

RED615 ANSI

Line differential protection and control



RED615 is a phase-segregated, two-end line differential protection and control relay for protection, control, measurement and supervision in utility and industrial power distribution systems. RED615 is also ideal for line differential applications with an in-zone transformer. RED615 relays communicate between substations either over a fiber-optic link or galvanic pilot wire connection.

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RED615 ANSI 5.0 FP1

RED615 is a member of ABB's Relion® family and part of its 615 protection and control product series. The 615 series protection and control relays are characterized by their compactness and withdrawable design. Engineered from the ground up, the 615 series has been designed to unleash the full potential of the IEC 61850 standard for communication and interoperability of substation automation devices.

In addition to RED615, the 615 series includes the following relays:

- REF615 Feeder protection and control
- REF615 Feeder protection and control
- RET615 Transformer protection and control
- REM615 Motor protection and control
- REG615 Generator protection and control

Application

RED615 is available in five standard configurations, one of which is a plain line differential protection with overcurrent backup protection two with added earth-fault protection functionality in particular, and another two further extended with directional overcurrent as well as phase-voltage and frequency-based protection. Switch on to fault is now introduced in all standard configurations and voltage unbalance in the two extended ones. They both also include a fault locator which locates short circuits in

radial distribution networks and earth faults in effectively and low-resistance earthed ones. If the fault current is as high as or higher than the load current, earth faults in isolated neutral distribution networks will also be located. In addition, one of the two extended standard configurations includes support for three combi-sensor inputs for phase currents (Rogowski coil) and voltages (voltage divider), whereas the other supports conventional current and voltage instrument transformers as the rest of the standard configurations.

Two RED615 relays interconnected over a communication link form an entirely selective unit protection scheme. Protection of ring-type and meshed distribution networks generally requires unit protection solutions, also applied in radial networks containing distributed power generation.

The standard configurations can be tailored to meet application-specific requirements using the IEC 61850 compliant Protection and Control Relay Manager PCM600.

Human-machine interface (HMI)

As a member of the Relion® product family, RED615 shares the same human-machine interface (HMI) look and feel as the other Relion protection and control relays. The same look and feel includes the location of a push button with a certain function and the menu structure.

RED615 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 that has now been enriched with a number of usability enhancing features.

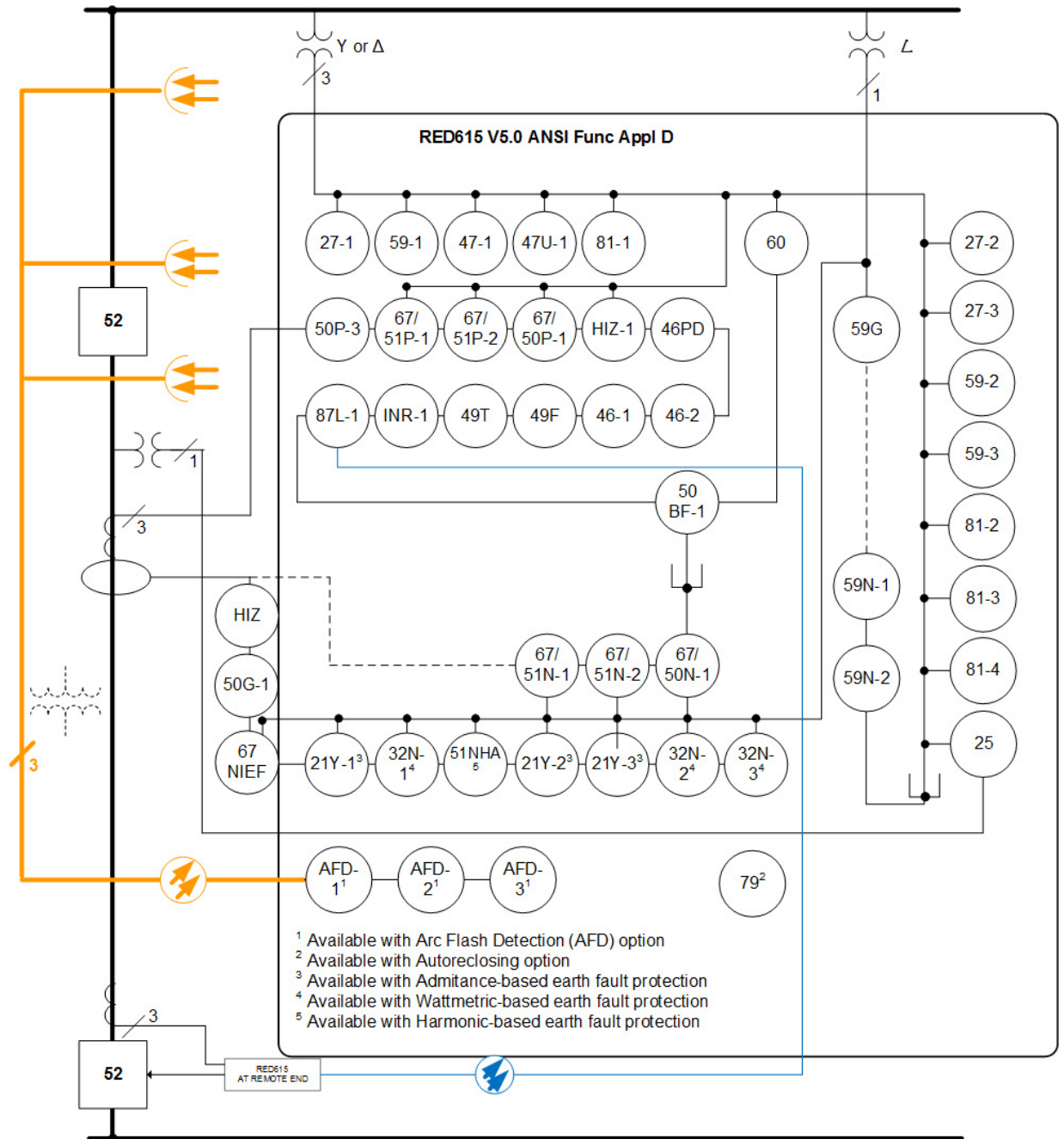
Standardized communication and redundancy

RED615 fully supports the IEC 61850 standard for communication and interoperability of substation automation devices, including fast GOOSE messaging and now also IEC 61850-9-2 LE and Edition 2, offering substantial benefits in terms of extended interoperability. The line differential relay further supports the DNP3, IEC 60870-5-103 and Modbus® protocols, now introducing also the parallel redundancy protocol (PRP) and the high-availability seamless redundancy (HSR) protocol. With the

protocol adapter SPA-ZC 302, Profibus DVP1 can also be used. RED615 is able to use two communication protocols simultaneously.

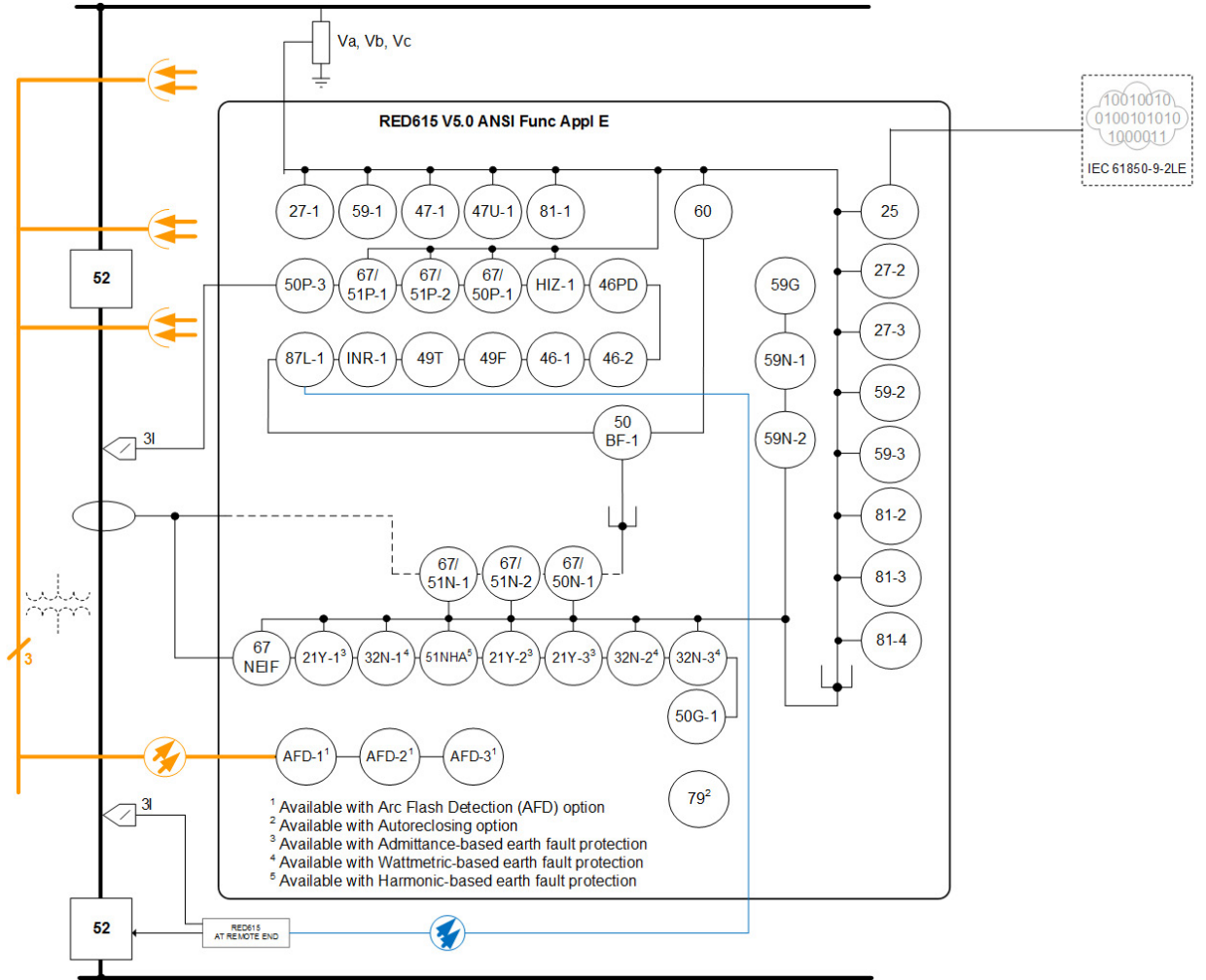
For redundant Ethernet communication, RED615 offers two optical Ethernet network interfaces. The redundant Ethernet solution can be built on the Ethernet-based IEC 61850, Modbus® and DNP3 protocols.

The implementation of the IEC 61850 standard in RED615 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. In addition, IEC 61850-9-2 LE process bus with sending sampled values of both analog voltages and currents and receiving sampled values of voltages is introduced. The sampled values can also be used for synchro-check, both in conventional instrument transformer and sensor-based applications, 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, RED615 supports synchronization over Ethernet using SNTP or over a separate bus using IRIG-B.



Main benefits

- Withdrawable plug-in unit design for swift installation and testing
- Selective unit protection as phase-segregated two-end line differential protection, either with sensors or conventional instrument transformers
- Ready-made standard configurations, including line differential communication, for fast and easy setup with tailoring capabilities
- Line differential communication between substations either over a fiber-optic link or a galvanic pilot wire connection
- Ideal for line differential applications with an in-zone transformer
- 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



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.

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Standard configurations

| Description | Std. conf. |
|---|------------|
| Line differential protection with directional overcurrent and earth-fault protection, voltage and frequency based protection and measurements, synchro-check and circuit-breaker condition monitoring (RTD option, optional power quality and fault locator) | D |
| Line differential protection with directional overcurrent and earth-fault protection, voltage and frequency based protection and measurements, circuit-breaker condition monitoring (sensor inputs, optional power quality, fault locator and synchro-check with IEC 61850-9-2LE) | E |

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Supported functions

| Function | IEC 61850 | ANSI | D | E |
|---|-----------|---------|-------------------|---------------------|
| Protection | | | | |
| Three-phase non-directional overcurrent protection, low stage | PHLPTOC | 51P | - | - |
| Three-phase non-directional overcurrent protection, high stage | PHHPTOC | 50P | - | - |
| Three-phase non-directional overcurrent protection, instantaneous stage | PHIPTOC | 50P/51P | 1 | 1 |
| Three-phase directional overcurrent protection, low stage | DPHLPDOC | 67/51P | 2 | 2 |
| Three-phase directional overcurrent protection, high stage | DPHHPDOC | 67/50P | 1 | 1 |
| Non-directional earth-fault protection, low stage | PHPVOC | 51N-1 | - | - |
| Non-directional earth-fault protection, high stage | EFHPTOC | 50G | - | - |
| Non-directional earth-fault protection, instantaneous stage | EFIPTOC | 50N/51N | - | - |
| Directional earth-fault protection, low stage | DEFLPDEF | 67/51N | 2 | 2 ²⁾ |
| Directional earth-fault protection, high stage | DEFHPDEF | 67/50N | 1 | 1 ²⁾ |
| Admittance based earth-fault protection | EFPADM | 21YN | (3) ³⁾ | (3) ²⁾³⁾ |
| Wattmetric based earth-fault protection | WPWDE | 32N | (3) ³⁾ | (3) ²⁾³⁾ |
| Transient/intermittent earth-fault protection | INTRPTEF | 67NIEF | 1 ⁴⁾ | 1 ²⁾⁴⁾ |
| Harmonics based earth-fault protection | HAEFPTOC | 51NHA | 1 ³⁾⁴⁾ | 1 ³⁾⁴⁾ |
| Non-directional (cross-country) earth fault protection, using calculated I ₀ | EFHPTOC | 51N-2 | 1 | 1 |
| Negative-sequence overcurrent protection | NSPTOC | 46 | 2 | 2 |
| Phase discontinuity protection | PDNSPTOC | 46PD | 1 | 1 |
| Residual overvoltage protection | ROVPTOV | 59/59N | 3 | 3 ²⁾ |
| Three-phase undervoltage protection | PHPTUV | 27 | 3 | 3 |
| Three-phase overvoltage protection | PHPTOV | 59 | 3 | 3 |
| Positive-sequence undervoltage protection | PSPTUV | 47U+ | 1 | 1 |
| Negative-sequence overvoltage protection | NSPTOV | 47 | 1 | 1 |
| Frequency protection | FRPFRQ | 81 | 4 | 4 |
| Three-phase thermal protection for feeders, cables and distribution transformers | T1PTTR | 49F | 1 | 1 |
| Three-phase thermal overload protection for power transformers, two time constants | T2PTTR | 49T | 1 | 1 |
| Binary signal transfer | BSTGGIO | BST | 1 | 1 |
| Circuit breaker failure protection | CCBRBRF | 50BF | 1 | 1 |
| Three-phase inrush detector | INRPHAR | INR | 1 | 1 |
| Switch onto fault | CBPSOF | SOTF | 1 | 1 |
| Master trip | TRPPTRC | 86/94 | 2 | 2 |
| Multi-purpose protection | MAPGAPC | MAP | 18 | 18 |
| Fault locator | SCEFRFLO | 21FL | (1) | (1) |
| Line differential protection with in zone power transformer | LNPLDF | 87L | 1 | 1 |
| High impedance fault detection | PHIZ | HIZ | 1 | - |
| Power Quality | | | | |
| Current total demand distortion | CMHAI | PQI | (1) ⁶⁾ | (1) ⁶⁾ |
| Voltage total harmonic distortion | VMHAI | PQVPH | (1) ⁶⁾ | (1) ⁶⁾ |
| Voltage variation | PHQVVR | PQSS | (1) ⁶⁾ | (1) ⁶⁾ |
| Voltage unbalance | VSQVUB | PQVUB | (1) ⁶⁾ | (1) ⁶⁾ |
| Control | | | | |
| Circuit-breaker control | CBXCBBR | 52 | 1 | 1 |

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Supported functions

| Function | IEC 61850 | ANSI | C | D |
|--|-----------|-------------|-----|---------------------|
| Control | | | | |
| Disconnecter control | DCXSWI | 29DS | 2 | 2 |
| Earthing switch control | ESXSWI | 29GS | 1 | 1 |
| Disconnecter position indication | DCSXSWI | | 3 | 3 |
| Earthing switch indication | ESSXSWI | 29GS | 2 | 2 |
| Auto-reclosing | DARREC | 79 | (1) | (1) |
| Synchronism and energizing check | SECRSYN | 25 | 1 | (1) ⁷⁾ |
| Condition monitoring | | | | |
| Circuit-breaker condition monitoring | SSCBR | 52CM | 1 | 1 |
| Trip circuit supervision | TCSSCBR | TCM | 2 | 2 |
| Current circuit supervision | CCSPVC | CCM | 1 | 1 |
| Fuse failure supervision | SEQSPVC | 60 | 1 | 1 |
| Protection communication supervision | PCSRTPC | PCS | 1 | 1 |
| Runtime counter for machines and devices | MDSOPT | OPTM | 1 | 1 |
| Measurement | | | | |
| Disturbance recorder | RDRE | DFR | 1 | 1 |
| Load profile record | LDPRLRC | LoadProf | 1 | 1 |
| Fault record | FLTRFRC | -FAULTREC | 1 | 1 |
| Three-phase current measurement | CMMXU | IA, IB, IC | 1 | 2 |
| Sequence current measurement | CSMSQI | I1, I2, I0 | 1 | 2 |
| Residual current measurement | RESCMMXU | IG | 1 | 1 |
| Three-phase voltage measurement | VMMXU | VA, VB, VC | 2 | 1 (2) ⁷⁾ |
| Residual voltage measurement | RESVMMXU | VG | 1 | |
| Sequence voltage measurement | VSMSQI | V1, V2, V0 | 1 | 1 |
| Three-phase power and energy measurement | PEMMXU | P, E | 1 | 1 |
| RTD/mA measurement | XRGGIO130 | X130 (RTD) | (1) | |
| Frequency measurement | FMMXU | f | 1 | 1 |
| IEC 61850-9-2 LE sampled value sending ⁵⁾⁵⁾⁰ | SMVSENDER | SMVSENDER | (1) | (1) |
| IEC 61850-9-2 LE sampled value receiving (voltage sharing) ⁵⁾⁶⁾ | SMVRCV | SMVRECEIVER | (1) | (1) |

1, 2, ... = Number of included instances. The instances of a protection function represent the number of identical protection function blocks available in the standard configuration.

() = option

TR = The function block is to be used on the terminal side in the application

1) "Uo measured" is always used.

2) "Uo calculated" is always used.

3) One of the following can be ordered as an option: admittance-based E/F, wattmetric-based E/F or harmonics-based E/F.

4) "Io measured" is always used.

5) "Io calculated" is always used.

6) Power quality option includes current total demand distortion, voltage total harmonic distortion, voltage variation and voltage unbalance.

7) Available only with IEC 61850-9-2

8) Available only with COM0031-0037

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Notes

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