

RET615 ANSI

Transformer protection and control



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REF615 ANSI 5.0 FP1

RET615 is a member of ABB's Relion® product family and a part of its 615 protection and control product series. The 615 series 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 between substation automation devices.

Application

The RET615 is the ultimate protection and control relay for two-winding power transformers and power generator-transformer blocks. It can be applied for protection and control of the most commonly used power transformer combinations of delta and wye (grounded or ungrounded) windings. Flexible order coding allows for choosing current-only or current-and-voltage configurations to best fit your transformer application needs.

Protection and control

The RET615 features three-phase, multi-slope transformer differential protection with an unrestrained stage and a restrained stage to provide fast and selective protection for phase-to-phase, winding interturn and bushing flash-over faults. Besides second harmonic restraint an advanced waveform-based blocking algorithm ensures stability at transformer

The RET615 is a dedicated transformer protection and control IED for power transformers, unit and step-up transformers including power generator-transformer blocks in utility and industry power distribution systems.

energization and a fifth harmonic restraint function ensures good protection stability at moderate overexcitation of power transformers.

Sensitive restricted earth-fault protection (REF) completes the overall differential protection to detect even single phase-to-ground faults close to the grounded neutral of the transformer.

The low-impedance REF protection uses neither stabilizing resistors nor varistors and allows the ratio of the grounded neutral CT to differ from the phase current transformer ratios. Because the REF protection characteristics do not need time grading with other protection schemes, high-speed fault clearance may be achieved. The RET615 also includes a thermal overload protection function, which supervises the thermal stress of the transformer windings to prevent accelerated aging of the insulations. Multiple stages of phase and ground overcurrents are provided for both transformer windings plus optional voltage inputs for metering and protection of one transformer winding or both windings. A fast three-channel arc-fault protection system for arc flash supervision of the switchgear compartments is offered.

RET615 also integrates basic control functionality, which facilitates the control of two circuit breakers

via the front panel HMI or by means of remote controls. To protect from unauthorized access and to maintain the integrity of information, the relay has been provided with a four-level, role-based, user authentication system. The access control system applies to the front panel HMI, the web browser based HMI and the PCM600 Protection and Control IED Manager.

Standardized communication

RET615 genuinely supports the new IEC 61850 standard for inter-device communication in substations. It also supports the industry standard Modbus® protocol, and the well-established DNP3.0 protocol.

The implementation of the IEC 61850 substation communication standard in RET615 covers both vertical and horizontal communication, including GOOSE messaging and parameter setting according to IEC 61850-8-1. The substation configuration

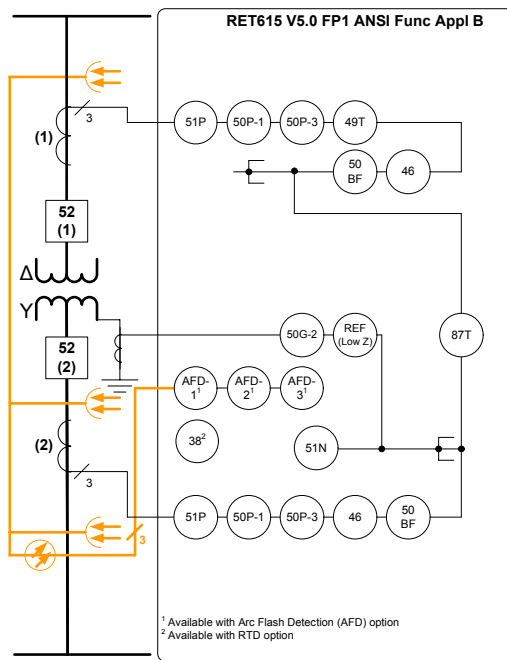
language enables the use of engineering tools for efficient configuration and commissioning of substation devices. For accurate time stamping RET615 supports synchronization over Ethernet using SNTP or over a separate bus using IRIG-B.

Bus protection via GOOSE

The IEC 61850 implementation in RET615 also includes fast peer-to-peer communication over the substation bus. GOOSE communication is used between RET615 and REF615 relays of the incoming and outgoing feeders of a substation to cooperate and form a stable, reliable and high-speed busbar protection system. The cost-effective GOOSE-based busbar protection is obtained just by configuring the IEDs and the operational availability of the protection IEDs and their GOOSE messaging over the station bus. No separate hard-wiring is needed for the horizontal communication between the switchgear cubicles.

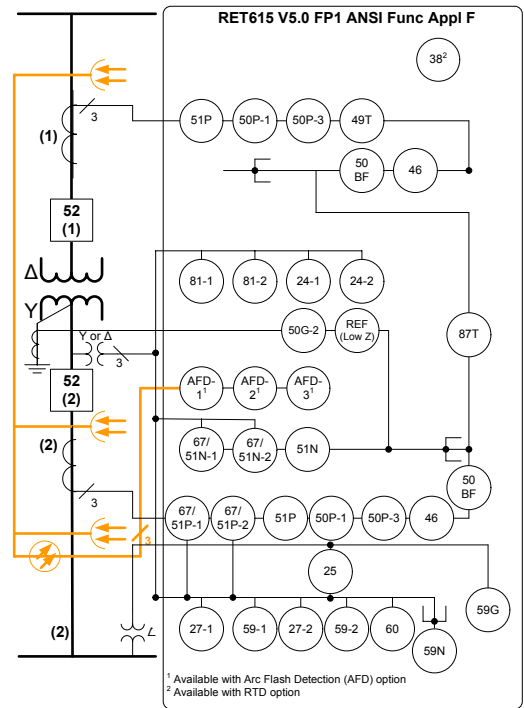
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01 RET615 V5.0 FP1 ANSI Functional Application B



02 RET615 V5.0 FP1 ANSI Functional Application F

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Functions and features

Included = •, Optional = ◦	ANSI Function	RET615 Functional Application					
		Firmware version 4.0, 4.2				Firmware version 5.0 FP-1	
		A	B	C	D	B	F
Protection							
Phase percentage differential (two windings), restrained and unrestrained	87T, 87H	•	•	•	•	•	•
Phase overcurrents (Winding 1)	51P (1), 50P (1)	•	•	•	•	•	•
Phase overcurrents (Winding 2)	51P (2), 50P (2)	•	•	•	•	•	•
Directional phase overcurrent	67P	—	•	•	•		•
Phase power directional	32P	—	—	—	—		
Neutral overcurrents (Winding 1)	51N (1), 50N (1)	•	•	•	•		
Neutral overcurrents (Winding 2)	51N (2), 50N (2)	•	•	•	•	•	•
Ground overcurrents	51G, 50G	•	•	•	•	•	•
Directional neutral overcurrent	67N	—	•	•	•		•
Neutral power directional	32N	—	—	—	—		
Thermal overload	49T	•	•	•	•	•	•
Undercurrent	37	•	•	•	•		
Restricted earth fault (REF), low impedance (Winding 2)	87LOZREF	•	•	•	•	•	•
Negative sequence overcurrent (Winding 1)	46 (1)	•	•	•	•	•	•
Negative sequence overcurrent (Winding 2)	46 (2)	•	•	•	•	•	•
Load sheds and restorations	81LSH	—	•	•	•		
Underfrequencies, overfrequencies, rate-of-changes	81	—	•	•	•		•
Overexcitation	24	—	•	•	•		•
Resistive thermal devices (RTD)	38	—	•	2	—	•	•
Phase undervoltage	27	—	•	•	•		•
Phase overvoltage	59	—	•	•	•		•
Phase sequence overvoltage	47	—	•	•	•		
Ground overvoltage	59G	—	•	•	—		•
Neutral overvoltage	59N	—	•	•	•		•
Circuit breaker failure	50BF	•	•	•	•	•	•
Electrically latched/self-resetting trip digital outputs	86/94	•	•	•	•	•	•
Arc flash detection via three lens sensors	AFD-1, AFD-2, AFD-3	•	•	•	•	•	•
Control							
Circuit breaker control	52 (1), 52 (2)	•	•	•	•	•	•
Control for disconnect						•	•
Control for earthing switch						•	•
Synchronism and energizing check	25						•
Number of pages in HMI		1	1	1	1	2	2
Customizable HMI		•	•	•	•	•	•
User programmable LED's		11	11	11	11	11	11
User programmable push buttons		—	—	—	—	—	—
Monitoring and supervision							
Trip circuit monitoring	TCM	•	•	•	•	•	•
Breaker condition monitoring	52CM	• ⁽¹⁾	• ⁽¹⁾	• ⁽¹⁾	• ⁽¹⁾	•	•
Advanced current circuit supervision for transformers	MCS, 3I, I2	—	—	—	—		
Fuse failure	60	—	•	•	•		•
Tap changer position	84T	•	•	•	•	•	•
Open CT secondary monitoring (Windings 1 & 2)	CTSRCTF	•	•	•	•		

		RET615 Functional Application					
		Firmware version 4.0, 4.2				Firmware version 5.0 FP-1	
Included = •, Optional = ◦	ANSI Function	A	B	C	D	B	F
Metering							
Three-phase currents (Winding 1)	IA, IB, IC (1)	•	•	•	•	•	•
Three-phase currents (Winding 2)	IA, IB, IC (2)	•	•	•	•	•	•
Sequence currents (Winding 1)	I1, I2, I0 (1)	•	•	•	•	•	•
Sequence currents (Winding 2)	I1, I2, I0 (2)	•	•	•	•		
Ground current	IG	•	•	•	•	•	•
Demand values (Windings 1 & 2)		•	•	•	•	•	•
Maximum and minimum demand values (Windings 1 & 2)		•	•	•	•	•	•
Three-phase voltages	VA, VB, VC	—	•	•	•		•
Sequence voltages	V1, V2, V0	—	•	•	•		•
Ground voltage	VG	—	•	•	—		•
RTD/mA measurement						•	•
Frequency	f	•	•	•	•		•
Power and energy (1-phase, 3-phases) and power factor	P, E, and PF	—	•	•	•		•
Automation and communications							
Max number of Digital Inputs		14	12	8	11	14	12
Max number of Digital Outputs		13	10	10	10	13	10
Max number of High-Speed Outputs (HSO's are optional and take the place of some digital outputs)		3	3	3	3	3	3
Sample values per IEC 61850-9-2LE							•
Front 100Base-TX Ethernet (RJ45) port		•	•	•	•	•	•
Rear 100Base-TX Ethernet (RJ45) port		•	•	•	•	•	•
Rear 100Base-FX Ethernet (LC) port		•	•	•	•	•	•
Rear 100Base-TX Ethernet(RJ45) + RS-485(1x4-wire or 2x2-wire) + IRIG-B ports		•	•	•	•	•	•
Rear [2 * Ethernet 100FX (LC) + Ethernet 10/100BaseT (RJ45) + serial glass fiber (ST)] w HSR/PRP2			• ⁽²⁾		• ⁽²⁾	•	•
Rear 100Base-FX Ethernet(LC) + RS-485(1x4-wire or 2x2-wire) + IRIG-B ports		•	•	•	•	•	•
Rear 100Base-TX and -FX Ethernet (1 * LC, 2 * RJ45) + serial glass fiber (ST) ports w HSR/PRP2		•	•	•	•	•	•
Rear 100Base-TX Ethernet (3 * RJ45) + serial glass fiber (ST) ports w HSR/PRP2		•	•	•	•	•	•
Ethernet 100Base-TX (RJ45) + configurable RS232/RS485 + [RS485 or serial glass fiber (ST) + IRIG-B] ports ⁽³⁾		•	•	•	•	•	•
All three DNP3.0, Modbus, and IEC61850 communication protocols		•	•	•	•	•	•
Records							
Sequence of events recorder	SER	•	•	•	•	•	•
Fault recorder	FLR	•	•	•	•	•	•
Digital fault (waveform) recorder	DFR	•	•	•	•	•	•
Load profile	LoadProf	-	-	-	-	•	•
Digital Fault Recorder signal channels (Analog/Digital)		4/64	4/64	4/64	4/64	12/64	12/64
Events recorder (FIFO), 1ms resolution		1024	1024	1024	1024	1024	1024
Fault records		128	128	128	128	128	128

1 Applicable for two breakers

2 Firmware version 4.2 must be selected

3 Not available with Arc Flash Detection (AFD) option

Analog inputs

- Three phase currents: 5/1 A programmable
- Ground current: 5/1 A programmable or 0.2 A
- Rated frequency: 60/50 Hz programmable
- Three-phase and ground voltages: programmable nominal secondary voltage (available as options)

Binary inputs and outputs

- Four, eight with VT inputs, binary inputs standard
- Two NO outputs with trip circuit monitoring
- Three NO outputs
- One Form C output and self-check alarm output
- Additional binary inputs and outputs available as options

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
- Optional IRIG-B time synchronization
- Optional HSR/PRP communication
- Optional IEEE1588v2 time synchronization (available with REF615 V5.0 and later)
- IEC61850-9-2LE (available with REF615 V5.0 and later)

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 V2.8 for setting, configuration and data retrieval
- COM600 Station Automation series products V5.0
- Web browser based user interface (IE 11 or later)

Certificates

- UL Listed product, File E103204

Control voltage

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

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Notes

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Notes

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abb.com/mediumvoltage
abb.com/substationautomation

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