



Relion® 615 series

Transformer protection and control RET615

Compact and versatile solution for utility
and industrial power distribution systems

Compact protection and control for two-winding power transformers

RET615 is a dedicated transformer protection and control relay 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.

Application

RET615 has been designed to be the main protection for two-winding power transformers and power generator-transformer blocks. RET615 is available in eight standard configurations to match the most commonly employed power transformer vector groups, and to coordinate the applied transformer neutral earthing principle with the relevant earth-fault protection scheme. The standard configurations can be tailored to meet application-specific requirements using the IEC 61850-compliant Protection and Control IED Manager PCM600.

The standard configurations are intended for either power transformers with earthed HV-side neutrals or with effectively earthed LV-side neutrals, alternatively with a neutral earthing resistor on the LV-side. There is also a choice between either low or high-impedance restricted earth-fault (REF) protection. Some standard configurations include phase-voltage protection and measurement functions which provide two-stage power transformer overvoltage and undervoltage protection and/or supervision.

RET615 features three-phase transformer differential protection, one multi-slope stabilized (biased) stage and one instantaneous stage, providing a fast and selective protection for phase-to-phase short circuits, winding interturn-faults and bushing flash-overs. To minimize the effects of an arc fault, RET615 can be equipped with high-speed outputs, decreasing the operate time by four to six milliseconds compared to conventional binary outputs.

Human-machine interface

As a member of the Relion® product family, RET615 shares the same human-machine interface (HMI) look and feel as the other Relion protection and control relays and IEDs. The same look and feel includes the location of a push button with a certain function and the menu structure.

RET615 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

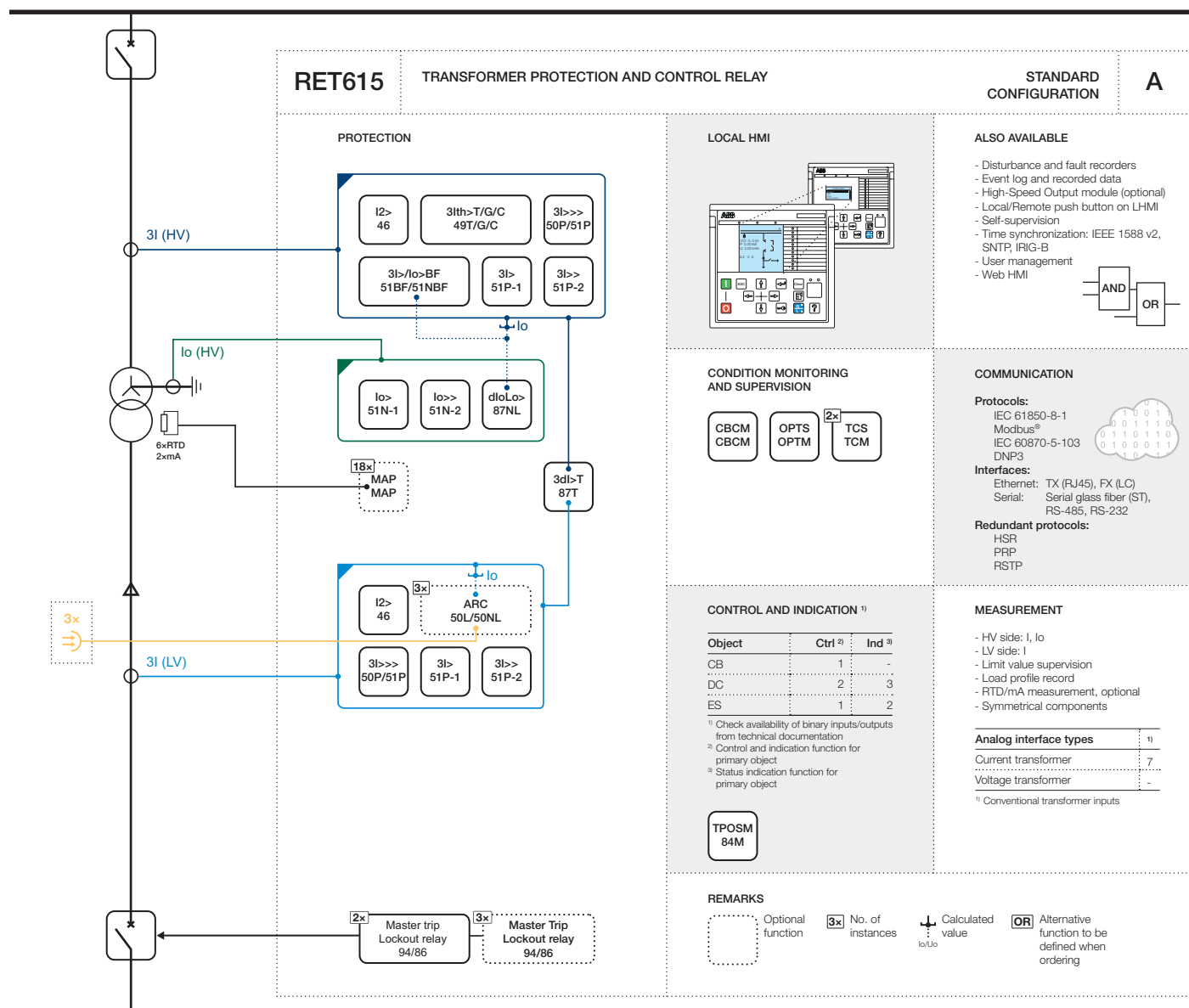
accessed not only locally but also via the web browser-based HMI that has now been enriched with a number of usability enhancing features.

Standardized communication and redundancy

RET615 fully supports the IEC 61850 standard for communication and interoperability of substation automation devices, including fast GOOSE messaging and IEC 61850-9-2 LE, and can now also benefit from the extended interoperability provided by Edition 2. The transformer relay further supports both the parallel redundancy protocol (PRP) and the high-availability seamless redundancy (HSR) protocol, together with the DNP3, IEC 60870-5-103 and Modbus® protocols. With the protocol adapter SPA-ZC 302, Profibus DVP1 can also be used. RET615 is able to use two communication protocols simultaneously.

For redundant Ethernet communication, RET615 offers either two optical or two galvanic Ethernet network interfaces. A third port with a galvanic Ethernet network interface provides connectivity of any other Ethernet device to an IEC 61850 station bus inside a switchgear bay. 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 RET615 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. Also IEC 61850-9-2 LE process bus with sending sampled values of not only analog voltages but now also currents, in addition to receiving sampled values of voltages, is supported. 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, RET615 supports synchronization over Ethernet using SNTP or over a separate bus using IRIG-B.



Function overview of RET615 standard configuration A

Main benefits

- Withdrawable plug-in unit design for swift installation and testing
- Extensive range of protection and control functionality for two-winding power transformers, including advanced and fast differential protection with high inrush stability
- Ready-made standard configurations – matching the most commonly employed vector groups – for fast and easy setup with tailoring capabilities
- Support for various neutral earthing options, matching either high-impedance or numerically low-impedance restricted earth-fault principles
- 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

615 series

RET615 is a member of ABB's Relion product family and part of its 615 protection and control series of relays, characterized by compactness and withdrawable plug-in unit design. In addition to RET615, the 615 series includes the following relays:

- REF615 Feeder protection and control
- RED615 Line differential protection and control
- REU615 Voltage protection and control
- REM615 Motor protection and control
- REV615 Capacitor bank protection and control
- REG615 Generator and interconnection protection

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.

Standard configurations

Standard configurations

Description	Standard configuration
Transformer differential with low-impedance restricted earth-fault protection on the HV side	A
Transformer differential with low-impedance restricted earth-fault protection on the LV side	B
Transformer differential with high-impedance restricted earth-fault protection on the HV side	C
Transformer differential with high-impedance restricted earth-fault protection on the LV side	D

Supported functions, codes and symbols

Functionality

Protection

Three-phase non-directional overcurrent protection, low stage

Three-phase non-directional overcurrent protection, high stage

Three-phase non-directional overcurrent protection, instantaneous stage

Non-directional earth-fault protection, low stage

Non-directional earth-fault protection, high stage

Negative-sequence overcurrent protection

Residual overvoltage protection

Three-phase undervoltage protection

Three-phase overvoltage protection

Three-phase thermal overload protection for power transformers, two time constants

Stabilized and instantaneous differential protection for two-winding transformers

Numerical stabilized low impedance restricted earth-fault protection

High impedance based restricted earth-fault protection

Circuit breaker failure protection

Master trip

Arc protection

Multi-purpose protection

Control

Circuit-breaker control

Disconnecter control

Earthing switch control

Disconnecter position indication

Earthing switch indication

Tap changer position indication

Standard configurations

Description	Standard configuration
Transformer differential with voltage protection and measurements, and low-impedance restricted earth-fault protection on the HV side	E
Transformer differential with voltage protection and measurements, and low-impedance restricted earth-fault protection on the LV side	F
Transformer differential with voltage protection and measurements, and high-impedance restricted earth-fault protection on the HV side	G
Transformer differential with voltage protection and measurements, and high-impedance restricted earth-fault protection on the LV side	H

1, 2,... = number of included instances / I/Os
() = optional

	IEC 61850	IEC 60617	IEC-ANSI	A	B	C	D	E	F	G	H
	PHLPTOC1	3I> (1)	51P-1 (1)	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV
	PHLPTOC2	3I> (2)	51P-1 (2)	1 LV	1 LV	1 LV	1 LV	1 LV	1 LV	1 LV	1 LV
	PHHPTOC1	3I>> (1)	51P-2 (1)	1 HV	HV	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV
	PHHPTOC2	3I>> (2)	51P-2 (2)	1 LV	1 LV	1 LV	1 LV	1 LV	1 LV	1 LV	1 LV
	PHIPTOC1	3I>>> (1)	50P/51P (1)	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV
	PHIPTOC2	3I>>> (2)	50P/51P (2)	1 LV	1 LV	1 LV	1 LV	1 LV	1 LV	1 LV	1 LV
	EFLPTOC1	I0> (1)	51N-1 (1)	1 HV	-	1 HV 1)	-	1 HV	-	1 HV 1)	-
	EFLPTOC2	I0> (2)	51N-1 (2)	-	1 LV	-	1 LV 2)	-	1 LV	-	1 LV 2)
	EFHPTOC1	I0>> (1)	51N-2 (1)	1 HV	-	1 HV 1)	-	1 HV	-	1 HV 1)	-
	EFHPTOC2	I0>> (2)	51N-2 (2)	-	1 LV	-	1 LV 2)	-	1 LV	-	1 LV 2)
	NSPTOC1	I2> (1)	46 (1)	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV
	NSPTOC2	I2> (2)	46 (2)	1 LV	1 LV	1 LV	1 LV	1 LV	1 LV	1 LV	1 LV
	ROVPTOV	U0>	59G	-	-	-	-	2 HV)	2 HV	2 HV	2 HV
	PHPTUV	3U<	27	-	-	-	-	2 HV	2 HV	2 HV	2 HV
	PHPTOV	3U>	59	-	-	-	-	2 HV	2 HV	2 HV	2 HV
	T2PTTR	3Ith>T/G/C	49T/G/C	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV
	TR2PTDF	3dI>T	87T	1	1	1	1	1	1	1	1
	LREFPNDF	dIoLo>	87NL	1 HV	1 LV)	-	-	1 HV	1 LV)	-	-
	HREFPDIF	dIoHi>	87NH	-	-	1 HV	1 LV 3)	-	-	1 HV	1 LV 3)
	CCBRBRF	3I>/I0>BF	51BF/51NBF	1 HV 1)	1 HV 1)	1 HV 1)	1 HV 1)	1 HV 1)	1 HV 1)	1 HV 1)	1 HV 1)
	TRPPTRC	Master Trip	94/86	2(5) ⁴⁾	2(5) ⁴⁾	2(5) ⁴⁾	2(5) ⁴⁾	2(5) ⁴⁾	2(5) ⁴⁾	2(5) ⁴⁾	2(5) ⁴⁾
	ARCSARC	ARC	50L/50NL	(3) LV 5)	(3) LV 5)	(3) LV 5)	(3) LV 5)	(3) LV 5)	(3) LV 5)	(3) LV 5)	(3) LV 5)
	MAPGAPC	MAP	MAP	18	18	18	18	18	18	18	18
	CBXCBR	I ↔ O CB	I ↔ O CB	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV
	DCXSWI	I ↔ O DCC	I ↔ O DCC	2	2	2	2	2	2	2	2
	ESXSWI	I ↔ O ESC	I ↔ O ESC	1	1	1	1	1	1	1	1
	DCSXSWI	I ↔ O DC	I ↔ O DC	3	3	3	3	3	3	3	3
	ESSXSWI	I ↔ O ES	I ↔ O ES	2	2	2	2	2	2	2	2
	TPOSSLTC	TPOSM	84M	1	1	1	1	1	1	1	1

Standard configurations

Supported functions, codes and symbols

Functionality

Condition Monitoring

- Circuit-breaker condition monitoring
- Trip circuit supervision
- Runtime counter for machines and devices
- Fuse failure supervision

Measurement

- Disturbance recorder
- Load profile record
- Fault record
- Three-phase current measurement
- Sequence current measurement
- Residual current measurement
- Three-phase voltage measurement
- Residual voltage measurement
- Sequence voltage measurement
- Three-phase power and energy measurement
- RTD/mA measurement
- IEC 61850-9-2 LE sampled value sending ^{6) 7)}
- IEC 61850-9-2 LE sampled value receiving (voltage sharing) ^{6) 7)}

1, 2,... = number of included instances / I/Os
() = optional

	IEC 61850	IEC 60617	IEC-ANSI	A	B	C	D	E	F	G	H
	SSCBR	CBCM	CBCM	1 ^{HV}	1 ^{HV}	1 ^{HV}	1 ^{HV}	1 ^{HV}	1 ^{HV}	1 ^{HV}	1 ^{HV}
	TCSSCBR	TCS	TCM	2	2	2	2	2	2	2	2
	MDSOPT	OPTS	OPTM	1	1	1	1	1	1	1	1
	SEQRFUF	FUSEF	60	-	-	-	-	1	1	1	1
	RDRE	DR	DFR	1	1	1	1	1	1	1	1
	LDPMSTA	LOADPROF	LOADPROF	1	1	1	1	1	1	1	1
	FLTRFRC	FAULTREC	FAULTREC	1	1	1	1	1	1	1	1
	CMMXU1	3I (1)	3I (1)	1 ^{HV}	1 ^{HV}	1 ^{HV}	1 ^{HV}	1 ^{HV}	1 ^{HV}	1 ^{HV}	1 ^{HV}
	CMMXU2	3I (2)	3I (2)	1 ^{LV}	1 ^{LV}	1 ^{LV}	1 ^{LV}	1 ^{LV}	1 ^{LV}	1 ^{LV}	1 ^{LV}
	CSMSQI	I1, I2, IO	I1, I2, IO	1 ^{HV}	1 ^{HV}	1 ^{HV}	1 ^{HV}	1 ^{HV}	1 ^{HV}	1 ^{HV}	1 ^{HV}
	RESCMMXU1	Io (1)	In (1)	1 ^{HV}	-	1 ^{HV}	-	1 ^{HV}	-	1 ^{HV}	-
	RESCMMXU2	Io (2)	I2 (2)	-	1 ^{LV}	-	1 ^{LV}	-	1 ^{LV}	-	1 ^{LV}
	VMMXU	3U	3V	-	-	-	-	1 ^{HV}	1 ^{HV}	1 ^{HV}	1 ^{HV}
	RESVMMXU	Uo	Vn	-	-	-	-	1 ^{HV}	1 ^{HV}	1 ^{HV}	1 ^{HV}
	VSMSQI	U1, U2, U0	V1, V2, V0	-	-	-	-	1 ^{HV}	1 ^{HV}	1 ^{HV}	1 ^{HV}
	PEMMXU	P, E	P, E	-	-	-	-	1 ^{HV}	1 ^{HV}	1 ^{HV}	1 ^{HV}
	XRGGIO130	X130 (RTD)	X130 (RTD)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
	SMVSENDER	SMVSENDER	SMVSENDER	-	-	-	-	(1)	(1)	(1)	(1)
	SMVRCV	SMVRCV	SMVRCV	-	-	-	-	(1)	(1)	(1)	(1)

- 1) "Io calculated" is always used.
 - 2) IoB calculated is always used.
 - 3) "IoB measured" is always used.
 - 4) Master trip is included and connected to the corresponding HSO in the configuration only when the BIO0007 module is used. If additionally the ARC option is selected, ARCSARC is connected in the configuration to the corresponding master trip input.
 - 5) "IoB calculated" and "3IB" are always used.
 - 6) Available only with IEC 61850-9-2
 - 7) Available only with COM0031-0037
- HV = The function block is to be used on the high-voltage side in the application.
LV = The function block is to be used on the low-voltage side in the application.

Contact us

For more information, please refer to
RET615 Product Guide, or contact us

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