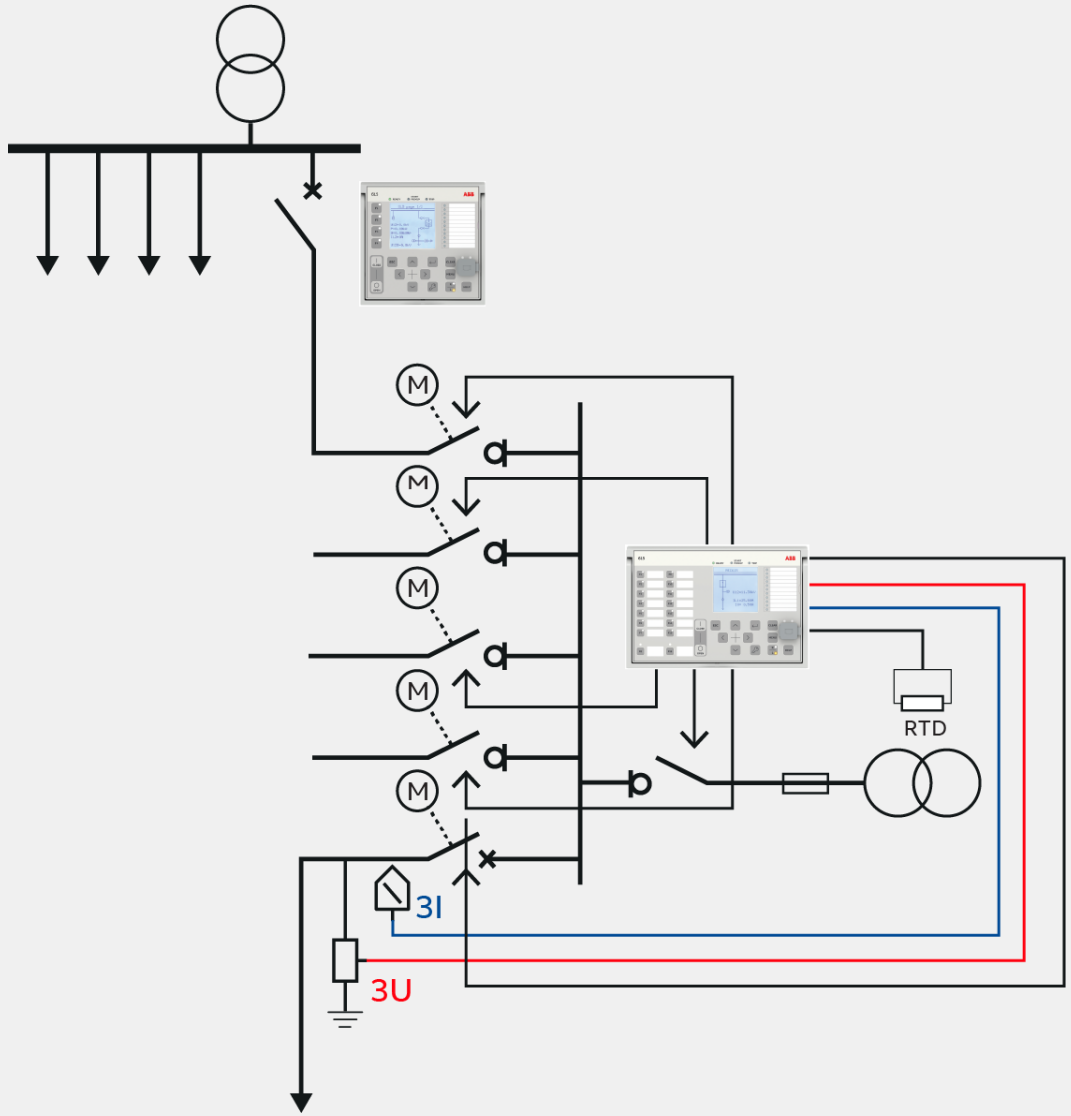


Grid automation REC615

Application examples 5/7

REC615 + RIO600: Remote control and protection of RMU station

- Remote controllable load break switches on cable feeders with sensor measurement
  - Enables selective protection of radial feeder with advanced direction earth-fault and overcurrent protection and auto-reclosing functionality.
- Embedded communication to SCADA via, for example, IEC 60870-5-104
- Graphical local HMI
- Power measurement
  - P, Q, S, cosϕ
- Power quality functionality
- RIO600 is used for additional I/O's and temperature measurement of distribution transformer

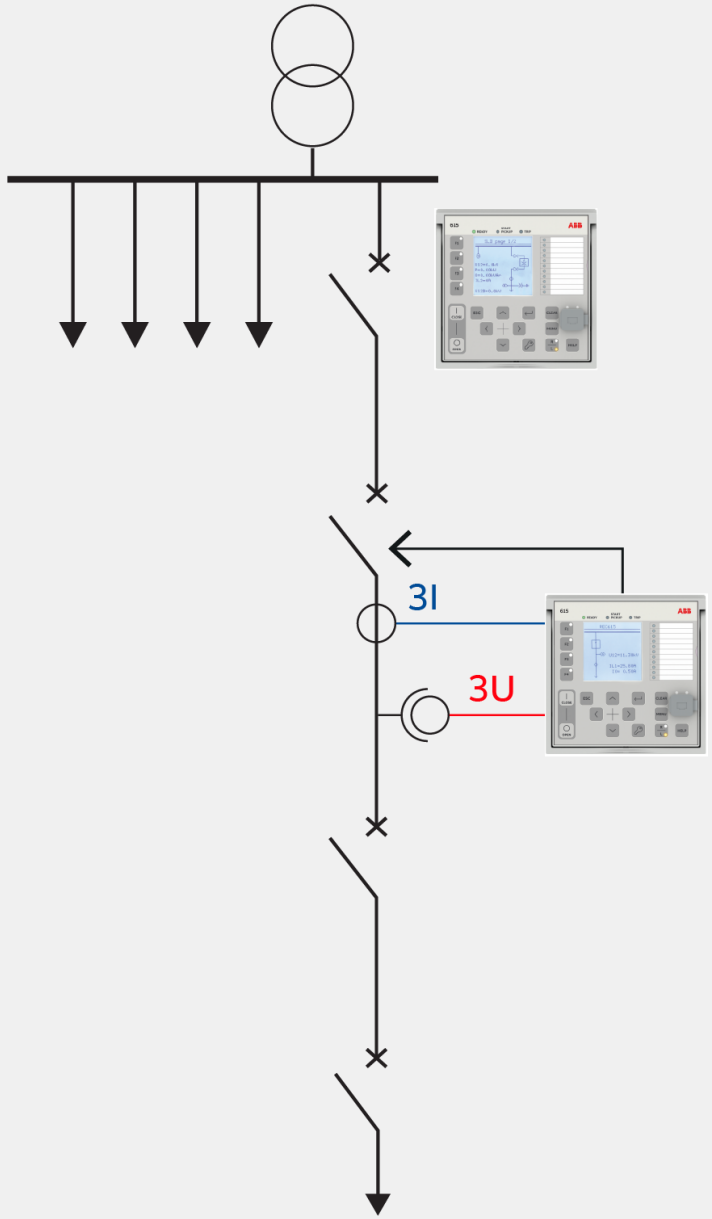


Grid automation REC615

Application example 6/7

Selective protection in radial feeder

- Selective protection in radial feeder
  - Reclosing functionality
  - Advanced earth fault protection
    - Multi frequency admittance based E/F detection
  - Directional overcurrent protection for distributed generation application
  - Synchrocheck functionality
  - Voltage protection functions for both sides

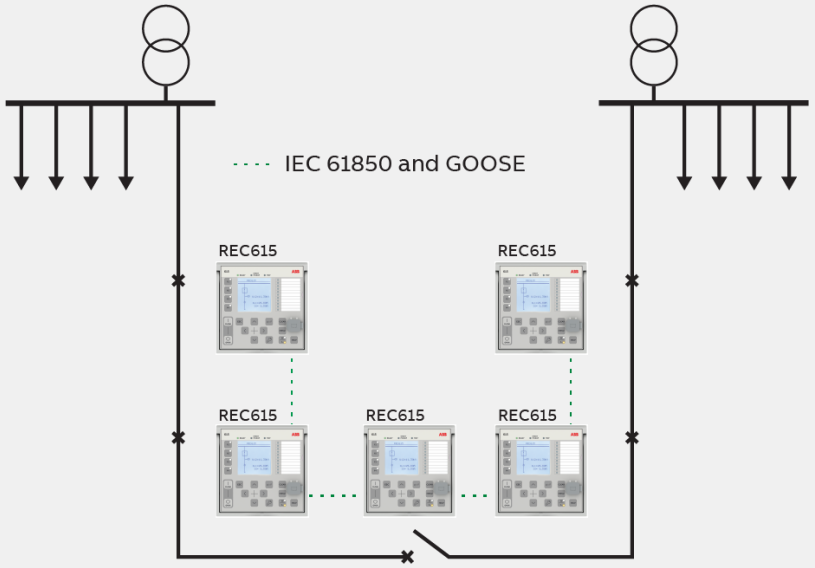


Grid automation REC615

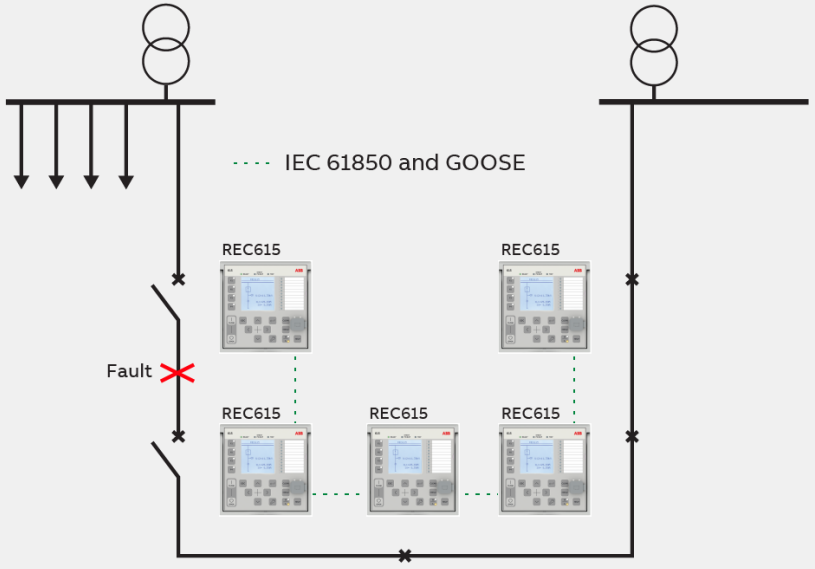
Application example 7/7

FLIR in radial feeder and ring configuration

- Precise earth-fault and overcurrent protection enables autonomous FLIR (Fault Location, Isolation and Restoration) using freely programmable logic functionality
- Utilize IEC 61850 and GOOSE communication
- In the pre-fault state the closed loop network is operated in radial type with one NOP (Normal Open Point)
- The fault is accurately located between two circuit breakers isolating faulty part and allowing NOP to be closed



Pre-fault state



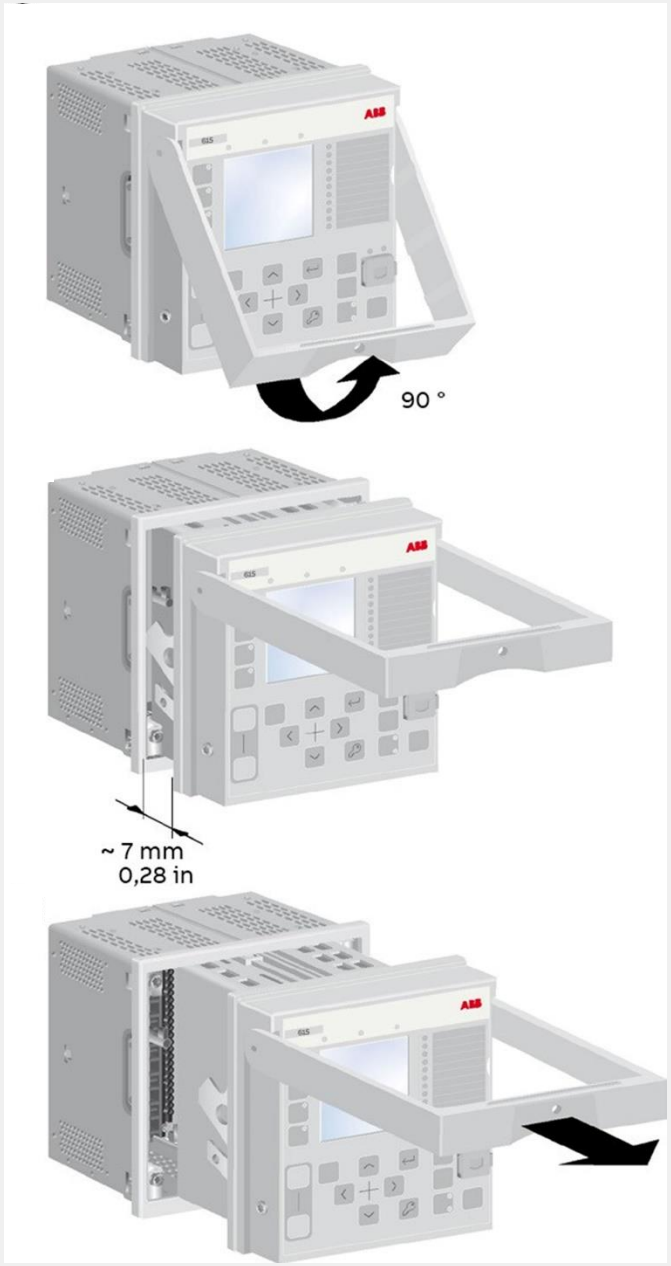
Post-fault state

Hardware

Hardware

Modular plug-in unit design for flexibility

- Quick and easy installation, maintenance and testing of the relay with withdrawable plug-in unit design
- Swift replacement, short meantime to repair (MTTR) and minimized costly downtime with spare units and modules in store
- Allows the case to be installed and wired before the plug-in unit is inserted
- Mechanical coding system for preventing insertion of the wrong plug-in unit in a case
- Sealable and screw-secured pull-out handle to prevent accidental or unauthorized removal of the plug-in unit



Hardware

One relay in two sizes

Standard or wide – the choice is yours

- Available in two hardware sizes – standard (same dimensions as for the Relion 615 series relays) and wide (same dimension as for the Relion 620 series relays)
- Wide is the best option for:
  - Applications requiring more I/Os or RTDs/mA measurements
  - More advanced protection schemes that require more current and voltage measurements
  - When more programmable push-buttons and LEDs are needed

Standard
5 slots for selected hardware
HMI with 4 function keys

Wide
7 slots for selected hardware
HMI with 16 function keys

RTD – Resistance Temperature Detector
mA - Milliampere

Hardware
Analog inputs

Analog inputs hardware

- 2 or 3 slots depending on the product size

Current and voltage measurement

- Support of instrument transformers, sensors and their combinations
- CTs or Rogowski coils for phase currents
- VTs or resistive/capacitive voltage dividers support for phase voltages

RTD/mA measurements

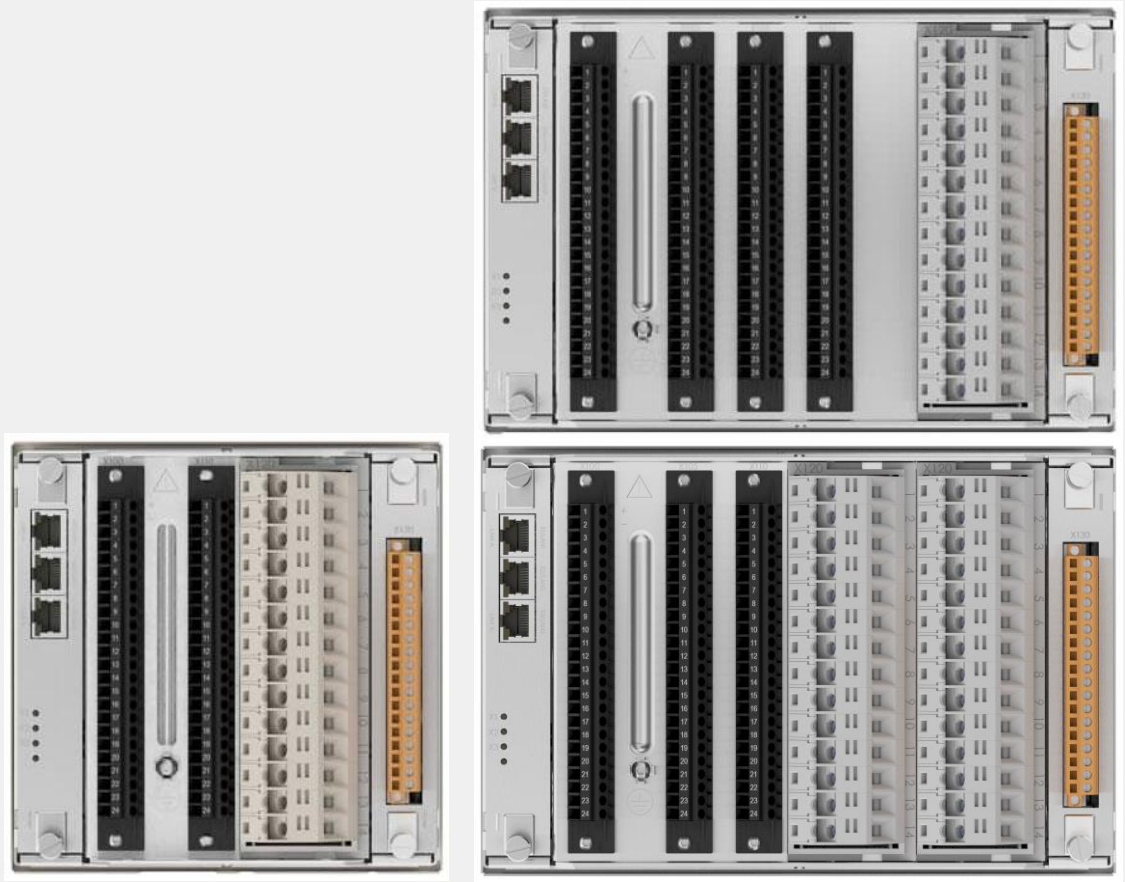
- 2 RTD and 1 mA inputs available in the standard variant
- Additional 6 RTD and 2 mA inputs available in wide variant

Hardware

Flexible selection of hardware

Modular design for maximum flexibility

- Freely selectable hardware modules according to protection, control and communication requirements
- Selectable I/O connectors – either of compression (IEC convention) or ring-lug type (ANSI convention).
- Optional full conformal coating for outstanding performance also in the most extreme environments
- Only a few fixed dependencies:
  - Process bus IEC 61850 9-2 LE possible with redundant Ethernet communication modules COM31 and 37



What’s new?

REC615: What’s new?

Extensions for earth-fault protection

- Non-directional earth-fault protection (50G/50N) – new function, ”instantaneous only”, based on IEC 61850 LN PIOC model
- Touch voltage-based earth-fault current protection IFPTOC (46SNQ/59N)
- Multi-frequency admittance-based earth-fault protection (67NYH)

Extensions for current protection

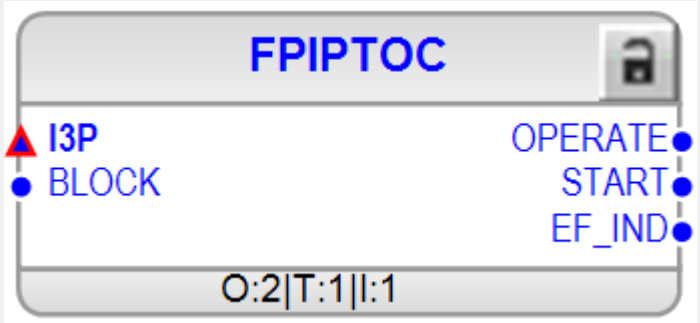
- Non-directional overcurrent protection (50P) – new function, “instantaneous only”, based on IEC 61850 LN PIOC model

Advanced fault location with unequaled accuracy for optimal fault management

REC615: What’s new?

Fault passage indicator

- Used to detect a fault downstream of the line
- For single-phase earth faults in high-impedance earthed networks
- Based only on phase current measurements, thus it is applicable in cases where voltage measurements are not available



REC615: What’s new?

Support for the GridShield recloser

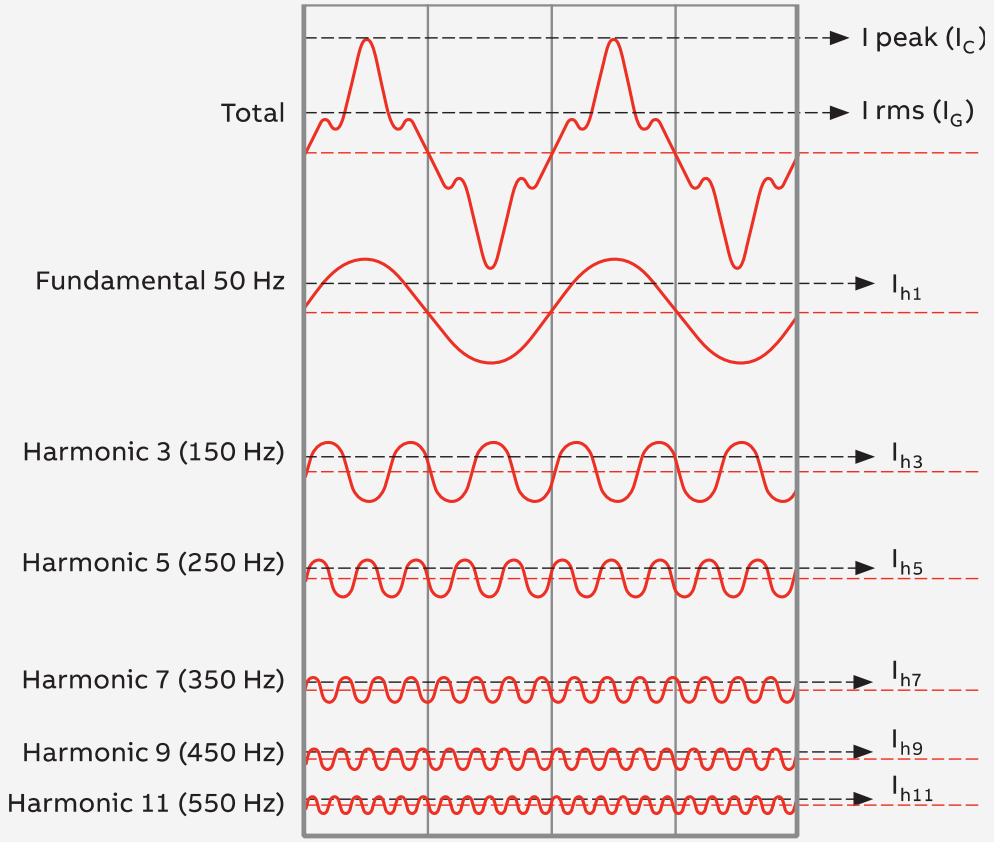
- Protection and control functionality with single-/three phase tripping or closing
- Recloser curves supported
- New single-/ three-phase reclose functionality
- Programmable push pushbuttons in the LHMI
- Single/three phase control in the LHMI
- Support for different recloser applications
  - Sectionalizing/midpoint/tiepoint recloser
- Used in combination with external ACM and UPS devices

ACM – Actuator control module
UPS – Universal power supply

REC615: What's new?

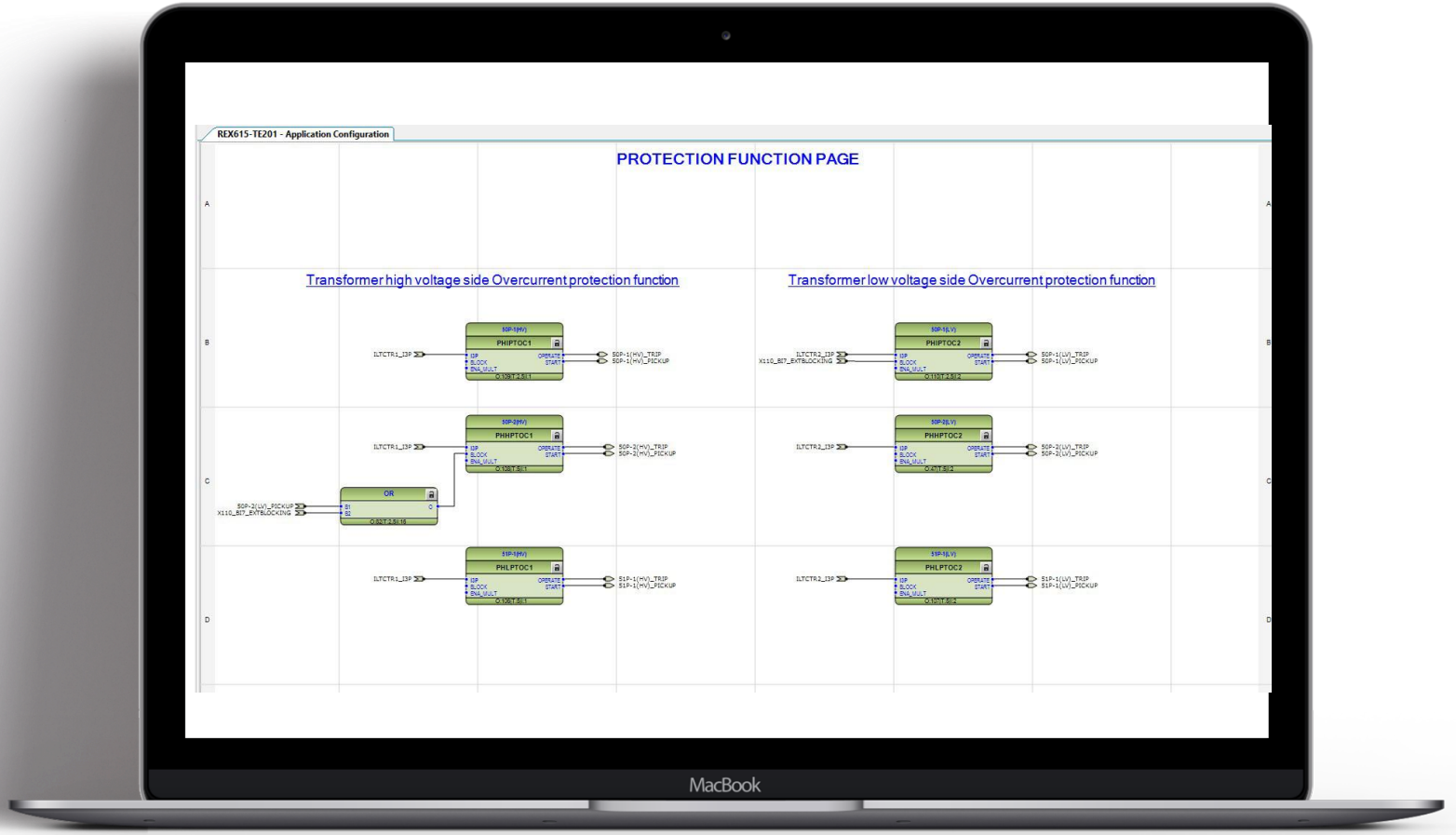
Other improvements

- Current and voltage harmonics with individual harmonics up to the 11th harmonic component
- Overall increase in the number of function instances for increased flexibility in product engineering

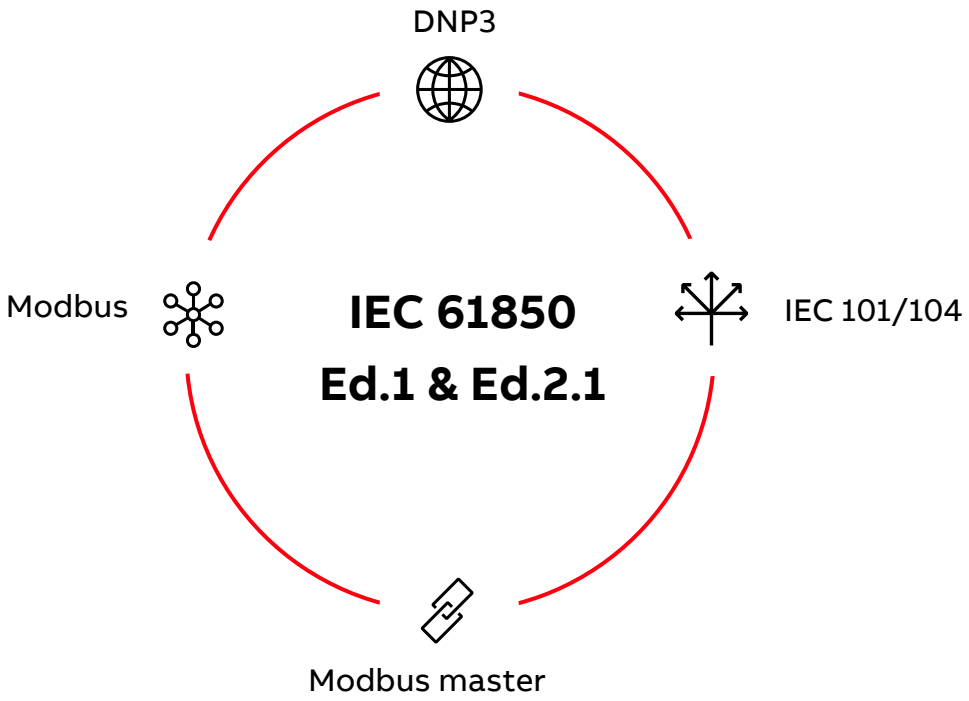


REC615: What's new?

- Freely configurable analog channels
- New logics functionalities such as timers, calendar, mathematic operators, value comparators, etc., to allow more advanced logics
- User-defined symbol engineering to allow tailoring IEC/ANSI symbols, naming functions or their I/Os – also visible via the LHMI
- Flexible product naming (FPN) to facilitate the mapping of the relay's IEC 61850 data model to that of the customer



REC615: What's new?

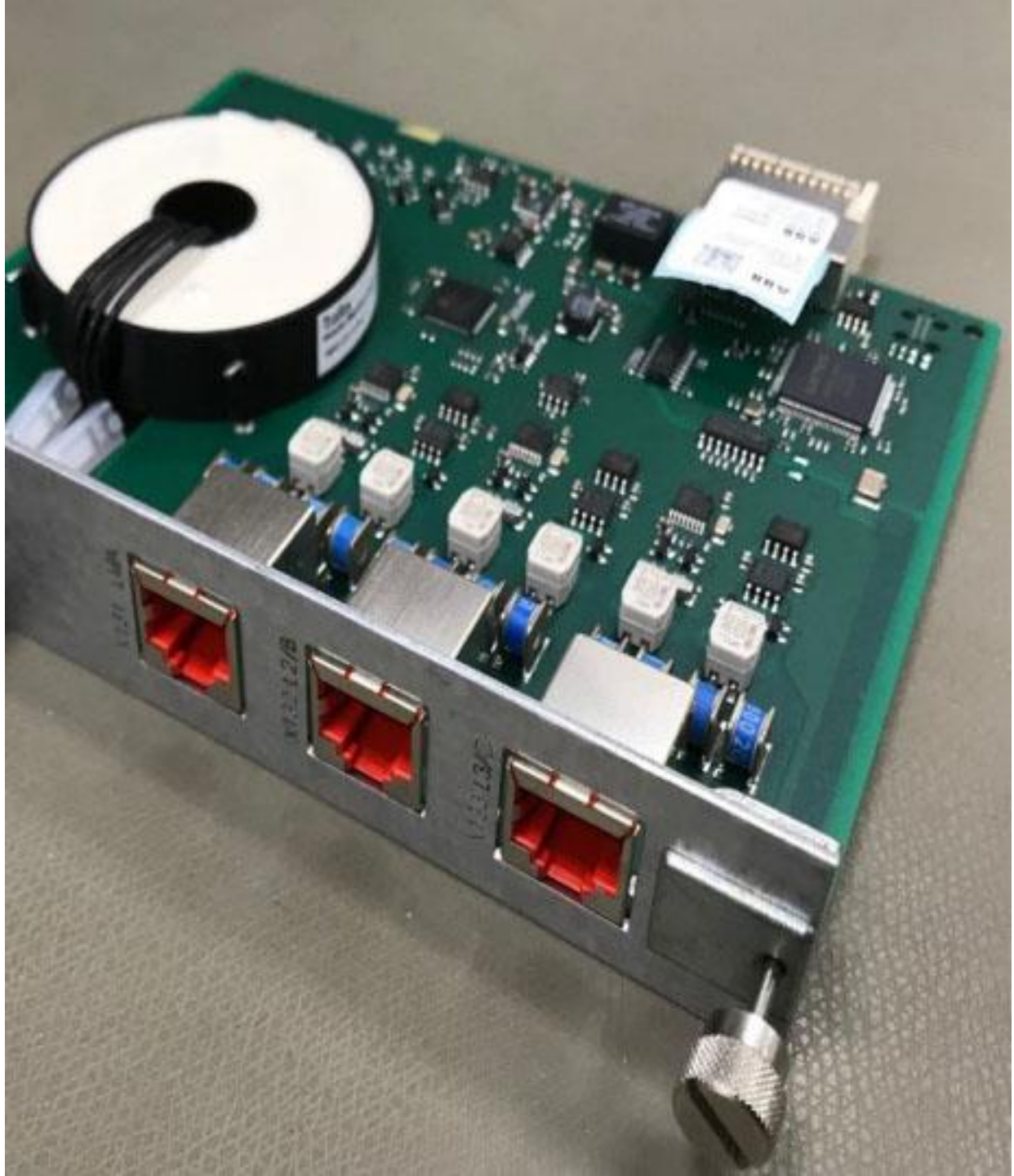


- Secure communication as an option for DNP3 and IEC 60870-5-104 according to the IEC 62351 standard – for further improved cyber security
- Redundant Ethernet IEC 61850 station communication with IRIG-B (via serial RS-485) time synchronization
- Double IP address for configuring a second communication network (horizontal and vertical communication), with, for example, redundant IEC 61850 in one network and MODBUS TCP in the other, or create a dedicated service network for relay engineers
- IEEE 1588-time synchronization with IEC/IEEE 61850-9-3 (Power Utility Profile) for better compatibility
- IEC 61850 Edition 2.1 data modelling compatibility and conformance certification to support the digitalization of the grid – still also supporting Edition 1
- Flexible product naming (FPN) to facilitate the mapping of the relay's IEC 61850 data model to that of the customer
- IEC 61850 cyclic reporting of measurement values
- Modbus Master protocol: data collection from Modbus slave devices and data transfer to SCADA using the supported remote protocols

REC615: What’s new?

New IEC 61869-compatible sensor module

- Current measurements from Rogowski current sensors and voltages from voltage sensors
- RJ45 combi-sensor input marked in red – including pins for currents and voltages according to IEC 61869
- Io (sensitive 0,2/1A) still with traditional summation current transformer
- Improved measurement dynamics and accuracy supporting accurate and well-performing functions – class 0.5 accuracy for currents and voltages



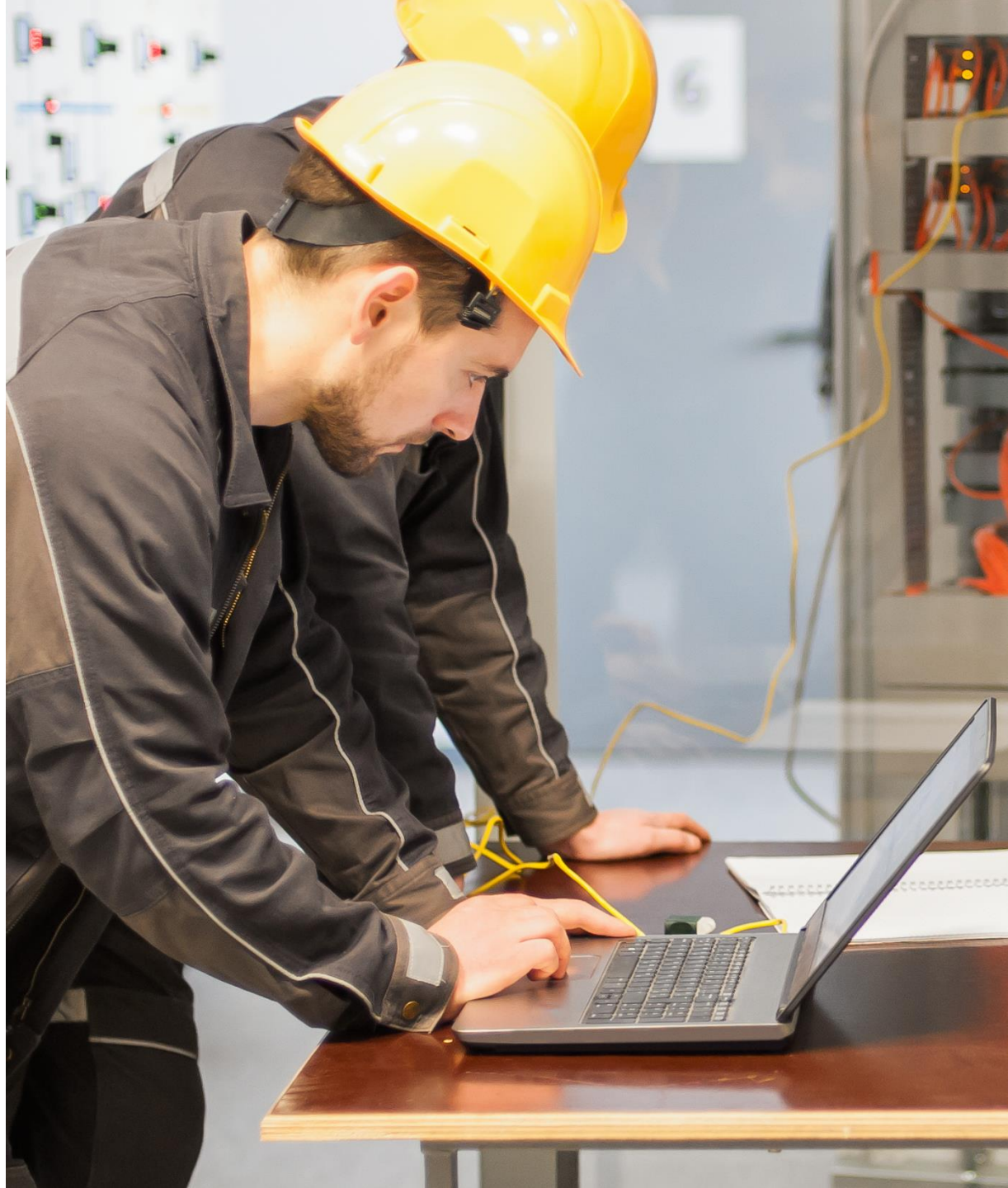
REC615: What's new?

IEC 61850-8-1 GOOSE

- Sending of larger amount of data – increased number of IEC 61850 data sets (GoCB 8, RCB 27)
- Faster analog GOOSE for sending data
- Receiving simulated messages for relay testing

Process bus IEC 61850-9-2LE SMV

- Sending and receiving current and voltage samples in current and voltage protection applications
- Sending one stream (one full set of currents and voltages)
- Receiving up to two full streams
- Automatic switching between streams – enabling main and backup measurements
- Receiving simulated sampled measured value (SMV) messages for relay testing

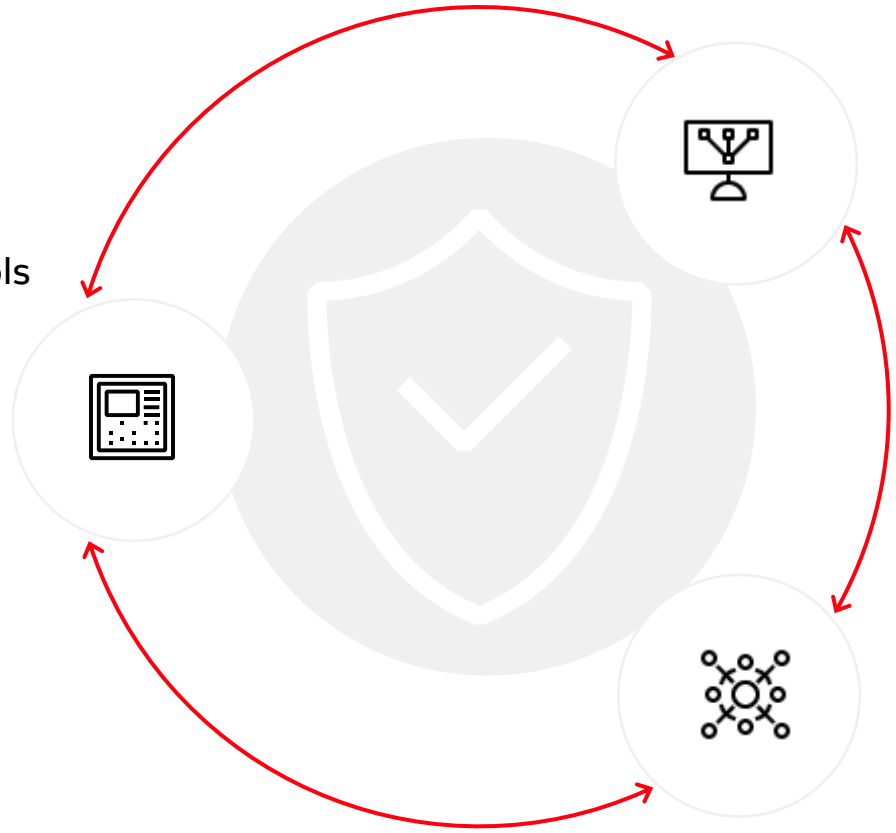


GOOSE - Generic Object-Oriented Substation Event
GoCB – GOOSE control block
RCB - Report control block

REC615: What's new?

Relay

- Hardened software configuration allowing only necessary services and protocols
- Intelligent network load monitoring including denial of service protection
- Supervised services, protocols and communication ports
- Role-based access control for individual users



Engineering and operation

- Secure web browser-based human-machine interface
- Encrypted communication between the engineering tool and the relay
- Chronological audit trail including security related events
- Easy firmware updates for improved reliability and cyber security

Solutions

- Centralized management of individual user accounts and roles
- Centralized viewing of security-related events
- Chronological audit trail including security related events
- Centralized cyber security certificate management with public key infrastructure

03

Ordering and maintenance

Ordering and modification

Ordering and modification

Defining the relay variant for ordering

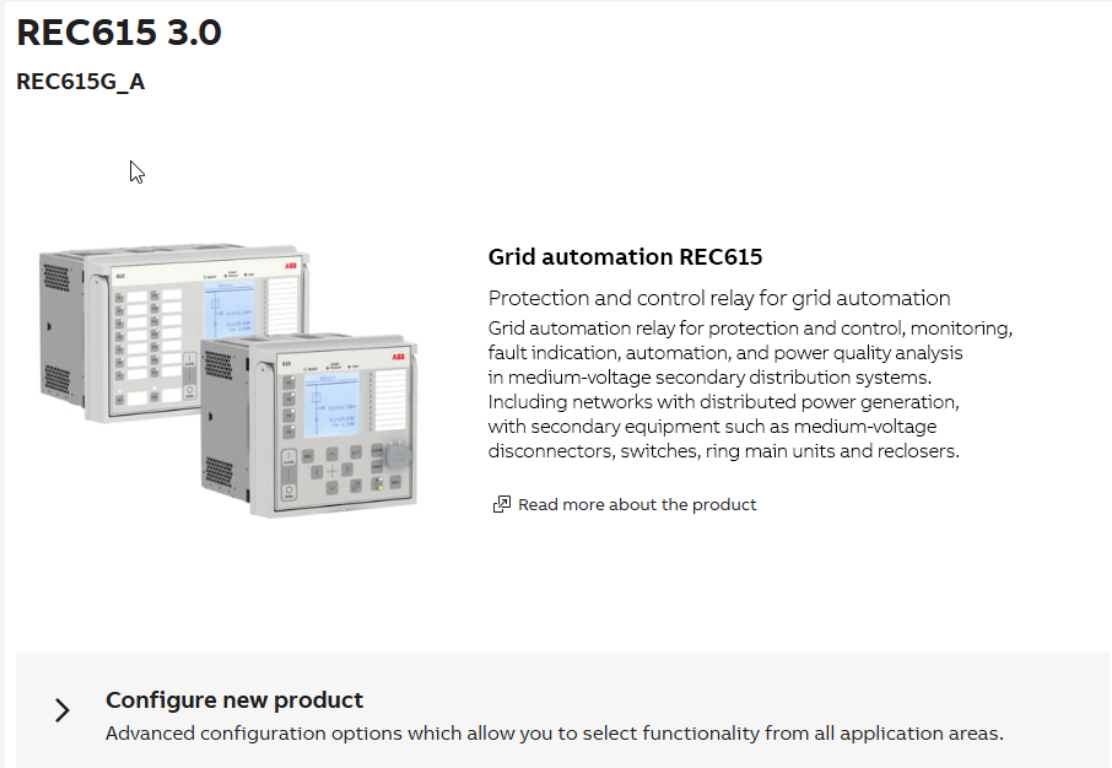
On ABB Relays-Online you can

- Create composition and ordering codes
- Place and follow orders
- Visit ABB Relays-Online to get started

In the product configurator you can select the relay's hardware and software:

- Select the required hardware and housing
- Select the required application package(s)
- Select other relay options

Select accessories



Ordering and modification

Ordering code structure, main code

The composition code for REC615 consists of two parts, a main code and option codes.

The main code looks like this - in red (example):

REC615A30GN+APP1+APP2+APP3+APP5+APP6+COM31+PSM4+BIO5+AIM17+SIM1+HMI1+CMP1+SCT1+PCL1

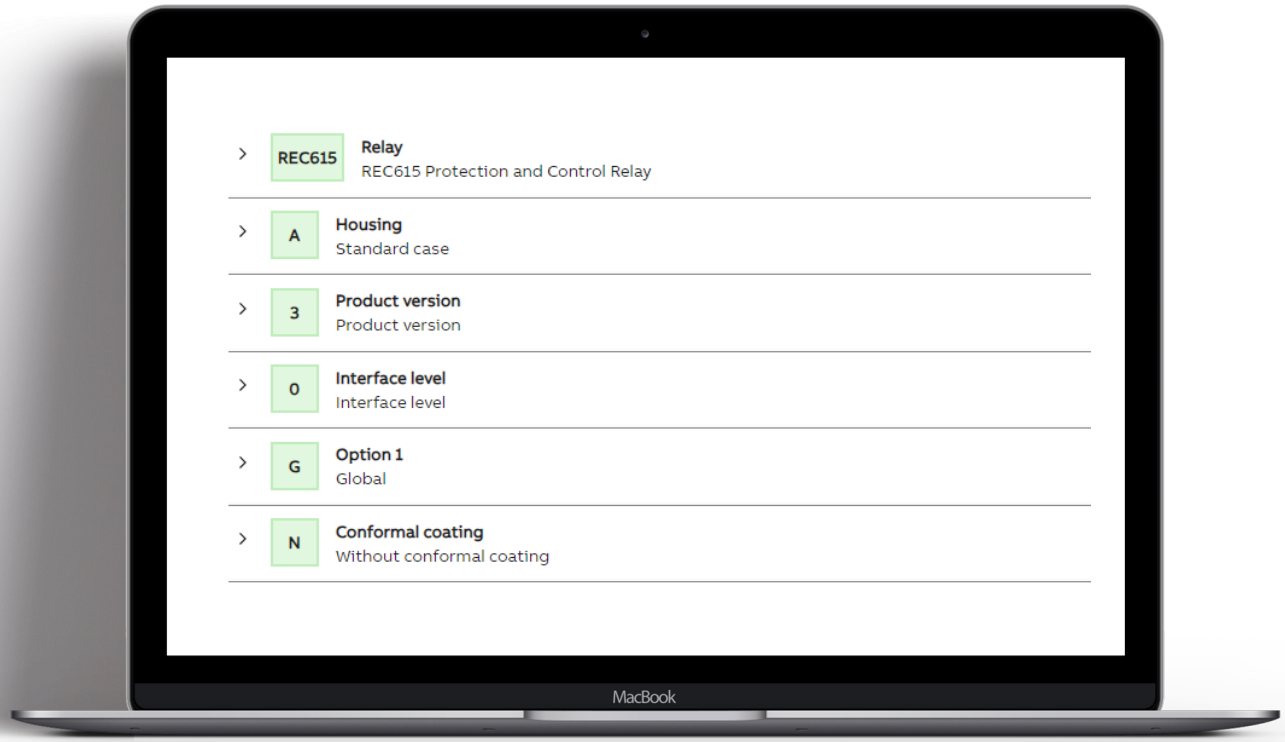


ABB Relays-Online – easy exploring, configuring and ordering

Ordering and modification

Ordering code structure, option codes

The composition code for REC615 consists of two parts, a main code and option codes.

The option codes look like this – in red (example):

REC615A30GN**+APP1+APP2+APP3+APP5+APP6+COM31+PSM4+BIO5+AIM17+SIM1+HMI1+CMP1+SCT1+PCL1**

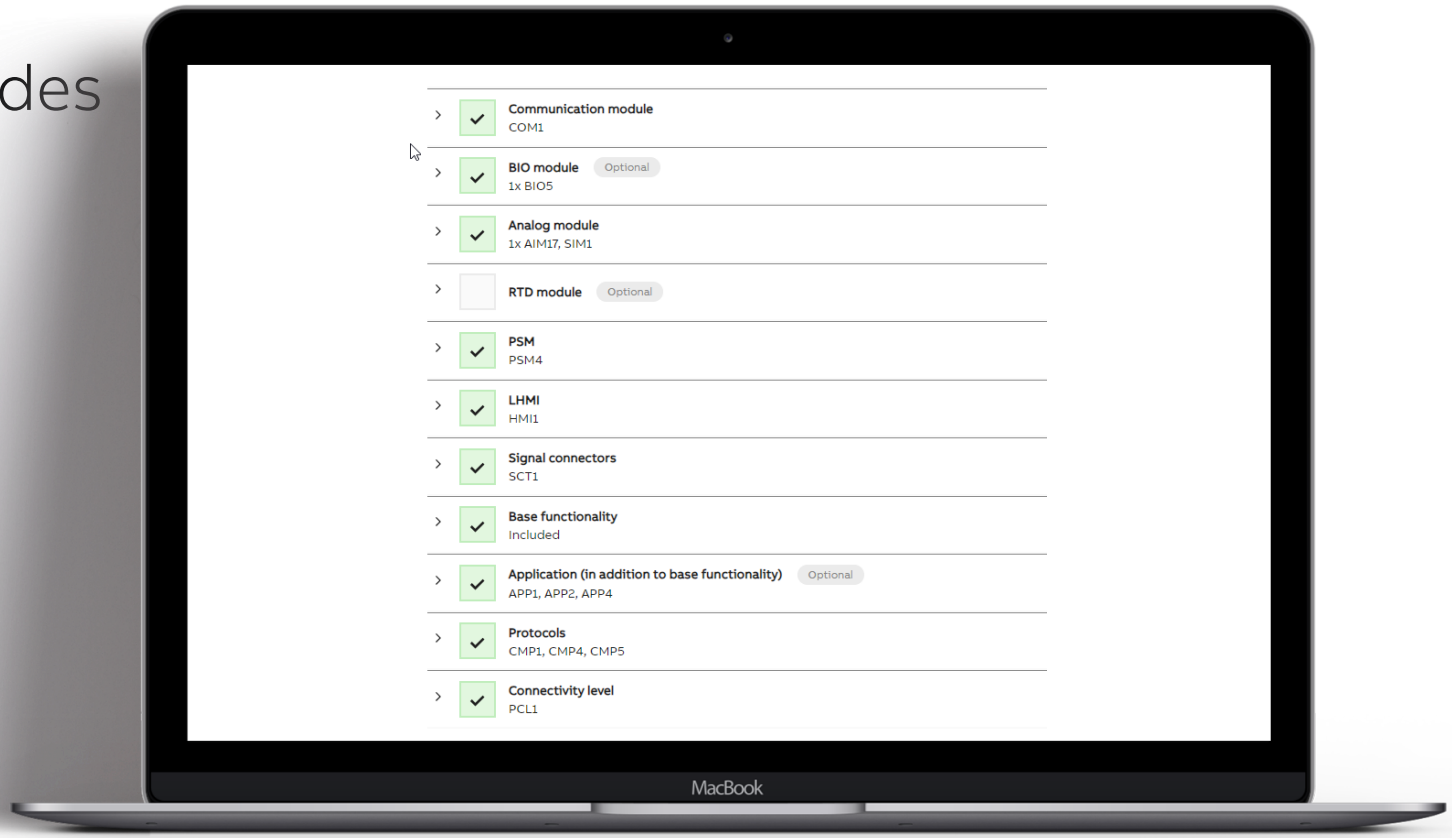


ABB Relays-Online – easy exploring, configuring and ordering

Ordering and modification

Modifying the delivered relay

REC615 hardware and software can be modified anytime – throughout the relay's entire life cycle:

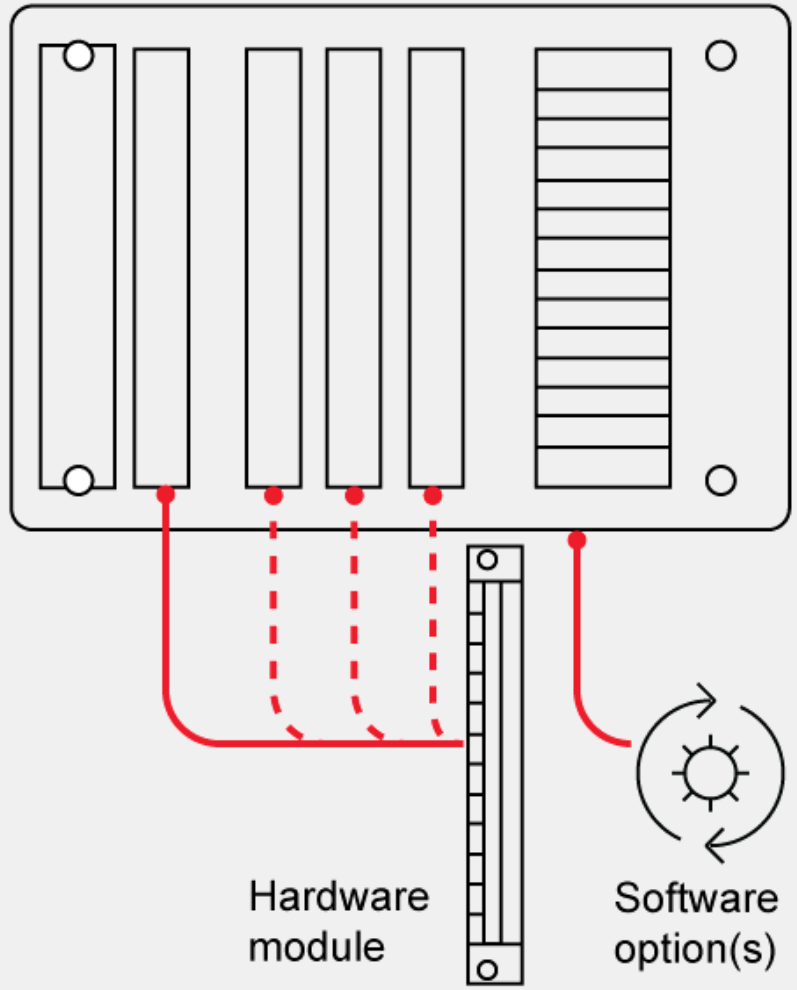
Software

- Adding application package(s)
- Adding communication protocol(s)

Hardware

- Adding a module, such as a binary input/output module to an empty slot
- Replacing a module, such as a communication module, with another variant

To modify your relay, go to ABB Relays-Online's Product configurator. Enter the serial number of the product you wish to modify and select the new application package(s), protocol(s) or hardware module(s). ABB Relays-Online will support you with making the order.



Easy maintenance

Fast and efficient modification and maintenance

- Upgrade with new application packages or communication protocols at any time
- Wide range of spare parts available for the lifetime of the relay
- Withdrawable plug-in unit for swift replacement, short meantime to repair and minimized costly downtime
- Quick an easy addition, removal and replacement of modules
- Easy access to firmware updates on the ABB Relays-Online platform

Replacing existing relays with REC615

For REC615 standard version replacements the hardware dimensions, modules and wiring connections remain the same.

IED templates, intended as guiding examples, facilitate engineering and are conveniently accessible via ABB’s relay setting and configuration tool PCM600.

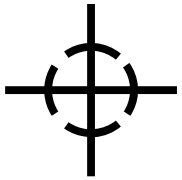
Its modular design combined with multiapplication coverage open up entirely new possibilities, making REC615 ready to evolve with the grid.

04

Key takeaways

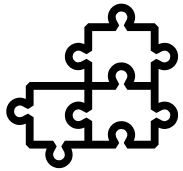
Grid automation REC615

Summary

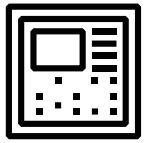


Wide application coverage with one freely configurable device for flexible and cost-effective tailoring to application-specific requirements

Ready-made application packages for convenient and smooth ordering



Easy and flexible adaptation to changing protection and communication requirements with fully modular hardware and software



Intuitive human-machine interface with a large graphical display for showing customizable single-line diagrams

Unique earth-fault protection portfolio for optimal selectivity, sensitivity and reliability – irrespective of type of network and fault

The next step for grid automation

Learn more about
Grid automation REC615

Web pages:

Grid automation campaign page

REC615 product page

Technical documentation (e.g. manuals)

Technical documentation portal


ABB