

Feeder Protection REF615 ANSI

Protection and Control



IEC 61850-based **Connectivity and Interoperability** for Distribution Substations

Area of application

The REF615 is a powerful and simple feeder protection relay perfectly aligned for the protection, measurement and supervision of utility substations and industrial power systems. Engineered from the ground up, the new feeder protection relay has been designed to unleash the full potential of the IEC 61850 standard for communication and interoperability of substation automation devices.

Unique REF615 features:

- High impedance (HIZ) fault detection
- Arc flash detection (AFD)
- Thermal overload protection of feeder cable
- Ring-lug terminals for all inputs and outputs
- Large LCD screen with clearly visible font
- Environmentally friendly design with RoHS compliance

Protection and control

The REF615 is the most powerful, most advanced and simplest feeder protection relay in its class, perfectly offering time and instantaneous overcurrent, negative sequence overcurrent, phase discontinuity, breaker failure and thermal overload protection. The relay also features optional high impedance fault (HIZ) and sensitive earth fault (SEF) protection for grounded and ungrounded distribution systems. Also, the relay incorporates a flexible three-phase multi-shot auto-reclose function for automatic feeder restoration in temporary faults on overhead lines.

Enhanced with safety options, the relay offers a three-channel arc-fault detection system for supervision of the switchgear circuit breaker, cable and busbar compartments.

The REF615 also integrates basic control functionality, which facilitates the control of one circuit breaker via the relay's front panel human machine interface (HMI) or remote control system. To protect the relay from unauthorized access and to maintain the integrity of information, the relay has been provided with a four-level, role-based user authentication system, with individual passwords for the viewer, operator, engineer and administrator level. The access control system applies to the front panel HMI, embedded web browser based HMI and the PCM600 relay setting and configuration tool.

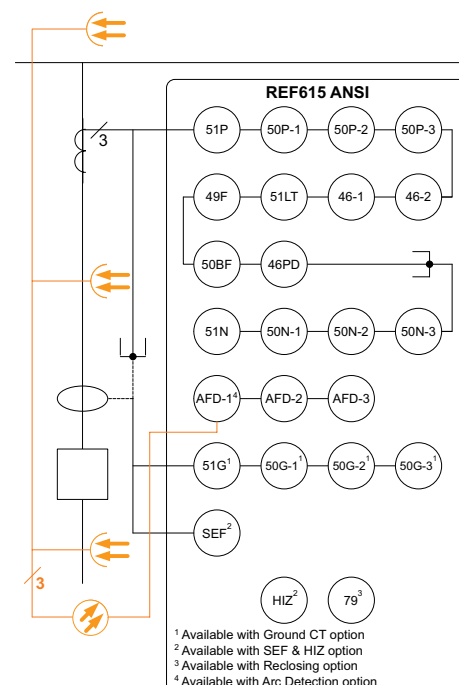
Standardized communication

REF615 supports the new IEC 61850 standard for inter-device communication in substations. The relay also supports the industry standard DNP3.0 and Modbus® protocols.

The implementation of the IEC 61850 substation communication standard in REF615 encompasses both vertical and horizontal communication, including GOOSE messaging and parameter setting according to IEC 61850-8-1. The substation configuration language enables the use of engineering tools for automated configuration, commissioning and maintenance of substation devices.

Bus protection via GOOSE

The REF615 IEC 61850 implementation includes GOOSE messaging for fast horizontal relay-to-relay communication. Applying GOOSE communication to the REF615 relays of the incoming and outgoing feeders of a substation, a stable, reliable and high-speed bus protection system can be realized. The cost-effective GOOSE-based bus protection is obtained just by configuring the relays and the operational availability of the protection is assured by continuous supervision of the protection relays and their GOOSE messaging over the station communication network. Costs are reduced since no separate physical input and output hard-wiring is needed for horizontal communication between the relays.





Pre-emptive condition monitoring

For continuous knowledge of the operational availability of the REF615 features, a comprehensive set of monitoring functions to supervise the relay health, the trip circuit and the circuit breaker health is included. The breaker monitoring can include checking the wear and tear of the circuit breaker, the spring charging time of the breaker operating mechanism and the gas pressure of the breaker chambers. The relay also monitors the breaker travel time and the number of circuit breaker (CB) operations to provide basic information for scheduling CB maintenance.

Rapid set-up and commissioning

Due to the ready-made adaptation of REF615 for the protection of feeders, the relay can be rapidly set up and commissioned, once it has been given the application-specific relay settings. If the relay needs to be adapted to the special requirements of the intended application, the flexibility of the relay allows the relay's standard signal configuration to be adjusted by means of the signal matrix tool (SMT) included in its PCM600 relay setting and configuration user tool.

By means of Connectivity Packages containing complete descriptions of ABB's protection relays, with data signals, parameters and addresses, the relays can be automatically configured via PCM600 relay setting and configuration user tool, COM600 Station Automation series devices, or MicroSCADA Pro substation automation system.

Unique draw-out design relay

The draw-out type relay design speeds up installation and testing of the protection. The factory-tested relay units can be withdrawn from the relay cases during factory and commissioning tests.

The relay case provides automatic short-circuiting of the CT secondary circuits to prevent hazardous voltages from arising in the CT circuits when a relay plug-in unit is withdrawn from its case.

The pull-out handle locking the relay unit into its case can be sealed to prevent the unit from being unintentionally withdrawn from the relay case.



REF615 highlights

IEC 61850
COMPLIANT

- Comprehensive overcurrent protection with **high impedance fault**, **sensitive earth fault** and **thermal overload protection** for feeder and dedicated protection schemes
- **Simultaneous DN3.0 Level 2+ and Modbus Ethernet communications** plus device connectivity and system interoperability according to the IEC 61850 standard for next generation substation communication
- **Enhanced digital fault recorder functionality** including high sampling frequency, extended length of records, 4 analog and 64 binary channels and flexible triggering possibilities
- **High-speed, three-channel arc flash detection (AFD)** for increased personal safety, reduced material damage and minimized system down-time
- Total control of the operational capability of the protection system through **extensive condition monitoring** of the relay and the associated primary equipment
- **Draw-out type relay unit** and a unique relay case design for a variety of mounting methods and fast installation, routine testing and maintenance
- **One single tool** for managing relay settings, signal configuration and disturbance handling

Standard Configurations

| | | Analog Inputs | 3 CT | 3 CT + Ground CT | 3 CT + SEF/HIZ CT |
|---|--------------------------|---------------|------|------------------|-------------------|
| | | Order Code | AA | AB | AC |
| Functions | | | | | |
| Protection | | ANSI | | | |
| Phase overcurrent protection, 4 elements | 51P, 50P-1, 50P-2, 50P-3 | | • | • | • |
| Phase long time overcurrent protection | 51LT | | • | • | • |
| Neutral overcurrent protection, 4 elements | 51N, 50N-1, 50N-2, 50N-3 | | • | • | • |
| Ground overcurrent protection, 4 elements | 51G, 50G-1, 50G-2, 50G-3 | | | • | |
| Sensitive earth fault protection | 50SEF | | | | • |
| Negative sequence overcurrent protection, 2 elements | 46-1, 46-2 | | • | • | • |
| High impedance fault protection | HIZ | | | | • |
| Thermal overload protection | 49F | | • | • | • |
| Phase discontinuity protection | 46PD | | • | • | • |
| Cold load inrush detection, 2 elements | 62CLD-1, 62CLD-2 | | • | • | • |
| Circuit breaker failure protection | 50BF | | • | • | • |
| Electrically latched/self-resetting trip outputs | 86/94-1, 86/94-2 | | • | • | • |
| Arc flash detection via three lens sensors | AFD-1, AFD-2, AFD-3 | | • | • | • |
| Control | | | | | |
| Circuit breaker control | 52-1 | | • | • | • |
| Autoreclose | 79 | | | • | • |
| Monitoring and Supervision | | | | | |
| Trip circuit monitoring | TCM | | • | • | • |
| Breaker condition monitoring | 52CM | | • | • | • |
| Measurement | | | | | |
| Three-phase currents | IA, IB, IC | | • | • | • |
| Sequence currents | I1, I2, I0 | | • | • | • |
| Ground current | IG | | | • | |
| Demand phase currents | | | • | • | • |
| Maximum demand phase currents | | | • | • | • |
| Automation & Communications | | | | | |
| 10/100BaseT 'RJ45' Ethernet(DNP3.0 Level 2+, Modbus, IEC61850, SNTP, FTP) + IRIG-B | | | • | • | • |
| 100BaseFL 'LC' Ethernet (DNP3.0 Level 2+, Modbus, IEC61850, SNTP, FTP) + IRIG-B | | | • | • | • |
| 10/100BaseT 'RJ45' Ethernet(DNP3.0 Level 2+, Modbus, IEC61850, SNTP, FTP) + RS-485 (DNP3.0 Level 2+ or Modbus) + IRIG-B | | | • | • | • |
| 100BaseFL 'LC' Ethernet (DNP3.0 Level 2+, Modbus, IEC61850, SNTP, FTP) + RS-485 (DNP3.0 Level 2+ or Modbus) + IRIG-B | | | • | • | • |
| Records | | | | | |
| Sequence of events recorder | SER | | • | • | • |
| Fault recorder | FLR | | • | • | • |
| Digital fault (waveform) recorder | DFR | | • | • | • |

• = Included,
• = Optional

Analog inputs

- Three phase currents: 5/1 A
- Ground current: 5/1 A or 0.2 A
- Rated frequency: 60/50 Hz programmable

Binary inputs and outputs

- Four binary inputs with common ground
- Two NO double-pole outputs with TCM
- Two NO single-pole outputs
- One Form C signal output
- One Form C self-check alarm output
- Additional seven binary inputs plus three binary outputs (available as an option)

Communication

- IEC 61850-8-1 with GOOSE messaging
- DNP3.0 Level 2+ over TCP/IP
- Modbus over TCP/IP
- Time synchronization via SNTP (primary and backup servers)
- Optional serial RS-485 port programmable for DNP3.0 Level 2+ or Modbus RTU
- IRIG-B time synchronization with the RS-485 option

Control voltage

- Option 1: 48 ... 250 V dc, 100 ... 240 V ac
- Option 2: 24 ... 60 V dc

Product dimensions and weights

- Frame: 6.97" (177 mm) W x 6.97" (177 mm) H
- Case: 6.57" (165 mm) W x 6.30" (160 mm) H x 6.10" (155 mm)
- Weight: Relay - 7.72 lbs. (3.5 kg); Draw-out unit - 3.97 lbs. (1.8 kg)

Tools

- PCM600 V2.0 SP1 for setting, configuration and data retrieval
- COM600 Station Automation series products V3.2
- Web browser based user interface (IE 6.0 or later)



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