

ABB MEDIUM VOLTAGE PRODUCTS, DISTRIBUTION AUTOMATION

# Relion 615 series

Sales presentation

Speaker, position

# Agenda

Relion® 615 protection and control series

Main customer benefits

New features

New generator protection REG615

Common 615 series features

Feeder protection and control REF615

Line differential protection and control RED615

Motor protection and control REM615

Transformer protection and control RET615

ABB solutions

Conclusions

# Relion® 615 series

## Protection and control

### Products

- The 615 protection and control series of relays is a member of ABB's Relion® product family.
- The 615 series relays are characterized by their compactness and withdrawable plug-in unit design.





**Relion® 615 series**

**Main customer benefits**

# Relion® 615 series

## Protection and control

### Main customer benefits 1(5)

- Compact and versatile solution for utility and industrial power distribution systems with integration of protection, control, monitoring and supervision in one relay
- Wide application coverage – feeder, transformer, motor, line differential, voltage, capacitor bank as well as generator and interconnection protection and control
- Extensive protection and control functionality, either with sensors or conventional instrument transformers
- Withdrawable plug-in unit design for swift installation and testing
- Ready-made standard configurations for fast and easy setup with tailoring capabilities



# Relion® 615 series

## Protection and control

### Main customer benefits 2(5)

- 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





# Relion® 615 series

## Protection and control

### Main customer benefits 3(5)

- Extensive ground-fault protection portfolio with unique multifrequency admittance-based ground-fault protection, including integrated intermittent ground-fault protection, for higher sensitivity and selectivity based on a patented algorithm
  - "all-in-one" ground-fault protection
- Advanced and fast fault location of short circuits and ground faults
- Higher grid stability and reliability with advanced interconnection protection for monitoring distributed generation units, fulfilling the latest grid codes
- Green and high-tech choice for sensor-based applications in digital switchgears



# Relion® 615 series

## Protection and control

### Main customer benefits 4(5)

- Extensive generator protection with 100% stator ground-fault, generator differential protection and out-of-step protection
- Selective unit protection as phase-segregated two-end line differential protection, also ideal for use with an in-zone transformer
- Transformer differential protection supporting various transformer neutral grounding options





# Relion® 615 series

## Protection and control

### Main customer benefits 5(5)

- Part of the Relion® protection and control product family
- Extensive life cycle services:
  - Training, customer support, maintenance and modernization services
  - 12-year warranty
  - Global ABB sales coverage and support network





# Relion® 615 series


## New features

# Relion® 615 series

## Protection and control

### IEC 61850 Edition 2

- The 615 series relays support the IEC 61850 standard for communication and interoperability of substation automation devices according to Edition 2.
- Edition 2 offers the best possible interoperability for modern substations.
- Edition 1 is still supported as Edition 2 and Edition 1 are selectable modes during the engineering phase.
- Edition 2 offers:
  - Full relay functionality modelling for substation applications
  - Zero-loss Ethernet redundancy with HSR and PRP
  - Improved device mode handling for relay testing
  - Advanced and safe station control authority

**IEC 61850 Certificate Level A<sup>1</sup>**  
No. 74105701-OPE/INC 15-1136

**Issued to:**  
ABB Oy  
Medium Voltage Products  
Muutitie 2  
FI-65101 Vaasa  
Finland

**For the server product:**  
REF615 Protection and Control Relay  
Product version: 5.0 FP1  
Software version: 5.1  
Hardware version: G

The server product has not been shown to be non-conforming to:

**IEC 61850 Edition 2 Parts 6, 7-1, 7-2, 7-3, 7-4 and 8-1**

Communication networks and systems for power utility automation

The conformance test has been performed according to IEC 61850-10 Edition 2, the UCA International Users Group Edition 2 Server Test Procedures version 1.0 with TPCL<sup>2</sup> 1.0 with product's protocol, model and technical issue implementation conformance statements and the extra information for testing: "Protocol Implementation Conformance Statement for the IEC 61850 interface in 615 series - Revision H", "IEC 61850 Ed2 Model Implementation Conformance Statement (MICS) for 615 series - Revision B", "TISSUES Implementation Conformance Statement for the IEC61850 Ed2 interface in 615 series - Revision B" and "Protocol Implementation extra Information for Testing (PIXIT) for the IEC 61850 interface in 615 series - Revision L".


The following IEC 61850 conformance blocks have been tested with a positive result (number of relevant and executed test cases / total number of test cases):


1 Basic Exchange (20/26)	9a GOOSE Publish (11/13)
2 Data Sets (4/7)	9b GOOSE Subscribe (12/14)
4 Setting Group Selection (4/4)	12a Direct Control (6/18)
4+ Setting Group Definition (11/13)	12d Enhanced SBO Control (14/28)
5 Unbuffered Reporting (16/20)	13 Time Synchronization (6/7)
6 Buffered Reporting (23/29)	14 File Transfer (7/8)


This certificate includes a summary of the test results as carried out at ABB Oy in Finland with Unica 61850 Client simulator 4.29.03 with test suite Ed2 3.29.02 and Unica 61850 Analyzer 5.28.03. This document has been issued for information purposes only, and the original paper copy of the DNV GL report No. 74105701-OPE/INC 15-1135 will prevail.

The test has been carried out on one single specimen of the product as referred above and submitted to DNV GL by ABB Oy. The manufacturer's production process has not been assessed. This certificate does not imply that DNV GL has approved any product other than the specimen tested.

Arnhem, April 23, 2015

**M. Adriaens**  
Head of Department  
Operational Excellence

**Issued by:**  
  
DNV GL  
DNV KEMA is now DNV GL

**R. Schimmel**  
Certification Manager

<sup>1</sup> Level A - Independent test lab with certified ISO 9001 Quality System  
<sup>2</sup> TPCL - Test procedures change list

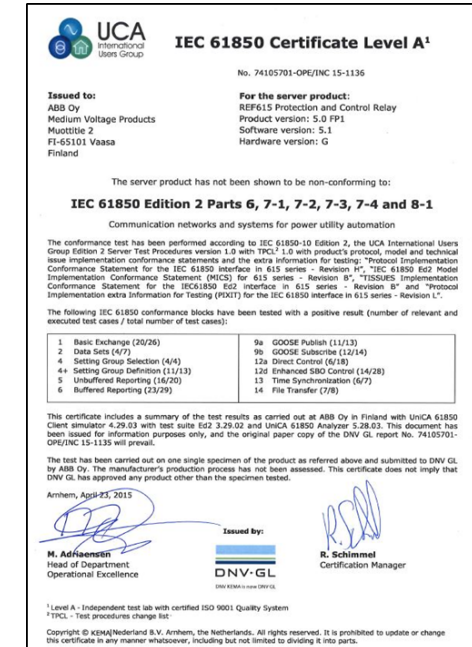
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# Relion® 615 series

## Protection and control

### IEC 61850 conformance

- IEC 61850 Certificate Level A1
- IEC 61850 Edition 2 Parts 6, 7-1, 7-2, 7-3, 7-4 and 8-1
  - Communication networks and systems in substations
- IEC 61850 First Edition Parts 6, 7-1, 7-2, 7-3, 7-4 and 8-1
  - Communication networks and systems in substations
- Complete 615 series IEC 61850 conformance by DNV-GL



# Relion® 615 series

## Protection and control

### Multifrequency admittance-based G/F protection 1(3)

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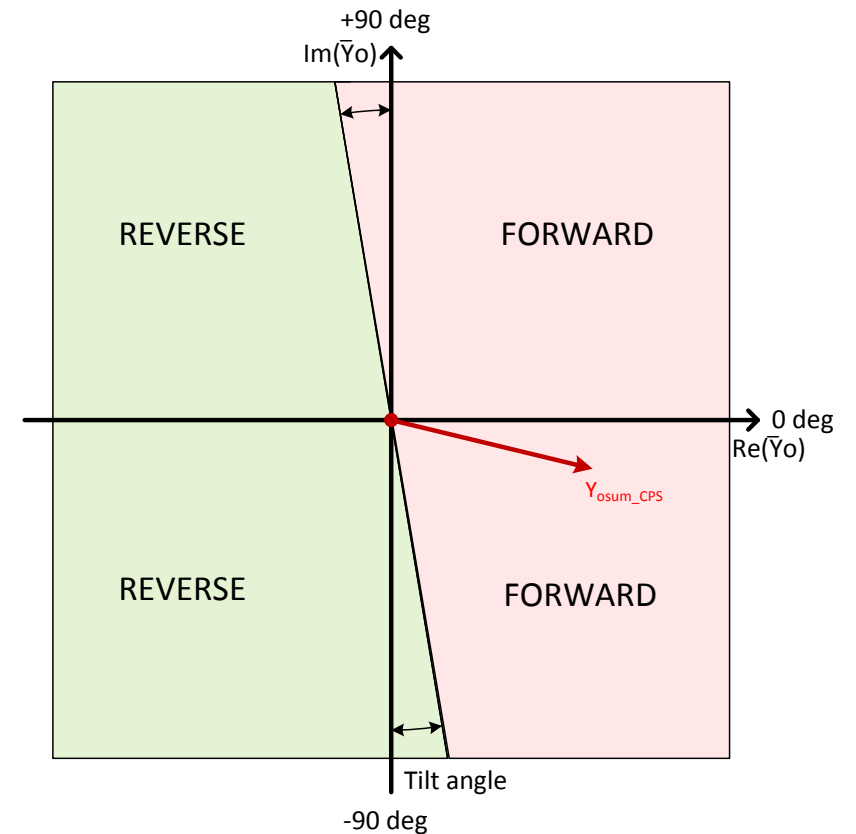
- Provides selective directional ground-fault protection for high-impedance grounded networks
- Operation based on multi-frequency neutral admittance measurement utilizing fundamental frequency and harmonic components in the residual voltage and current
- Special filtering algorithm enables reliable and secure fault direction also during intermittent ground faults
- Provides both reliability and sensitivity combined in one single protection function:
  - Low ohmic and higher ohmic ground faults
  - Continuous, transient and intermittent ground faults
- Easy implementation of protection scheme since dedicating different fault types to separate ground-fault protection functions and coordinating them is not necessarily required

# Relion® 615 series

## Protection and control

### Multifrequency admittance-based G/F protection 2(3)

- Easy setting principles based on basic network data
- Operation characteristic valid both in compensated and ungrounded networks
- Fault direction indication both in operate direction and non-operate direction
  - Can be used during the fault location process
- Integrated transient detector to identify intermittent ground faults and distinguish them from permanent faults





# Relion® 615 series

## Protection and control

### Multifrequency admittance-based G/F protection 3(3)

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- Three operation modes:
  - General ground fault - for all types of ground faults
  - Intermittent ground fault
  - Alarming ground fault – for minimizing the number of events during the fault localization process
- The residual current is recommended to be measured with a cable/ring core CT.
  - Setting values available for calculated/measured residual current and voltages
- Included in REF615, standard configurations L, and N

# Relion® 615 series

## Protection and control

### Process bus with sampled values of currents and voltages

- The relay can act as a merging unit and measure currents and voltages in the substation and send them as Sampled Measured Values (SMV) over Ethernet.
- Other relays in the substation having phase voltage-based functions can receive the SMVs over Ethernet and use them for the following purposes:
  - Instead of physically (VT or voltage sensor) measured phase voltages
- For synchro-check
- For voltage remanent protection
- The SMVs are transferred using the IEC 61850-9-2 LE (light edition) protocol.
- The relay uses IEEE 1588 V2 Precision Time Protocol (PTP) with Power Profile for high-accuracy time synchronization.

### Benefits

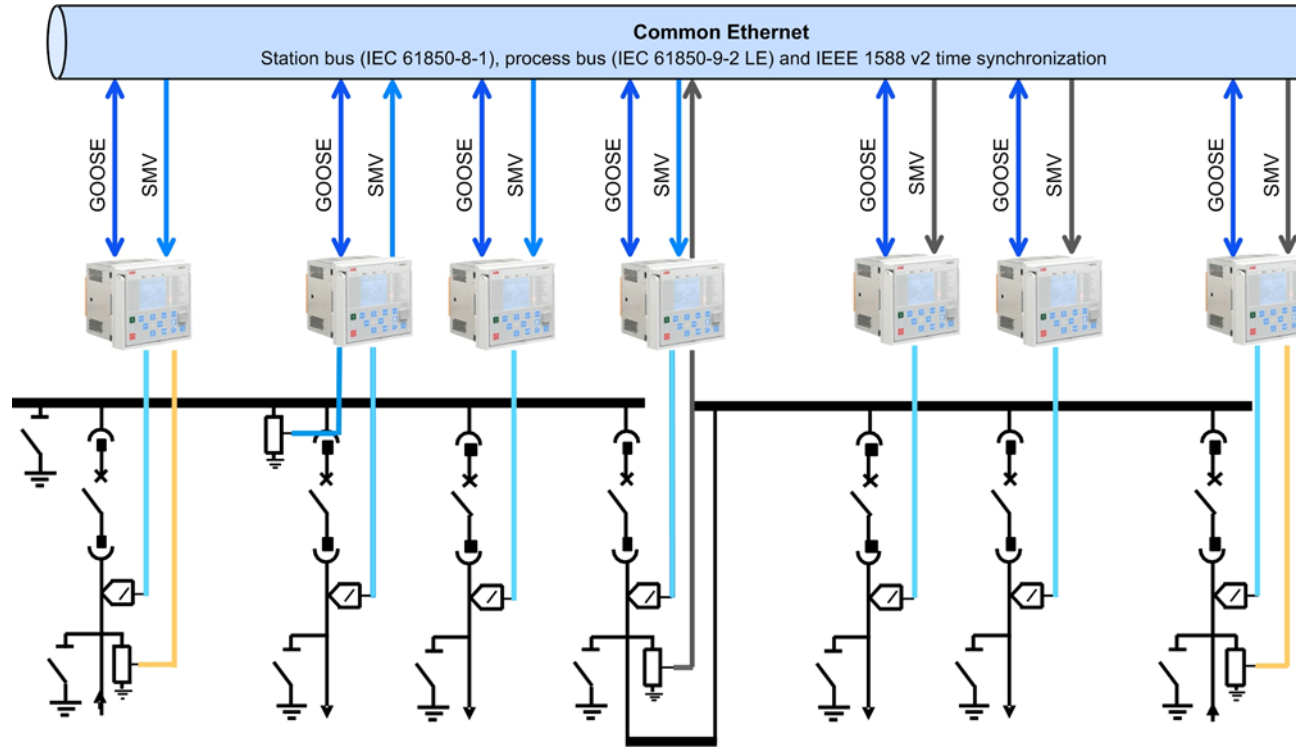
- Simplicity (reduces wiring and terminals)
- Flexibility
- Improved diagnostics
- Longer maintenance cycles



# Relion® 615 series

## Protection and control

System example of  
utilizing process bus



# Relion® 615 series

Protection and control

## Other functional enhancements 1(3)

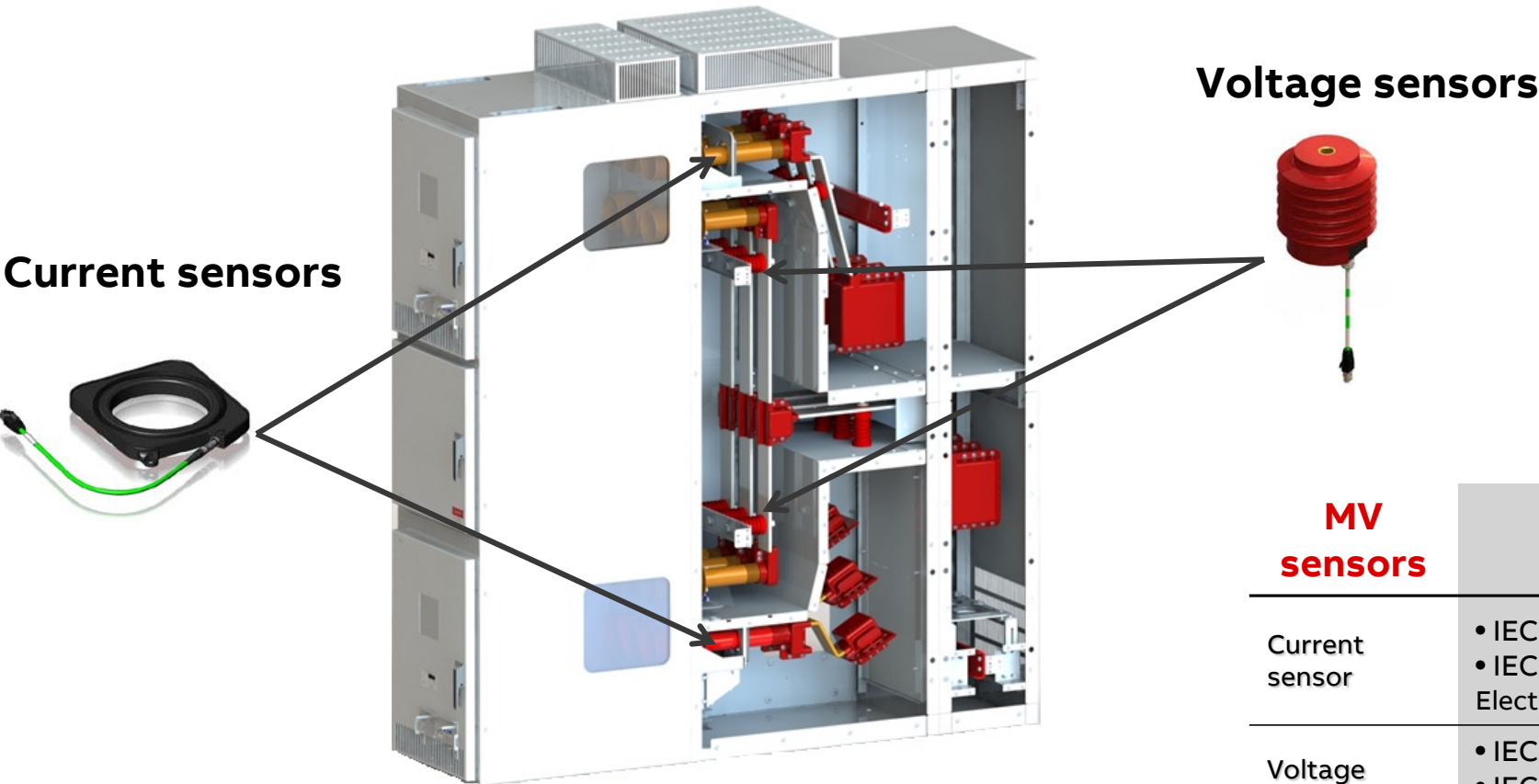
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- IEC 61850-9-2 LE support for sending sampled values of currents
- Synchronism and energizing check with IEC 61850-9-2 LE and sensors
- Report summary via WHMI and other enhancements
- Possibility to disable rear Ethernet ports using setting parameters
- Voltage unbalance added to the power quality option
- More timer, set-reset and analog value scaling function instances added



# Relion® 615 series

Current and Voltage Sensors



Supports the KECA and KEVA sensors

MV sensors	Standards
Current sensor	<ul style="list-style-type: none"><li>• IEC 60044-8 (2002)</li><li>• IEC 61869-10 (NEW)</li></ul> Electronic current transformers
Voltage sensor	<ul style="list-style-type: none"><li>• IEC 60044-7 (1999)</li><li>• IEC 61869-11 (NEW)</li></ul> Electronic voltage transformers

# Relion® 615 series

Current sensors are safer than conventional CTs

## Current Sensors

Rogowski coil sensor

- $U_s=150$  mV for 50 Hz
- $U_s=180$  mV for 60 Hz

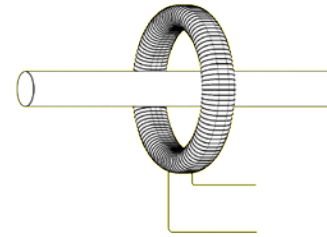
Proven technology which brings many benefits in various applications

Output voltage is proportional to the derivative of primary current

Output voltage is integrated by IED

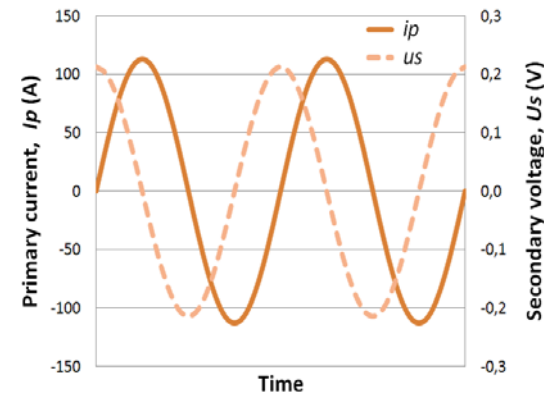
Accuracy up to class 0.5

Complies with IEC 60044-8



**No Saturation!  
(air core)**

$$u_s(t) = M \frac{di_p(t)}{dt}$$

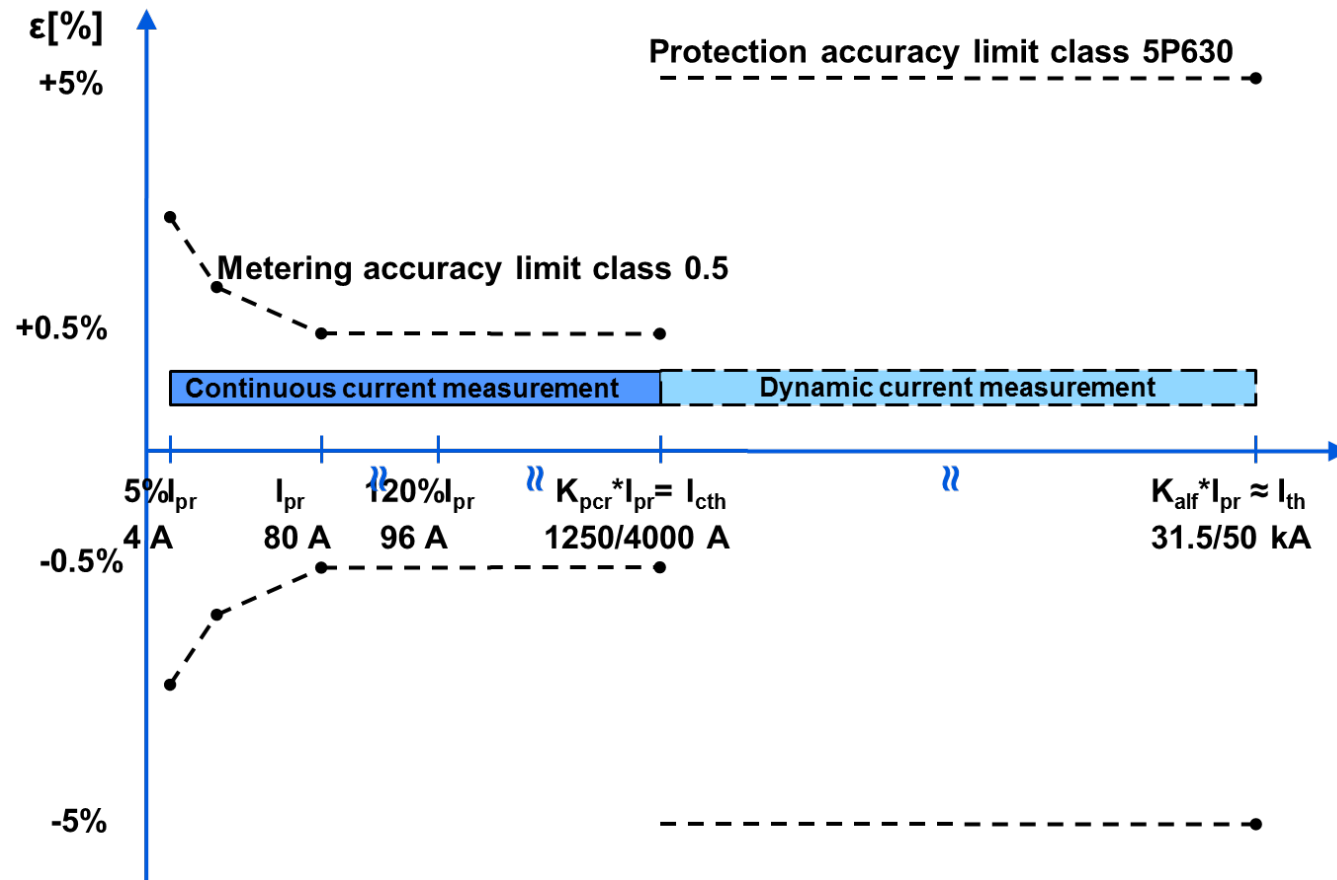


**Open CT  
hazard  
eliminated**



# Relion® 615 series

Current sensors - Combined accuracy class 0.5/5P630



# Relion® 615 series

Voltage sensors are safer than conventional VTs

## Voltage Sensors

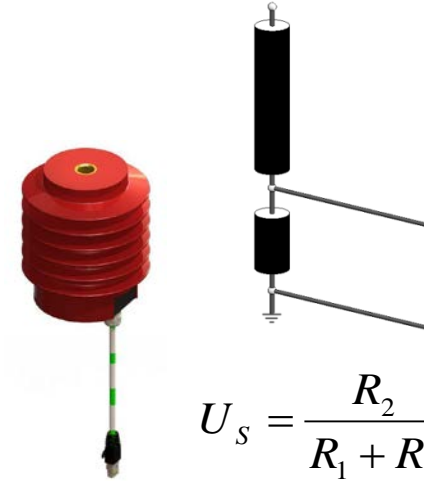
Resistive voltage divider sensor

10,000:1 transformation ratio

Accuracy up to class 0.5

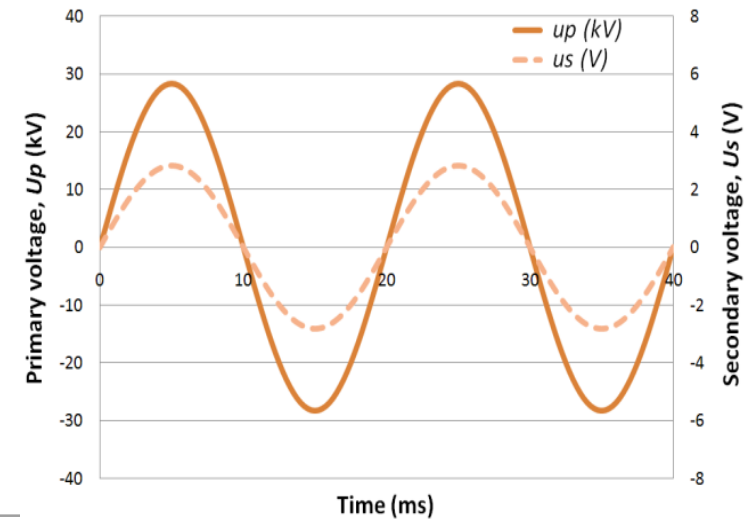
Passive element

Complies with IEC 60044-7



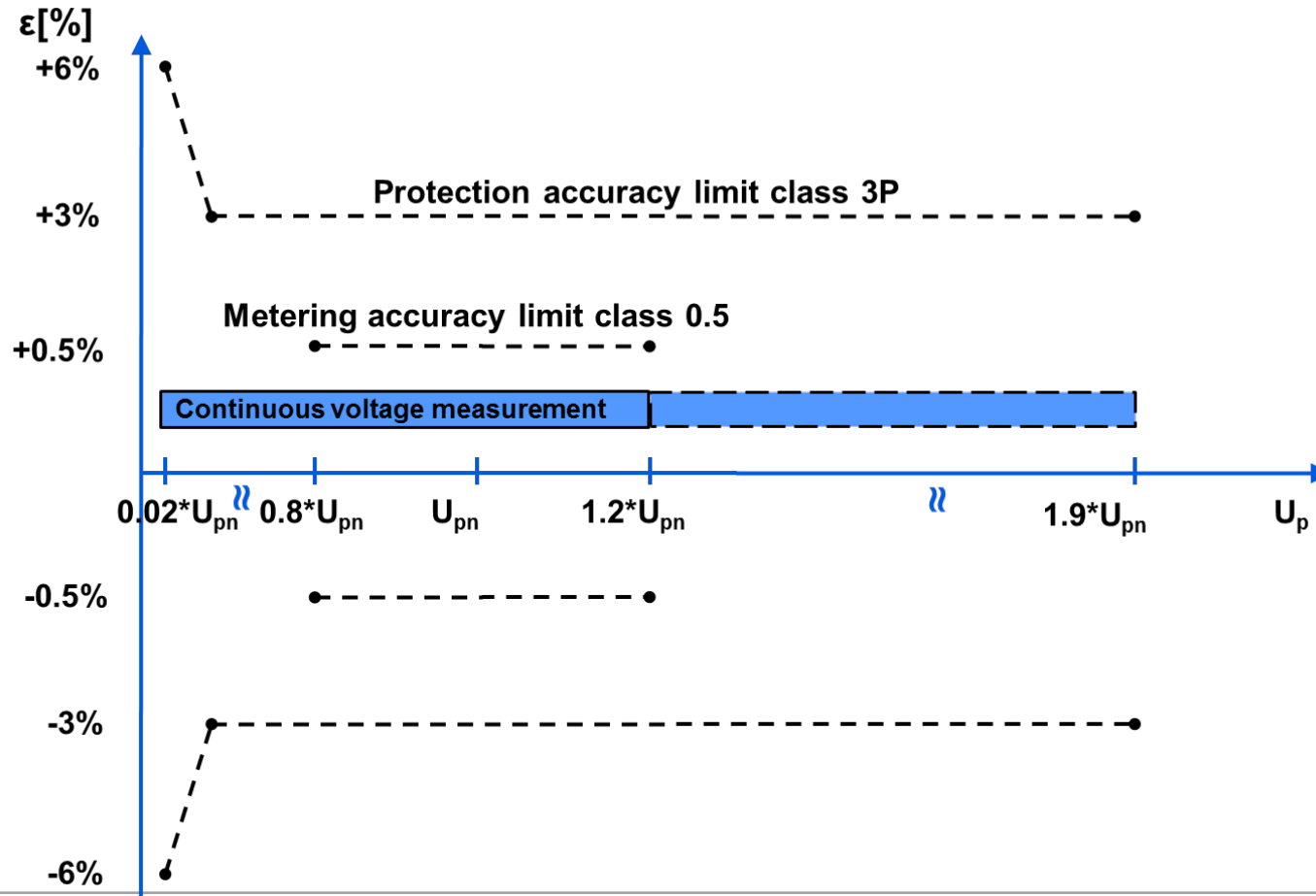
**No Ferroresonance!  
(non-inductive)**

$$U_s = \frac{R_2}{R_1 + R_2} U_P$$



# Relion® 615 series

Voltage dividers - Combined accuracy class 0.5/3P



# Relion® 615 series

## Protection and control

### Other functional enhancements 2(3)

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- RED615 (new application)
  - Standard configuration E supports Current and Voltage sensors
  - HSR and PRP-1 with fiber-optic redundant Ethernet
  - IEC 61850-9-2 LE and IEEE 1588 V2 with fiber-optic redundant Ethernet
- REF615 standard configurations L and N
  - Optional interconnection protection functions
  - Reverse power/directional overpower
  - Voltage remanent protection 27R
  - Standard configuration L for Current and Voltage sensors
  - Standard configuration N can alternatively be used for high-impedance based differential protection
- REF615 standard configuration P
  - Optional configuration for transfer schemes with 27R protection


# Relion® 615 series

## Protection and control

### Other functional enhancements 3(3)

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- RET615
  - Low impedance restricted ground-fault protection for low voltage side of the transformer only
  - Standard configuration F
    - Add overexcitation 24, directional elements 67P/67N, and frequency elements 81
    - Syncrocheck control
- REM615
  - Standard configuration D with Current and Voltage sensors
  - Standard configuration E with motor differential protection (Self-balancing and Restrained)
  - Voltage remanent protection 27R added to configuration B and D



# New generator protection

## REG615



# REG615

## Generator protection

### Compact generator protection

- REG615 is a dedicated generator protection relay designed for protection, control, measurement and supervision of power generators in utility and industrial power distribution systems.

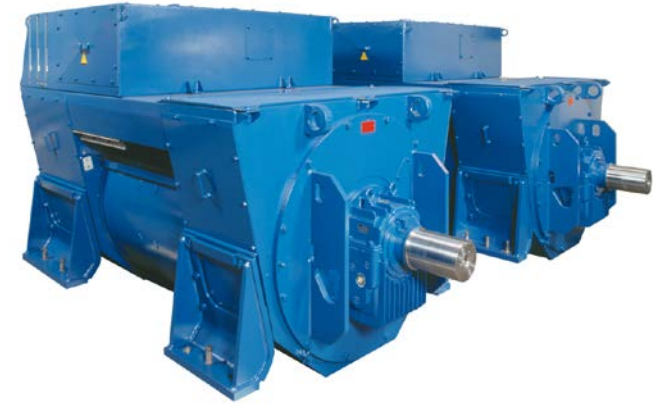


# REG615

## Generator protection

### Generator protection (standard configurations C and D)

- Main protection for small synchronous power generators, offering full protection during start-up and normal run for both the generator and the prime mover
- Backup protection for medium-sized generators in applications where an independent and redundant protection system is required
- Main application area: small and medium-sized diesel, gas, hydroelectric, combined heat and power (CHP), and steam power plants



# REG615

## Generator protection

### Standard configurations

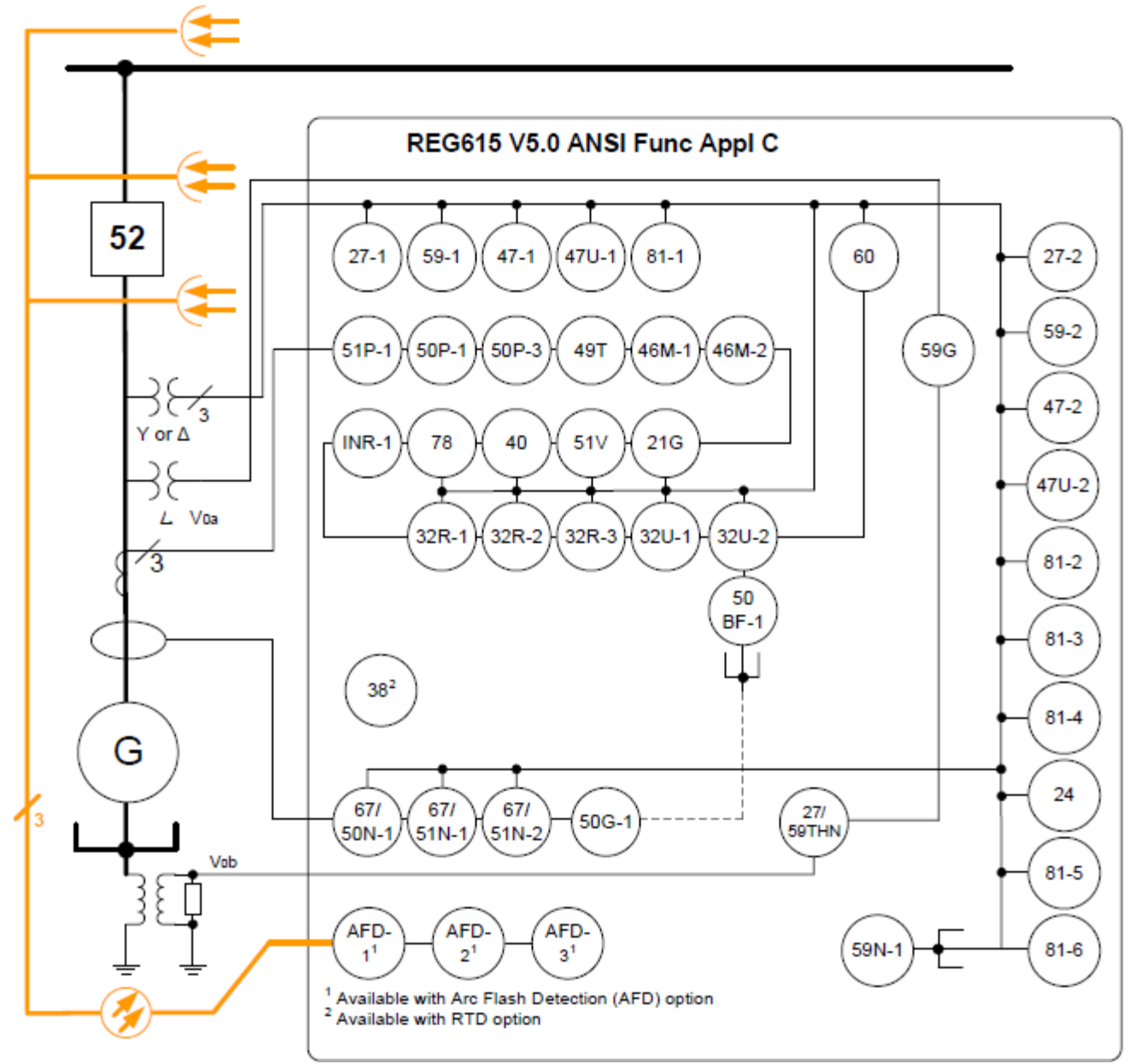
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- Standard configuration C – Generator protection with 100% stator ground-fault protection
  - Other main features are reverse power and directional overpower, out-of-step, underimpedance, overexcitation and underexcitation protection
  - 4CT + 5VT, and up to 16 BI / 10 BO
- Standard configuration D – Generator protection with generator differential and directional overcurrent protection and synchro-check
  - Other main features are reverse power and directional overpower, out-of-step, overexcitation and underexcitation protection
  - 7CT + 5VT, and up to 12 BI / 10 BO

# REG615

## Generator and interconnection protection

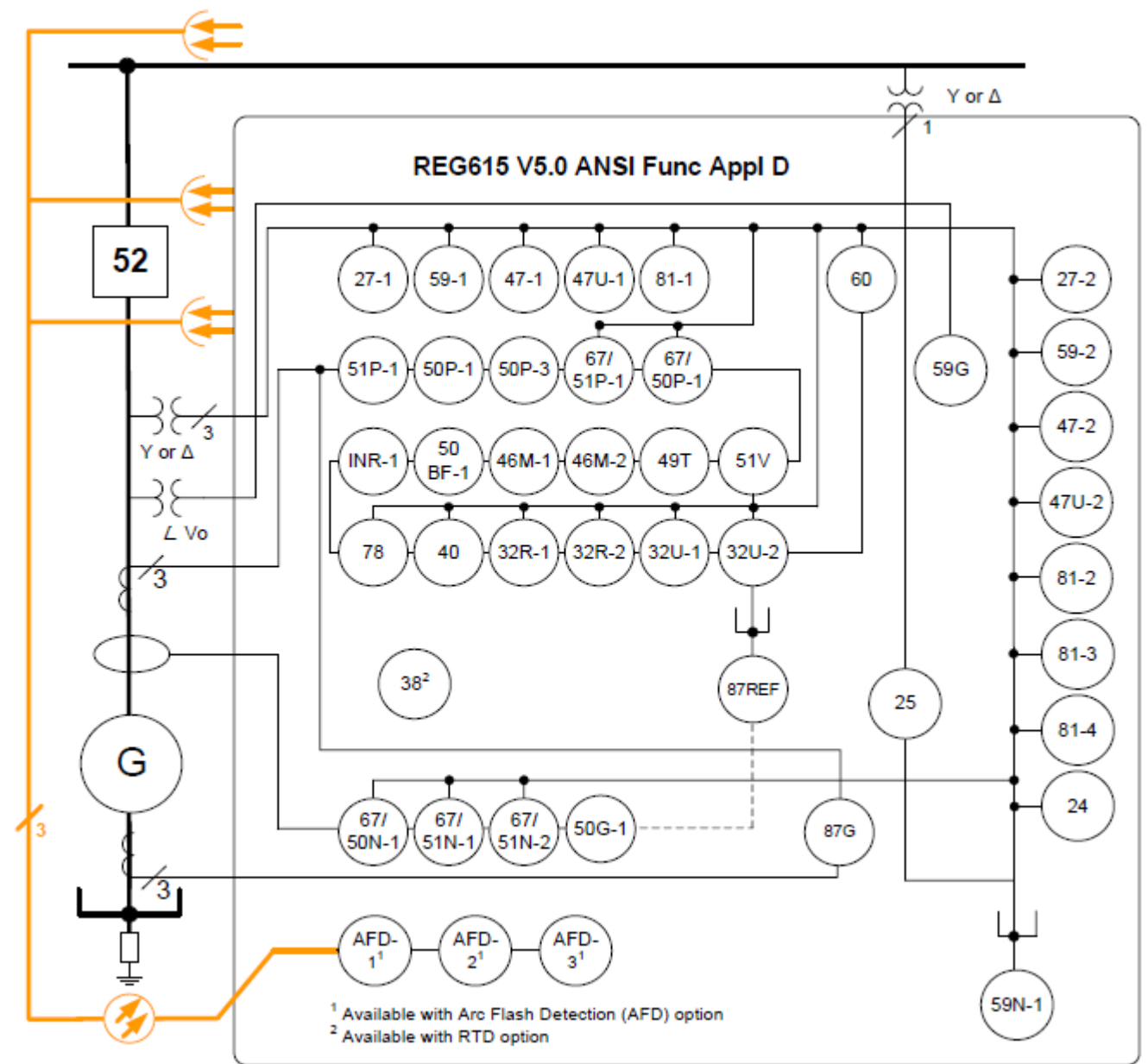
Functionality  
overview for  
standard  
configuration C



# REG615

## Generator and interconnection protection

Functionality  
overview for  
standard  
configuration D

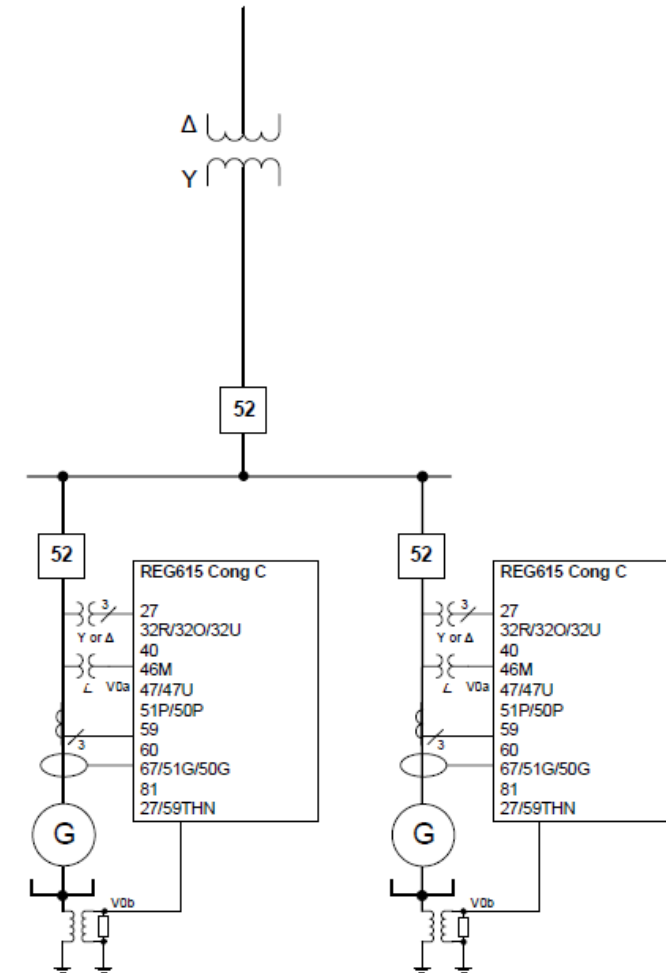


# REG615

## Generator protection

### Application example 1

- Diesel/gas generators connected in parallel with a common step-up transformer using standard configuration C
- Several generator units connected in parallel
  - Individually high-resistance grounded units
  - Small ground-fault current: typically 3...5 A
- Standard configuration C includes overcurrent (including voltage-dependent) and frequency, voltage and power-based protection, as well as residual current-based ground-fault protection for the generator. In addition, underexcitation and thermal overload protection are used.





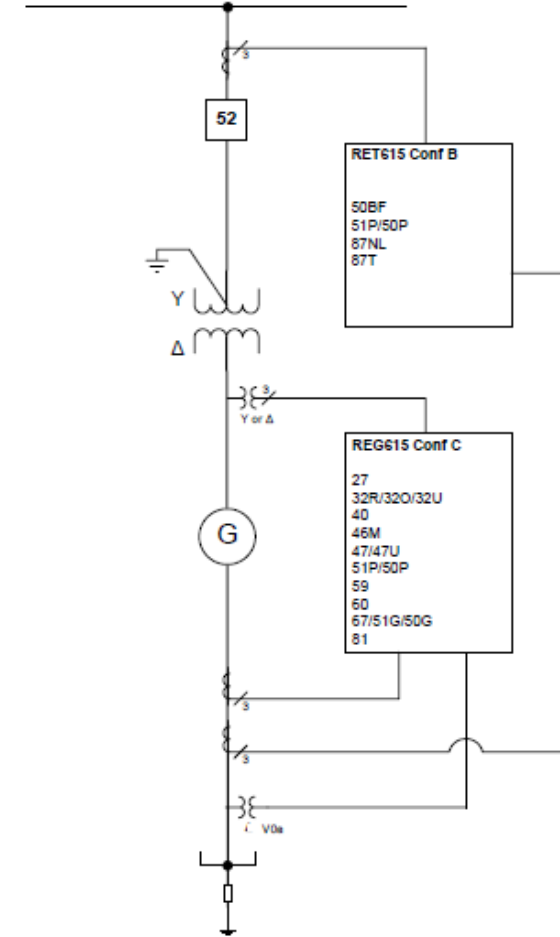


# REG615

## Generator protection

### Application example 3

- Generator in block connection with a transformer using standard configuration C and RET615 transformer differential protection relay
  - One single-phase voltage transformer connected to the generator neutral for residual overvoltage protection
  - Phase-to-ground voltages connected to the generator protection relay on the terminal side
- Standard configuration C includes overcurrent (including voltage-dependent), under-impedance and frequency, voltage and power-based protection, as well as residual overvoltage-based ground-fault protection for the generator. In addition, under- and overexcitation protection are used.





# **Relion® 615 series**

## **Common features**

# Relion® 615 series

## Protection and control

### Designed for IEC 61850

- Native support for IEC 61850 communication
- Selectable Edition 2/Edition 1 modes
- IEC 61850 enables horizontal communication between substation devices:
  - Binary and analog GOOSE
  - Sampled values over process bus
- The 615 series relays can simultaneously report events to five different clients on the station bus.
- Optional optical or galvanic redundant Ethernet solution (only optical in RED615)
- The 615 series relays support the following protocols that can be used in parallel with IEC 61850:
  - Modbus TCP/IP and RTU/ASCII
  - DNP3 TCP/IP and serial

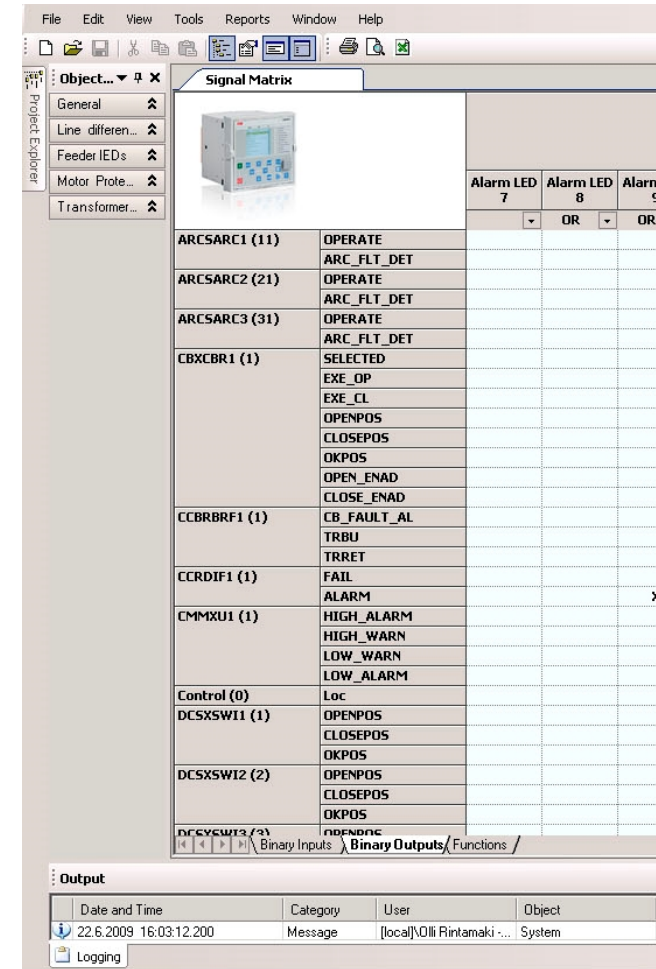


# Relion® 615 series

## Protection and control

### Standard conf. for rapid installation and commissioning

- Ready-made adaptations (standard configurations)
- Adjusting of standard signal configuration settings possible with the setting and configuration tool PCM600
- Rapid installation and commissioning after tailoring according to application-specific requirements



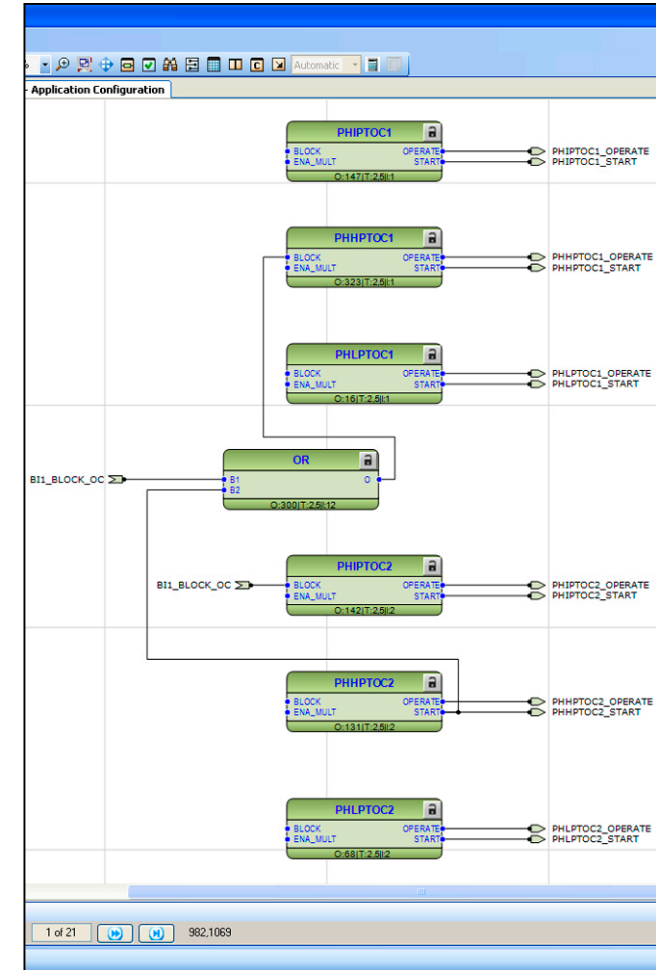
# Relion® 615 series

## Protection and control

### Application-specific tailoring of standard configurations

- The support for the graphical application configuration (ACT) functionality in PCM600 enables the creation of multi-layer logics.
- By combining protection functionality with logical elements, the relay configuration can be adapted to user-specific application requirements.
- The ACT support offers improved documentation of the standard configuration when altered.

**Note!** The utilization of the analog channels is defined by the standard configuration and cannot be changed using ACT.



# Relion® 615 series

## Protection and control

### Control of primary devices with dedicated push-buttons

- Control of primary devices via the relay's human-machine interface (HMI) or a remote control system
- Forcing of local/remote switch to local position via a binary input prohibits remote control during, for example, maintenance, with increased safety on site as a result.
- Interlocking schemes
- Optional multishot auto-reclosing of one CB



# Relion® 615 series

## Protection and control

### Patented and compact plug-in unit design

- Speeds up installation, maintenance and testing of the protection
- Shortened MTTR (mean time to repair) due to the plug-in unit design and modularity (with spare modules/units in stock)
- Allows the cases to be installed and wired before the plug-in units are 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) withdrawal of the plug-in unit



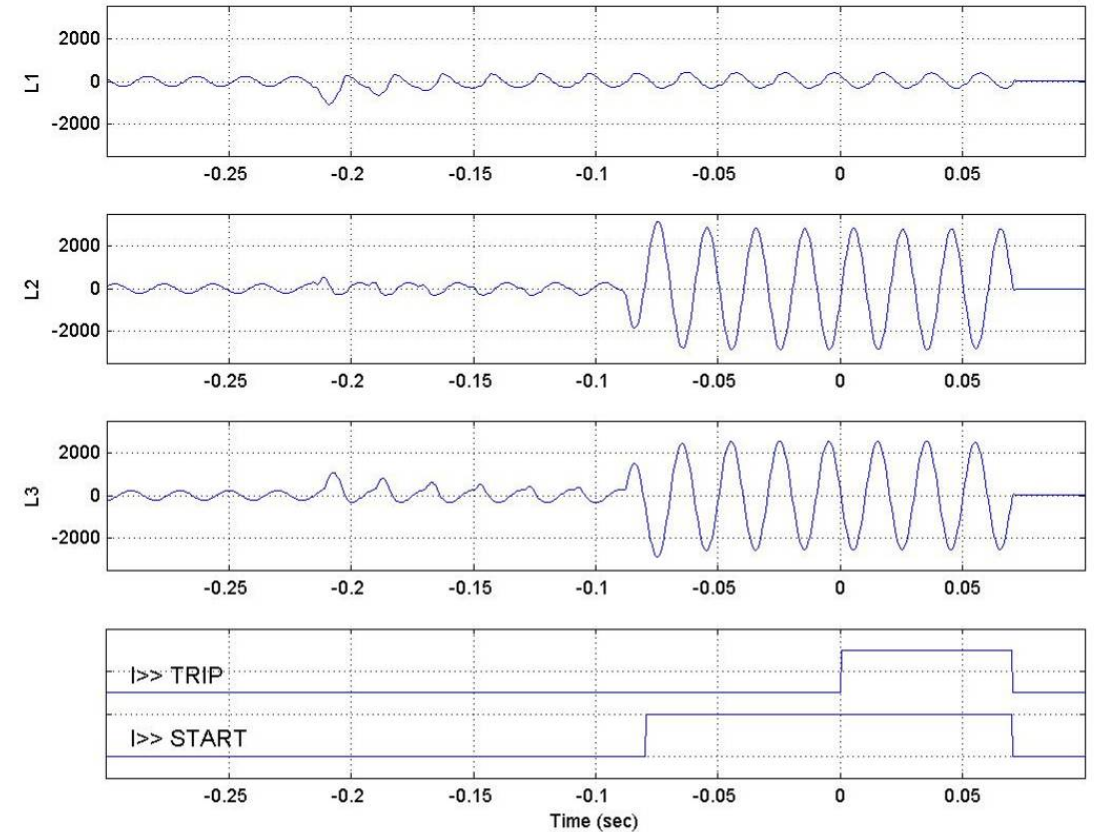


# Relion® 615 series

## Protection and control

### Disturbance recorder for in-depth analysis

- Up to 100 recordings can be recorded
- Flexible setting of sampling rate and channels enables maximizing the recording of user-relevant data
- Example:
  - 40 recordings of 500 ms with the highest sampling rate and maximum number of channels



# Relion® 615 series

## Protection and control

### Operation traceability for pre and post-fault analysis

- Critical data stored in the non-volatile memory to prevent loss of data in case of a power failure:
  - Disturbance recorder data
  - Events including time stamps
  - User audit trail
  - Recorded data
  - Circuit-breaker conditioning monitoring values
  - Thermal loading level
  - Operation indications and alarm LEDs show the status of the relay
  - Trip lock-out
  - Relay setting values
  - Relay configuration



# Relion® 615 series

Condition monitoring for ensured protection availability

## Condition monitoring for ensured protection availability

- Circuit-breaker condition monitoring provides information for scheduling CB maintenance.
- Runtime counter for machines and devices enables scheduling of time-based maintenance of the motor or transformer.
- Continuous supervision of the state of the relay hardware and software ensures operational availability of the protection.



# Relion® 615 series

## Protection and control

### Authorized relay access control

- Individual user accounts with role-based access control protects the relay from unauthorized access.
- Four access levels: viewer, operator, engineer and administrator
- Applies to:
  - Front-panel user interface
  - Web browser-based user interface
  - PCM600
- Passwords programmable by the administrator

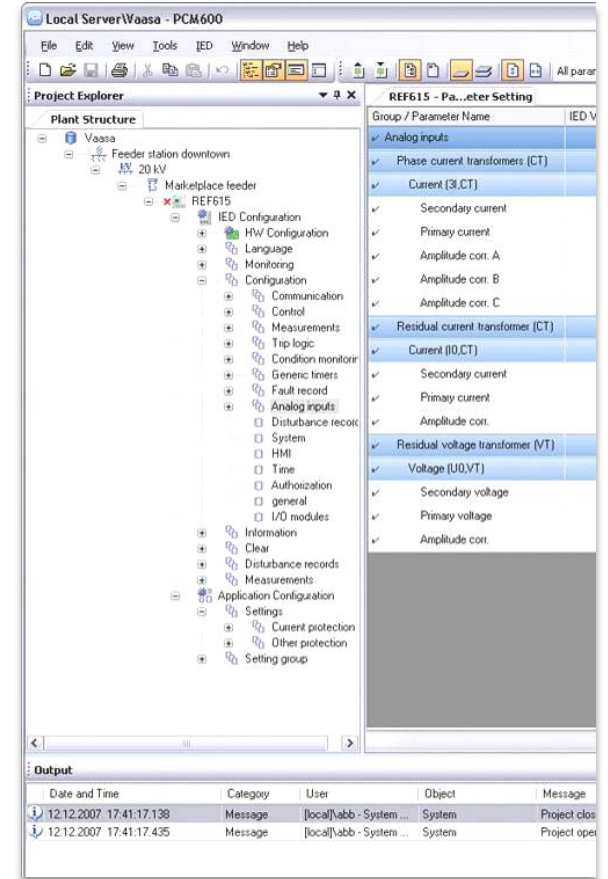


# Relion® 615 series

## Protection and control

### Versatile tools supporting engineering and operation

- PCM600
  - One single tool for managing settings, signal configuration and disturbance handling
- Web browser-based user interface
  - Local or remote relay access using a web browser
  - Internet Explorer versions 8.0, 9.0, 10.0 and 11.0 are verified
- Relay-specific connectivity packages
  - For automatic configuration via MicroSCADA Pro SYS600, Substation Management Unit COM600 or PCM600
- Substation Management Unit COM600
- MicroSCADA Pro
- PCM600 2.6 (with Rollup 20150626) or later

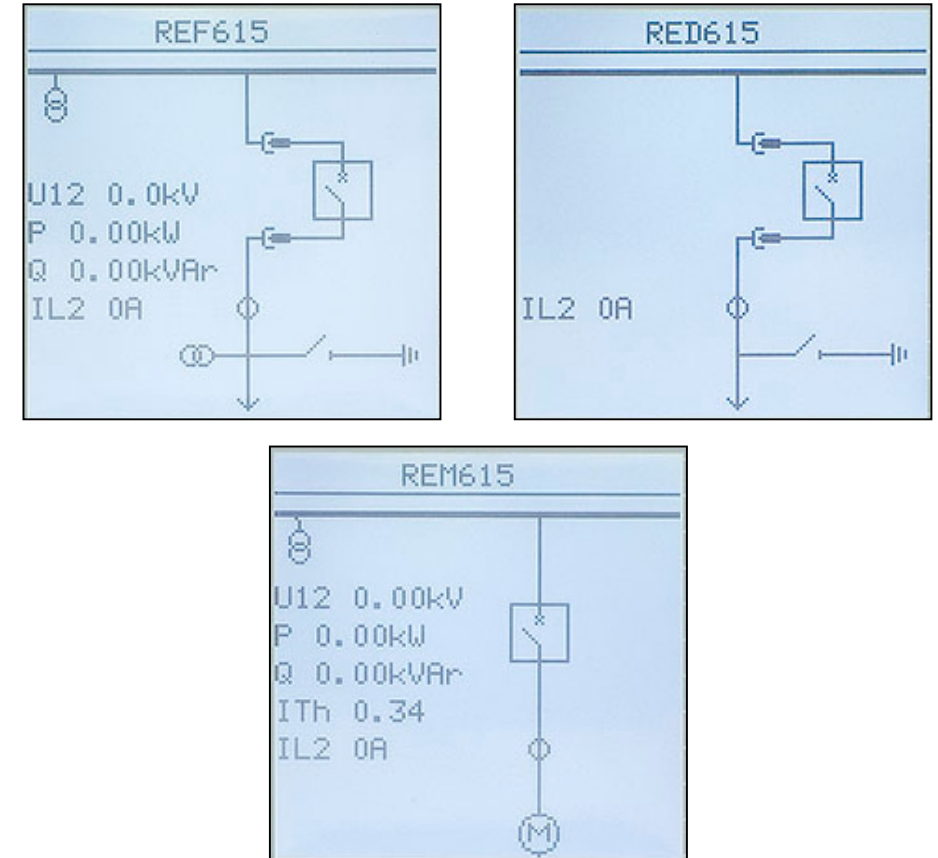


# Relion® 615 series

## Protection and control

### Single-line diagrams (SLD) for bay-level overview

- Pre-defined multipage SLD for fast commissioning of the relay
- Position indication for associated primary equipment
- Shows related measuring values
- Independent of role-based access control
- Optional local/remote access using web browser-based HMI
- Customizable according to user requirements

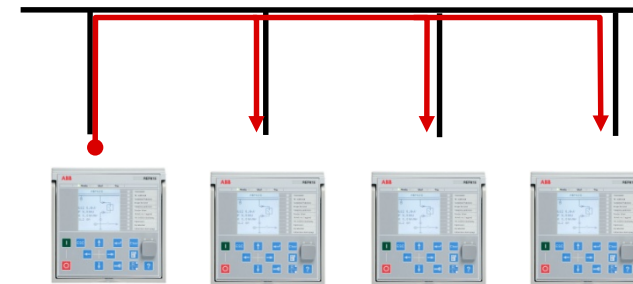
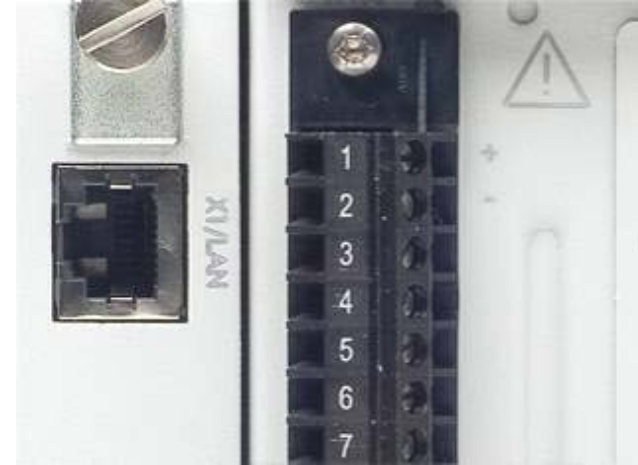


# Relion® 615 series

## Protection and control

### IEC 61850 communication with analog GOOSE messaging

- IEC 61850 GOOSE messaging enables fast transfer of analog values between relays.
- Measured values can be shared over the station bus.
- Analog GOOSE messaging can, for example, be employed for control schemes of parallel running transformers, thus saving on hardwiring costs.
- By sharing measured values, the need for separate transducers for values such as ambient temperature is reduced.





# Relion® 615 series

## Protection and control

### Thermal overload protection with RTD/mA measuring

- Prevents premature aging of the motor or transformer and reducing the risk of costly thermal overload failures
- Contributes to an optimal life span of the motor or transformer
- Measurements:
  - Motor bearing temperature
  - Stator winding temperature
  - Oli temperature
  - Ambient temperature
  - Pressure
  - Tap-changer position



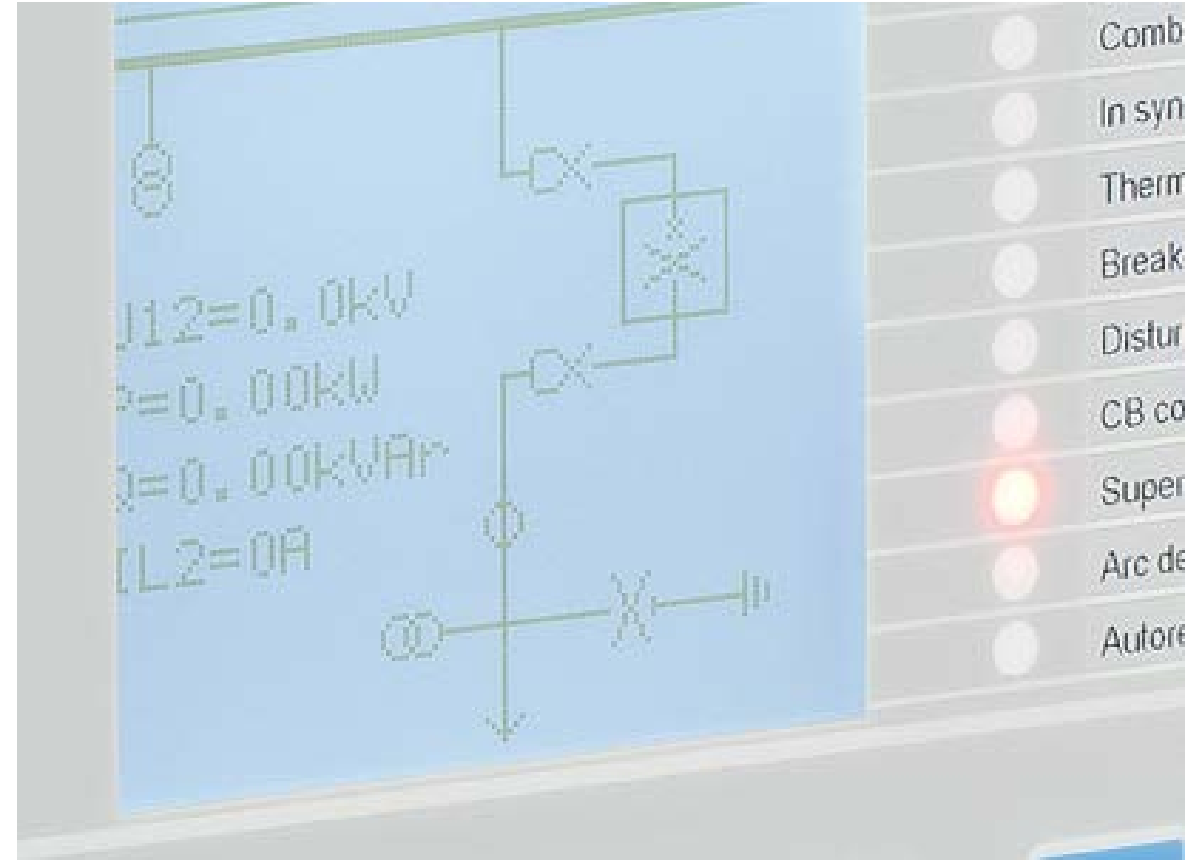


# Relion® 615 series

## Protection and control

### Extended control of primary network devices

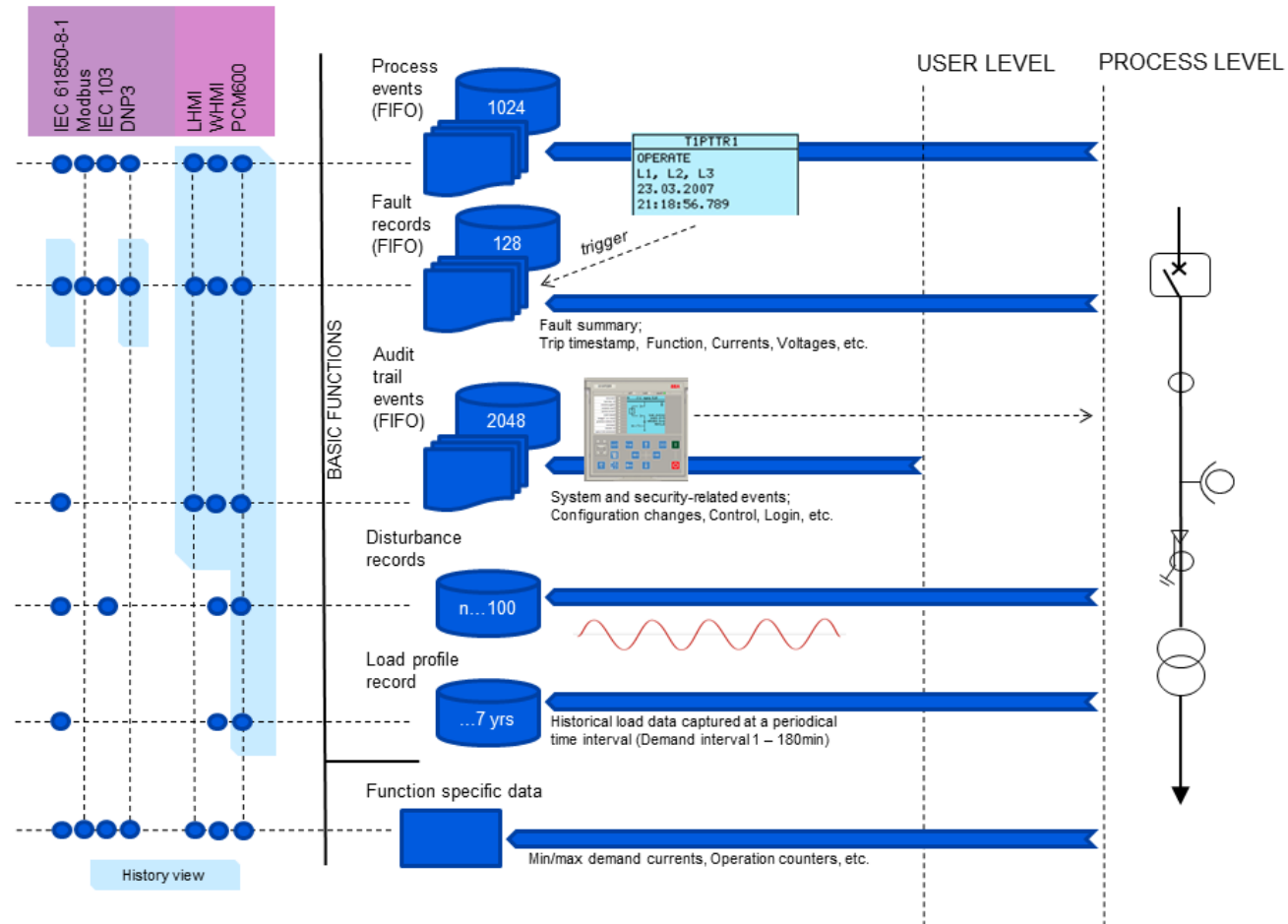
- In addition to circuit-breaker control, the relays feature:
  - Two control blocks for control of motor-operated disconnectors or a circuit-breaker truck and their position indications
  - A control block for control of a motor-operated grounding switch and its position indication
- The number of controllable devices depends on the number of available I/Os in the selected configuration.
- Devices can be controlled via the relay's local HMI or a remote control system.
- The single-line diagram indicates the position of the primary devices.



# Relion® 615 series

## Protection and control

### Recording and event capabilities – overview



# Relion® 615 series

## Protection and control

### Parallel protocols

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- Support for parallel use of the following protocols:
  - IEC 61850 and Modbus®
  - IEC 61850 and DNP3
- Flexibility to change communication protocol
- Enables connection of two substation systems with different communication protocols

# Relion® 615 series

## Protection and control

### Redundancy solutions

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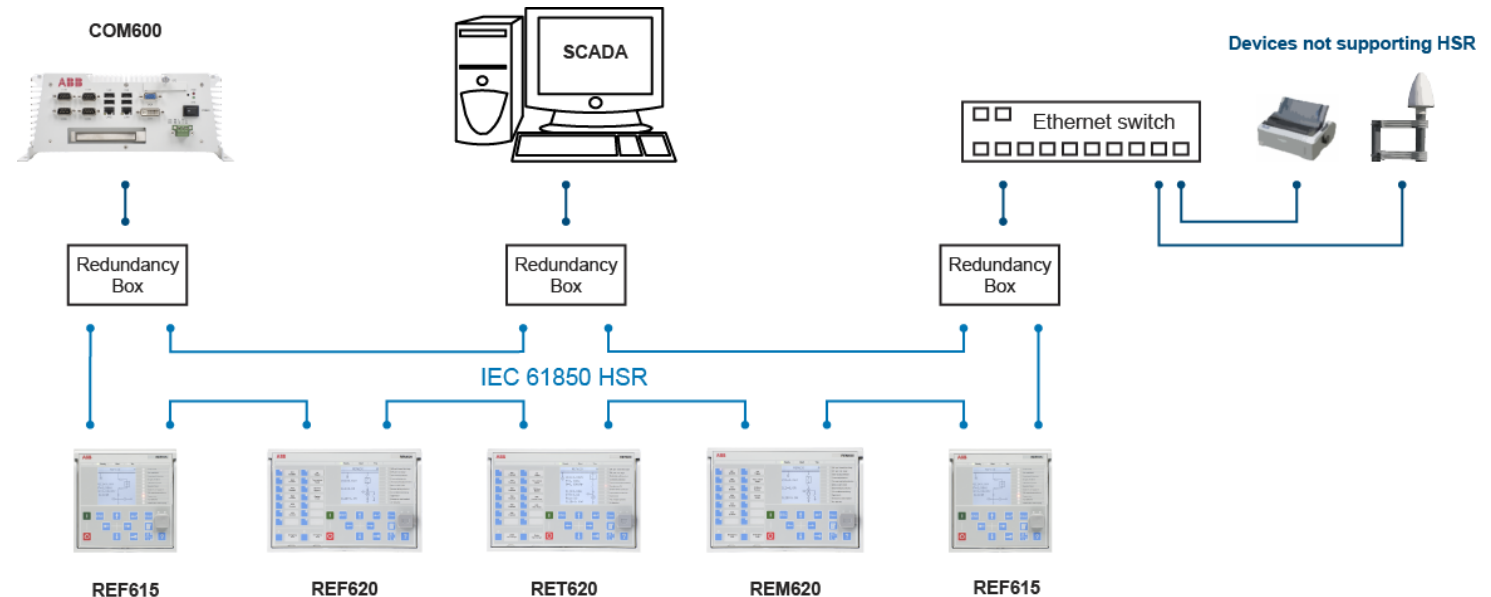
- Redundant Ethernet solutions
  - High availability seamless redundancy (HSR)
  - Parallel redundancy protocol (PRP)
  - IEC 61850 supports both HSR and PRP
- HSR
  - The nodes are connected via two ports to the network.
  - HSR is used in a ring topology.
  - Data is sent from both ports in both directions in a ring.
- PRP
  - Each network node is connected to two parallel local area networks, LANA and LANB.
  - The same data is sent to both local area networks.

# Relion® 615 series

## Protection and control

### IEC 61850 Ethernet redundancy – HSR

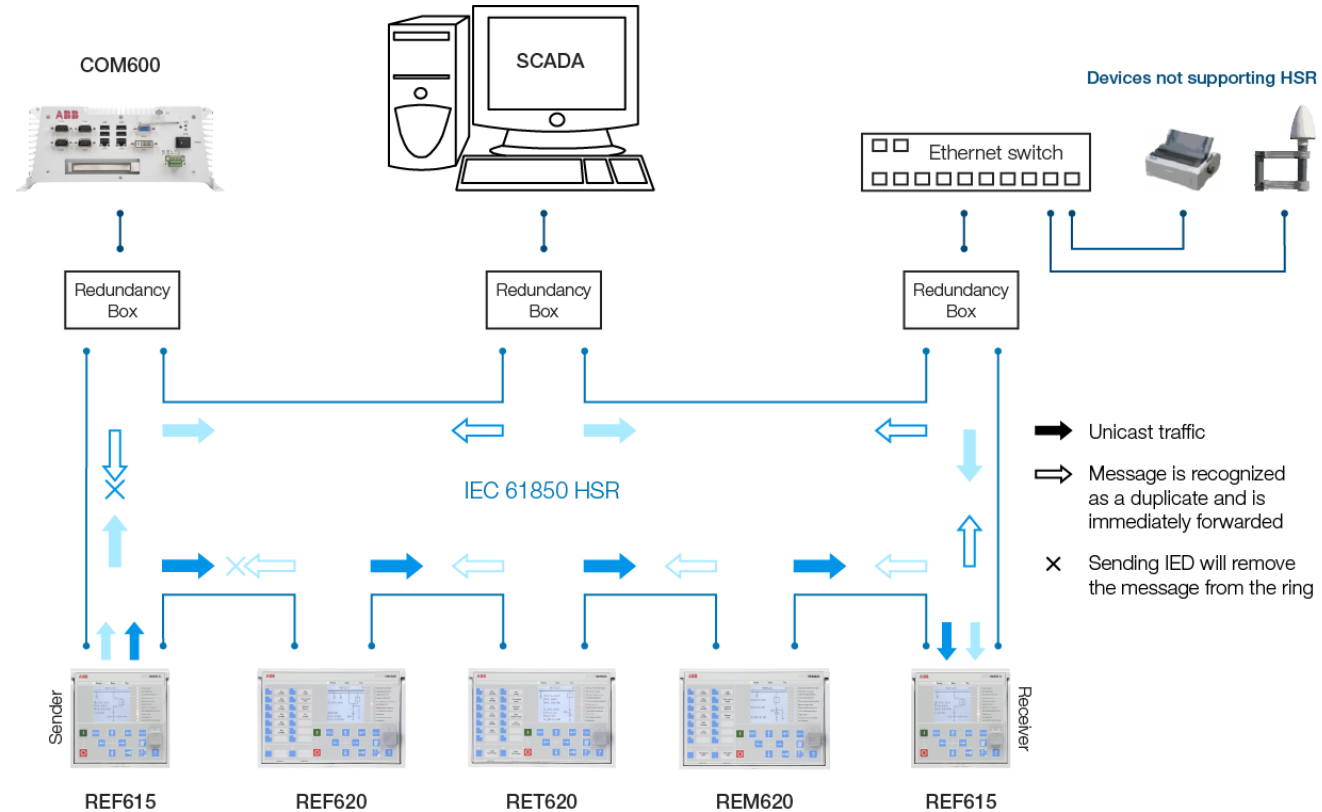
- Optional second fiber-optic or galvanic port (only fiber-optic for RED615)
- Enables redundant Ethernet communication controlled by a managed switch with IEC 61850 HSR protocol support
- Avoids single point of failure without any delay
- Secures highly critical communication between devices
  - Communication downtime is eliminated.
  - If the ring is broken, messages will still arrive over the intact path.
  - A broken ring is easily detected since duplicate messages are no longer received



# Relion® 615 series

## Protection and control

IEC 61850  
Ethernet  
redundancy HSR -  
operation principle

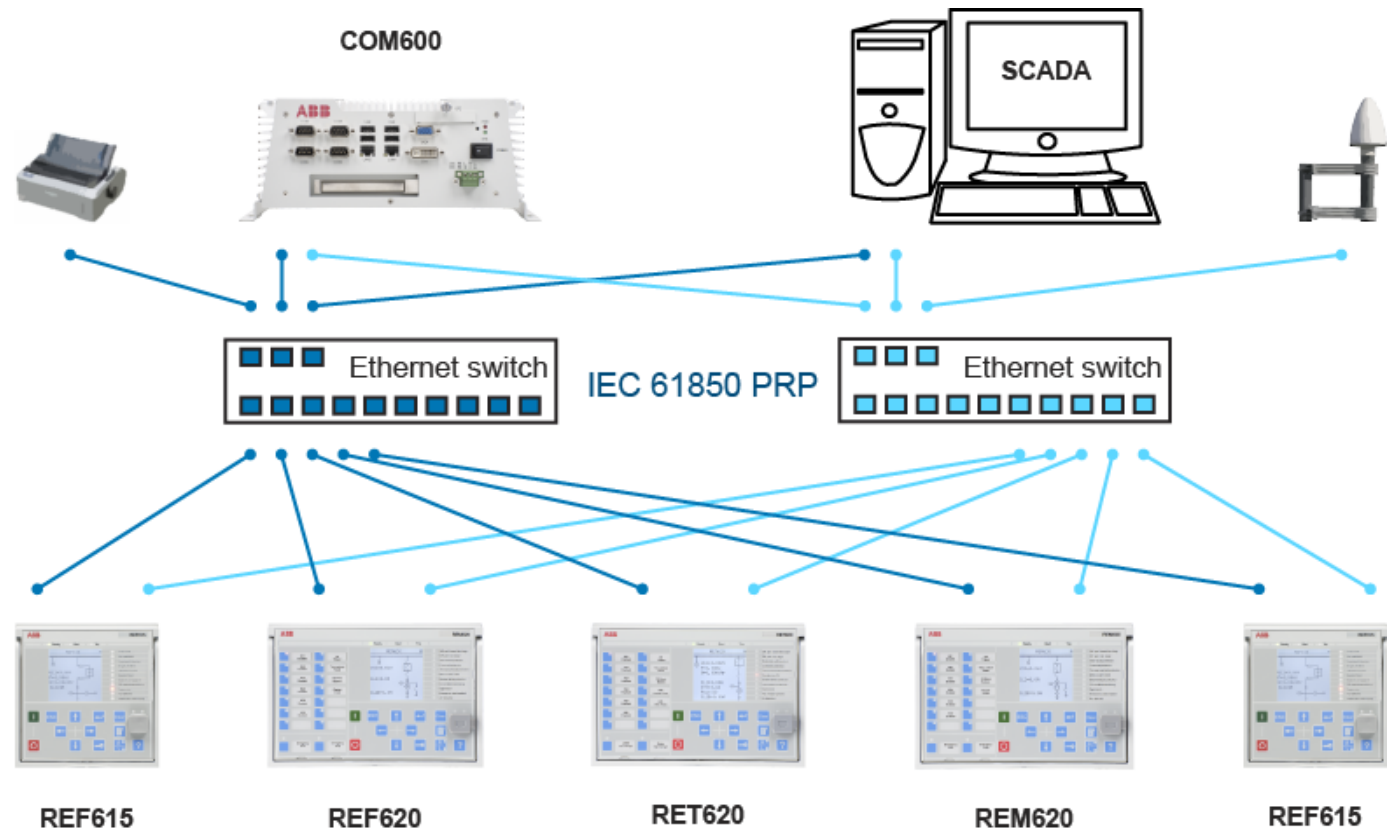


# Relion® 615 series

## Protection and control

### IEC 61850 Ethernet redundancy – PRP

- Optional second fiber-optic or galvanic port (only fiber-optic for RED615)
- Enables redundant Ethernet communication controlled by a managed switch with IEC 61850 standard PRP support
- Avoids single point of failure without any delay
- Secures highly critical communication between devices
  - Communication downtime is eliminated.
  - The communication network is fully duplicated.
  - If only one packet is received, the receiver knows the other path is broken.

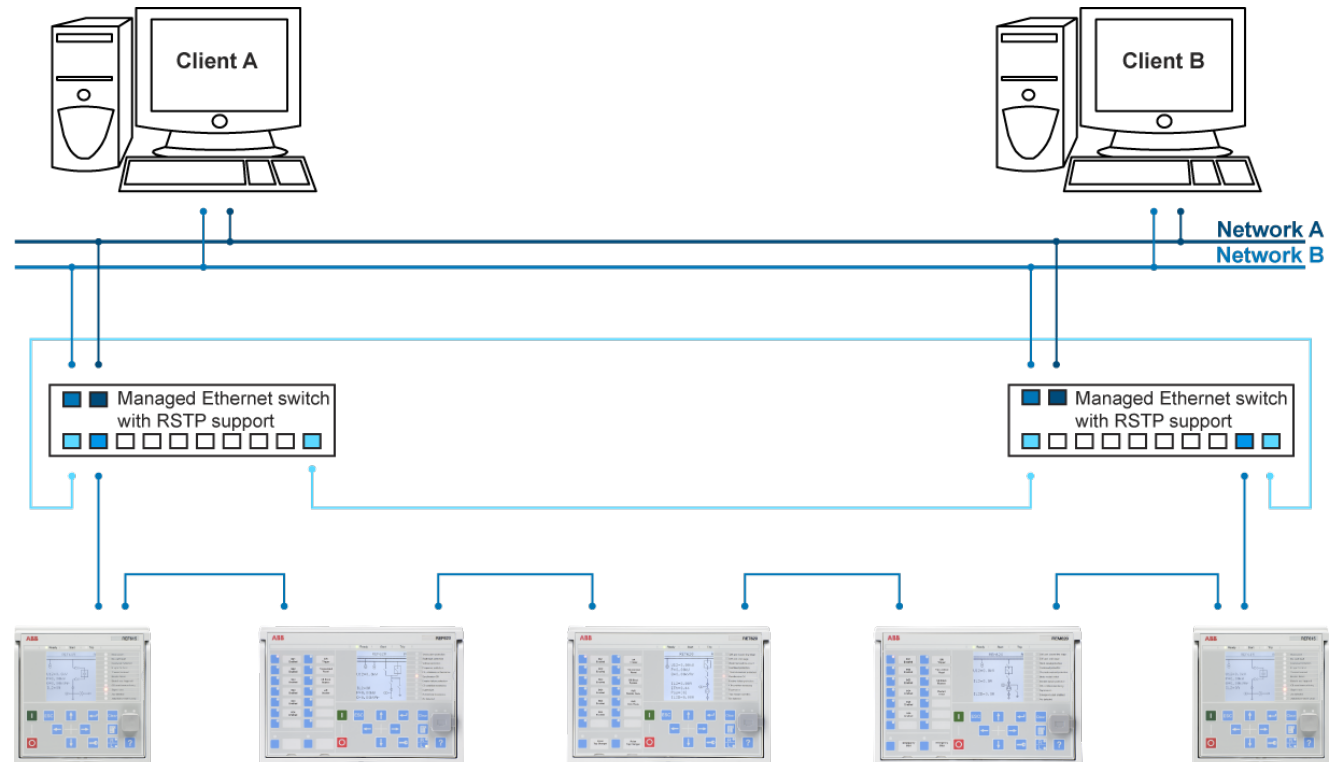


# Relion® 615 series

## Protection and control

### Self-healing Ethernet ring – RSTP

- Optional second fibre-optic or galvanic port on the communication module
- Enables the creation of a cost-efficient self-healing Ethernet communication ring controlled by a managed switch with rapid spanning tree protocol (RSTP) support
- Avoids single point of failure concerns
- Secures critical communication between devices
- Reduces communication downtime



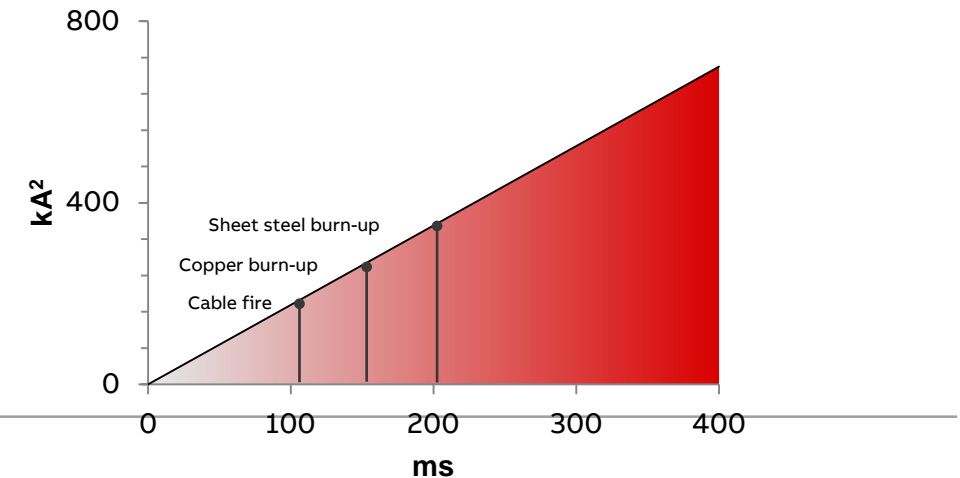


# Relion® 615 series

## Protection and control

### High-speed outputs for time-critical applications

- High-speed output (HSO) module for time-critical applications such as arc fault protection
- Three high-speed hybrid outputs
  - 4-6 ms faster than conventional power outputs but with same rating of output contacts
- One master trip function available per high-speed output
- Can be configured for any protection requiring a short operate time
- Available as an option

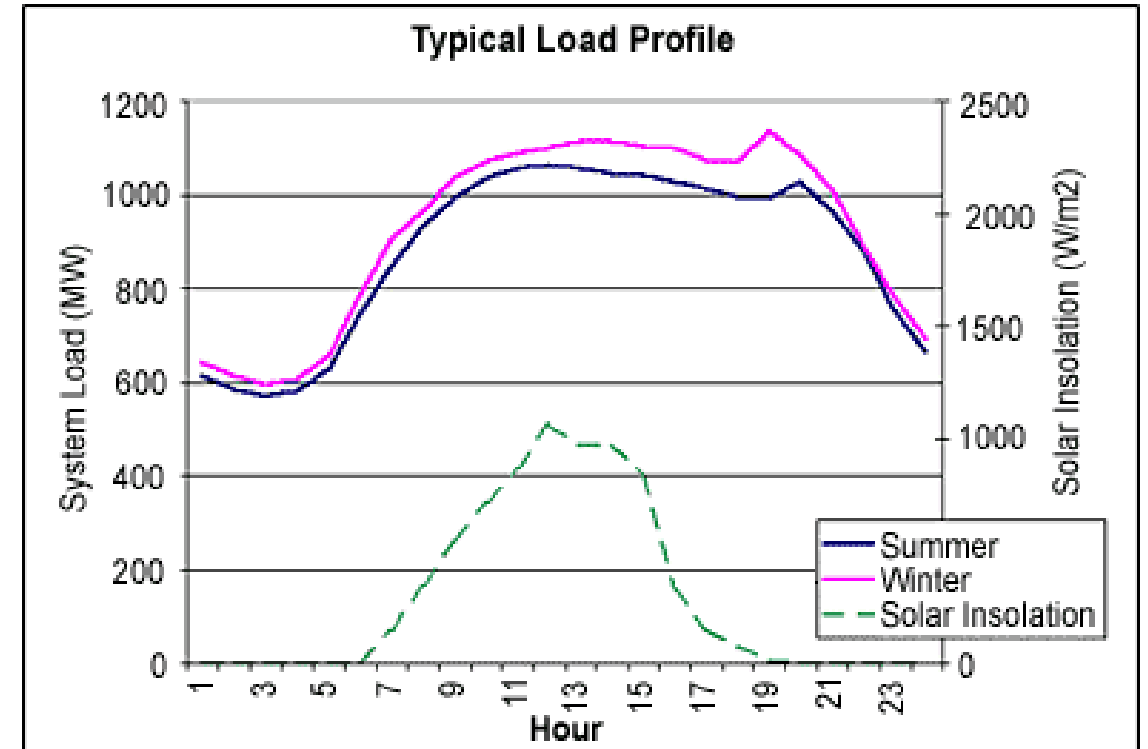


# Relion® 615 series

## Protection and control

### Load profile recorder

- Capturing and storing of longer history of measurement values in the non-volatile memory:
  - Currents
  - Voltages
  - Power
- Up to 12 quantities can be selected
- Adjustable time interval of 1 to 180 minutes
- Average value of the quantity over the selected time interval
- The total load profile recording length depends on the number of quantities and the time interval:
  - 6 quantities, 60min interval ~ 1year
  - 12 quantities, 10min interval ~ 1month
- The load profile record is stored in COMTRADE format in the relay.
- The load profile can be read using the load profile tool in PCM600.



# Relion® 615 series

## Protection and control

### IEEE 1588 time synchronization

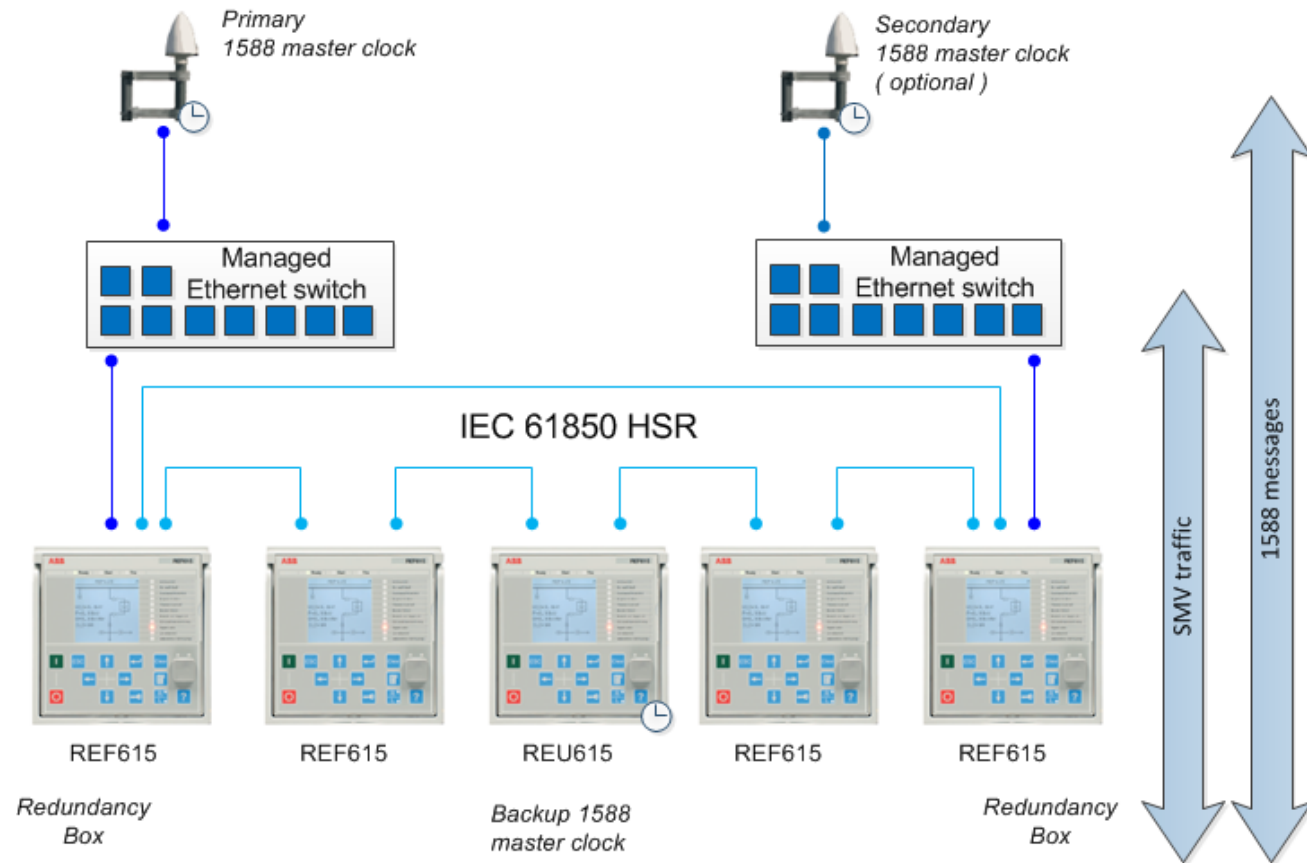
- The 615 series supports IEEE 1588 V2 Precision Time Protocol (PTP) with Power Profile.
  - Provides high-accuracy time synchronization of 1  $\mu$ s
- Required especially in process bus applications with sampled values using protocol IEC 61850-9-2 LE
  - Time stamp resolution of the relay: < 4  $\mu$ s
- IEEE 1588 support is included in variants having a redundant Ethernet communication module and with the following protocols:
  - IEC 61850
  - Modbus®
  - DNP



# Relion® 615 series

## Protection and control

IEEE 1588 time  
synchronization  
example using HSR



**REF 615**

# **Feeder protection and control**



# REF615

## Feeder protection

### Description

- REF615 is a dedicated feeder protection and control relay designed for protection, control, measurement and supervision in utility and industrial power distribution systems, including radial, looped and meshed distribution networks, with or without distributed power generation.



# REF615

## Feeder protection

### Area of application

- Designed for general applications requiring overcurrent and ground-fault protection
- Main application area: cable or overhead line feeders in isolated neutral, resistance-grounded, compensated or effectively-grounded distribution networks
- Optional three-channel arc protection system



# REF615

## Feeder protection

### Standard configurations 1 (2)

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- **Standard configuration D**

Non-directional overcurrent and ground-fault protection and circuit-breaker condition monitoring (RTD option)

- **Standard configuration F**

Directional overcurrent and ground-fault protection, voltage-based protection and measurements, and circuit-breaker condition monitoring (RTD option), **add voltage remanent protection**

- **Standard configuration L**

Directional and non-directional overcurrent and ground-fault protection with multi-frequency neutral admittance, voltage, frequency and power-based protection and measurements, and circuit-breaker condition monitoring (sensor inputs, optional power quality, fault locator, interconnection protection, synchro-check, **and voltage remanent protection** with IEC 61850-9-2LE)



# REF615

## Feeder protection

### Standard configurations 2(2)

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- **Standard configuration N**

Directional and non-directional overcurrent and ground-fault protection with multi-frequency neutral admittance, voltage, frequency and power-based protection and measurement, high-impedance differential protection, synchro-check and circuit-breaker condition monitoring (optional power quality, fault locator and interconnection protection), **add voltage remanent protection**

- **Standard configuration P**

Directional phase and ground overcurrent, voltage and power directional protection and power system metering for two tie breakers with synchro-check, and voltage remanent protection

  
**RED 615**

# **Line differential protection and control**



# RED615

## Line differential protection and control

### Description

- RED615 is a phase-segregated, two-end, unit-type line differential protection and control relay designed for protection, control, measurement and supervision in utility and industrial power distribution systems, including radial, looped and meshed distribution networks, with or without distributed power generation.
- RED615 is also suitable for line differential applications with an in-zone transformer.
- RED615 relays communicate between substations either over a fiber-optic link or a galvanic pilot wire connection.



# RED615

## Line differential protection and control

### Selective protection for specified zone

- Unit protection for applications requiring an entirely selective protection for a specified zone
- Main application area: two-end protection for cable and overhead line feeders
- Can also be used with an in-zone transformer
- Phase-segregated protection algorithm
- Protection communication either over a fiber-optic link or a galvanic pilot wire connection

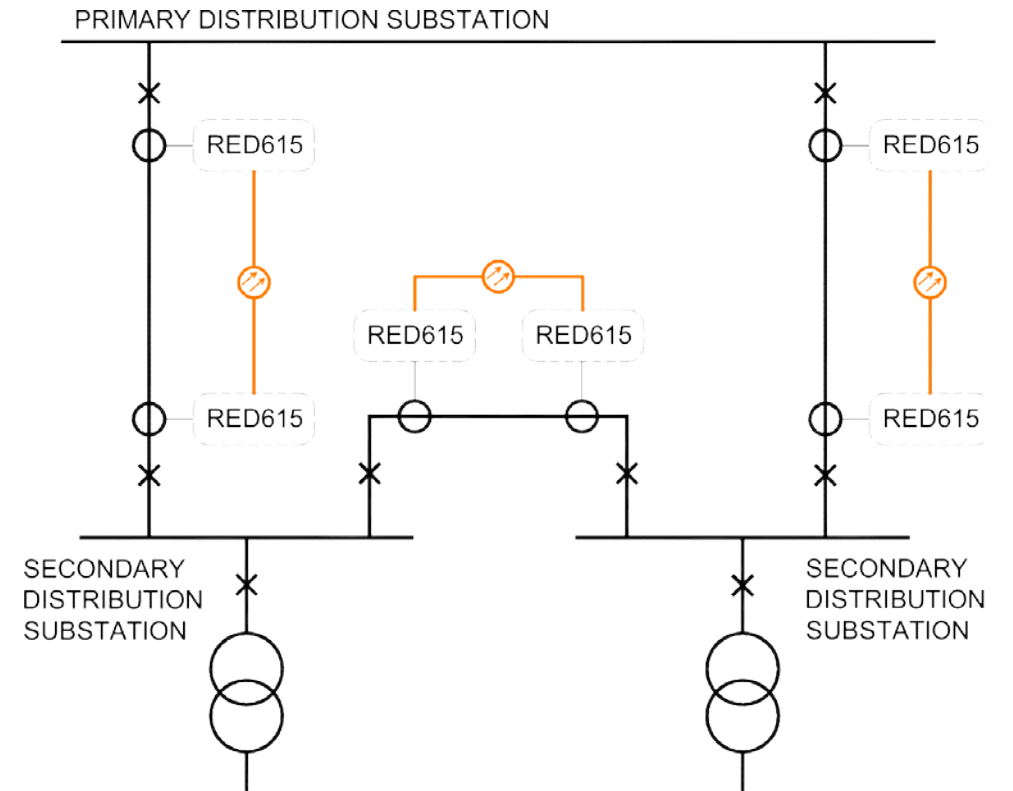


# RED615

## Line differential protection and control

### Line differential protection applications

- Parallel feeders
  - Looped feeder construction
  - Doubled feeders
- Two interconnected feeders between a primary substation and two secondary substations
  - Reserve connections or meshed network
- Distributed generation
  - Power generation at the remote end of the feeder
- Weak grid supplying relatively long distribution lines

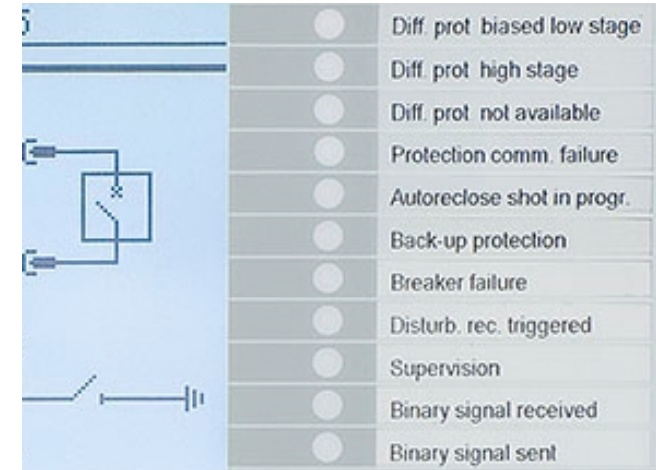


# RED615

## Line differential protection and control

### Standard configurations

- **Standard configuration D**  
Line differential protection with directional overcurrent and ground-fault protection, voltage and frequency-based protection and measurements, synchro-check and circuit-breaker condition monitoring (RTD option, optional power quality and fault locator)
- **Standard configuration E**  
Line differential protection with directional overcurrent and ground-fault protection, voltage and frequency-based protection and measurements, and circuit-breaker condition monitoring (sensor inputs, optional power quality, fault locator and synchro-check with IEC 61850-9-2LE)



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**REM 615**

# **Motor protection and control**



# REM615

## Motor protection and control

### Description

- REM615 is a dedicated motor protection and control relay designed for protection, control, measurement and supervision of asynchronous motors in the manufacturing and process industry.





# REM615

## Motor protection and control

### Area of application

- Circuit-breaker and contactor-controlled MV motors and medium-sized and large contactor-controlled LV motors in a variety of drives.
- Contactor-controlled, medium-sized and large low-voltage (LV) motors
- Manufacturing, process and refinery industry
- Protection for a variety of drives such as:
  - Pumps and conveyors
  - Crushers and choppers
  - Mixers and agitators
  - Fans and aerators
  - Compressors



# REM615

## Motor protection and control

### Standard configurations

#### Standard configuration A

- Motor protection with circuit-breaker condition monitoring (RTD option)

#### Standard configuration B

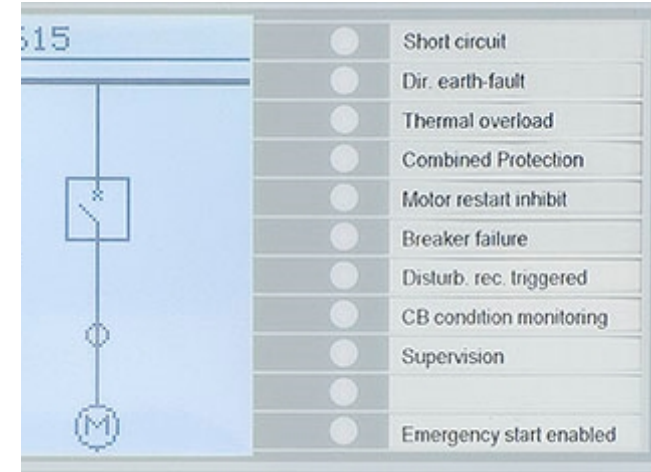
- Motor protection with voltage and frequency-based protection and measurements, and circuit-breaker condition monitoring (RTD option), **add voltage remanent protection**

#### Standard configuration D

- Motor protection with voltage and frequency-based protection and measurements, and circuit-breaker condition monitoring (sensor inputs), **add voltage remanent protection**

#### Standard configuration E

- Motor protection with differential (core-balance and true), overcurrent, load loss, phase and neutral voltage, frequency and RTD protection and power system metering for medium to large motors





**RET 615**

# **Transformer protection and control**

# RET615

## Transformer protection and control

### Description

- RET615 is a dedicated transformer protection and control relay designed for protection, control, measurement and supervision of power transformers, including step-up transformers, and power generator-transformer blocks, in utility and industrial power distribution systems.





# RET615

## Transformer protection and control

### Area of application

- Designed for unit protection applications requiring stabilized differential protection
- Main application area: two-winding transformers and generator-transformer blocks in power distribution networks
- Optional three-channel arc protection system



# RET615

## Transformer protection and control

### Standard configurations

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- **Standard configuration B**

Transformer differential with low-impedance restricted ground-fault protection on the LV side

- **Standard configuration F**

Transformer differential with voltage protection and measurements, and low-impedance restricted ground-fault protection on the LV side, **add over-excitation, directional elements, and synchro-check**



# **Relion® 615 series**

## **ABB solutions**

# Relion® 615 series

## Protection and control



### Supported ABB solutions 1(2)

- The ABB products constitute a genuine IEC 61850 solution for reliable power distribution in utility and industrial power systems.
- The native IEC 61850 support offers:
  - High communication performance
  - Continuous supervision of the protection and communication system integrity
  - No additional CPUs or adapters
  - Faster protection applications
- ABB’s Connectivity Package concept enables:
  - Streamlining of the IEC 61850 system engineering and relay configuration
  - Easy integration with COM600 and MicroSCADA Pro SYS600
  - Automated engineering, e.g. event lists and single-line diagram
  - Shortened system engineering time

Supported ABB solutions	
Substation Management Unit COM600	
MicroSCADA Pro SYS600	
System 800xA	
Supported ABB Edition 2 solutions	Version
Substation Management Unit COM600	4.1 or later
MicroSCADA Pro SYS600	9.4 or later



# Relion® 615 series

## Protection and control

### Supported ABB solutions 2(2)

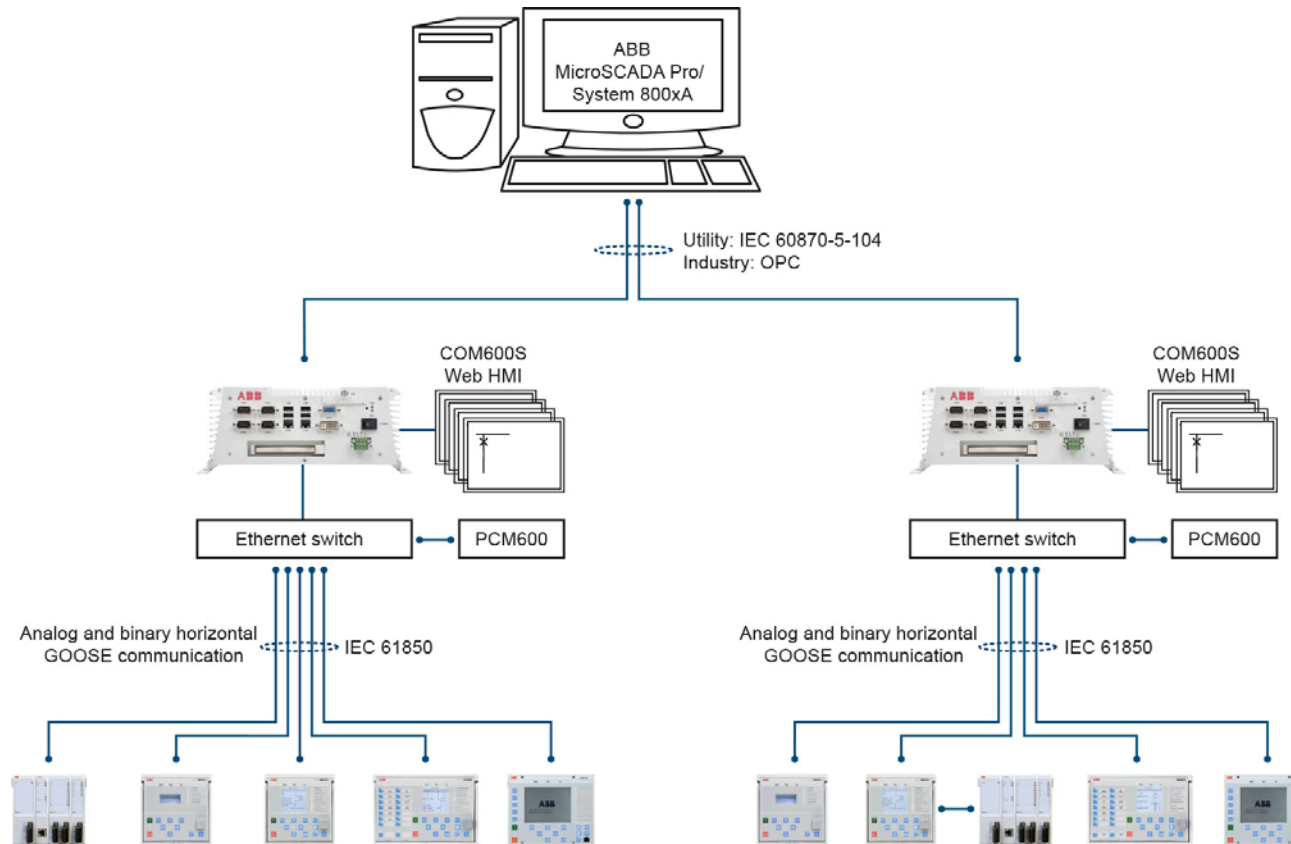
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- The 615 series relays supplemented with COM600 offer a variety of benefits:
  - Enhanced substation-level functionality using the data content of the bay-level relays
  - Web browser-based HMI providing single-line diagrams for switchgear bay solutions
- COM600 can be used as a local data warehouse for technical documentation and network data:
  - Extensive reporting and analyzing of network fault situations
  - Seamless connectivity to Micro SCADA Pro SYS600 and System 800xA

# Relion® 615 series

## Protection and control

Supported ABB  
solutions  
example





# Relion® 615 series

## Conclusions

# Relion® 615 series

## Protection and control

### Conclusions

- Native support for IEC 61850 and GOOSE messaging
- Patented plug-in unit design for flexible mounting and fast installation and commissioning
- Available in pre-defined standard configurations
- Comprehensive range of monitoring and watchdog functions
- Versatile tools including relay-specific connectivity packages



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# Relion® 615 series

Protection and control

Please visit our website for the latest  
product information  
[www.abb.com/substationautomation](http://www.abb.com/substationautomation)



**ABB**