

RELION® PRODUCT FAMILY

Grid automation relays REC615 and RER615

Protection of cable feeders and overhead lines with superior fault detection and location



Compact and versatile solution for making grids smarter

Grid automation protection and control relays, REC615 and RER615, are designed for remote control and monitoring, protection, fault indication, power quality analyzing and automation in medium voltage secondary distribution systems.

REC615, grid automation protection and control relay, and RER615, recloser protection and control relay, are suitable for a wide variety of power distribution networks, which can include distributed power generation, secondary equipment such as medium voltage disconnectors, breakers, switches, ring main units or reclosers. REC615 and RER615 are a member of the Relion® product family. The Relion family relays have been designed to unleash the full potential of the IEC 61850 standard for communication and interoperability between substation automation devices.

Application

With REC615 and RER615, grid reliability are enhanced, ranging from basic, non-directional overload protection to extended protection functionality with power quality analyses. Thus, REC615/RER615 meets today's requirements for smart grids and supports the protection of cable feeders and overhead lines in isolated neutral, resistance-earthed, compensated and solidly earthed networks. REC615 and RER615 are freely programmable with horizontal GOOSE communication, thus enabling sophisticated interlocking functions. The new adaptable standard configurations allow for this relay to be taken into use as soon as the application-specific parameters have been set.

REC615 and RER615 provide superior fault location, isolation and restoration (FLIR) to lower the frequency and shorten the duration of power outages. REC615 and RER615 also include advanced earth-fault detection methods that can detect developing faults in the network before they cause an outage.

REC615 and RER615 offer a variety of features to enhance grid reliability and functionality.

- Multiple controllable objects (up to ten objects including two breakers)
- Powerful in compensated networks (including recloser tripping curves)
- Sophisticated protection functionality to detect, isolate and restore power in all types of networks
- Integrated power quality measurement, including voltage dips and swells logging
- Freely programmable
- Load profile and event logging
- Flexible autoreclosing function
- Six easily manageable setting groups
- Adaptable standard configurations for rapid commissioning
- Web-based parametrization tool with download possibility
- Same configuration tools as for other Relion product family relays such as the 615, 620, 630 and 640 series
- Cyber security features such as audit trail
- Withdrawable-unit design
- Large, easy-to-read LCD screen with SLD, local control and parametrization possibilities with dedicated push buttons for safe and easy operation
- Four programmable function keys to support direct access of additional control functions
- IEC 60870-5-101/104, DNP3 level 2, Modbus or IEC 61850 with GOOSE messaging communication for high-speed protection, fault isolation and restoration
- Extendable I/O with RIO600
- Environmentally-friendly design with RoHS compliance

Human Machine Interface

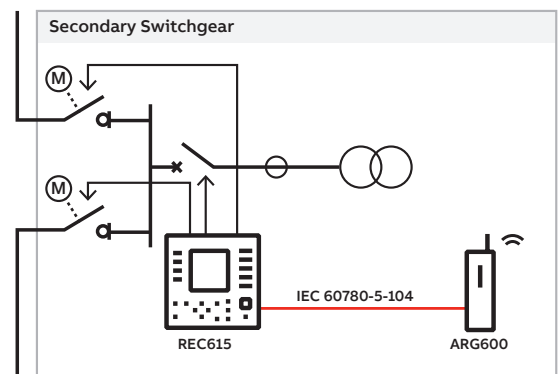
As a member of the Relion product family, REC615 and RER615 share the same Human Machine Interface (HMI) look and feel as the other Relion family relays. This has the added benefit that once you become familiar with one Relion relay, you can use them all.

REC615 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 the PCM600 IED tool 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.

Four programmable function keys support direct access of additional control functions (e.g. Hotline tag, non-reclose mode, enable/disable protection function). Eleven freely configurable and programmable two-color LEDs are available to visualize the status and alarms.

Two breakers and up to eight load-break switches or one recloser can be controlled via the relay's front panel HMI or a remote control system. To protect the relay from unauthorized access and to maintain the integrity of information, the relay is provided with a four-level,

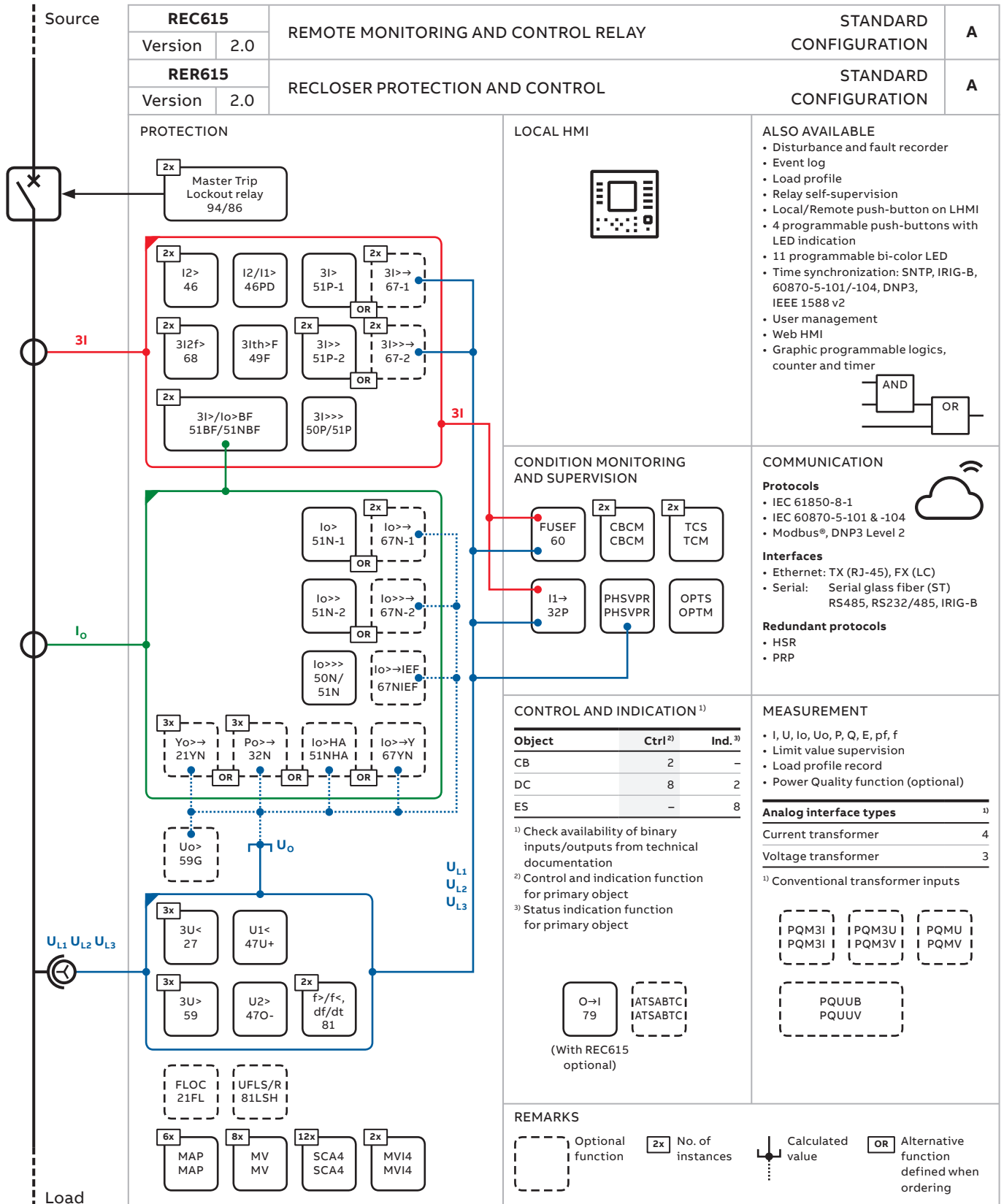
role-based user authentication system, with individual passwords for the viewer, operator, engineer and administrator levels. The access control system applies to the front panel HMI, embedded Web browser-based HMI and Protection and Control IED Manager PCM600.

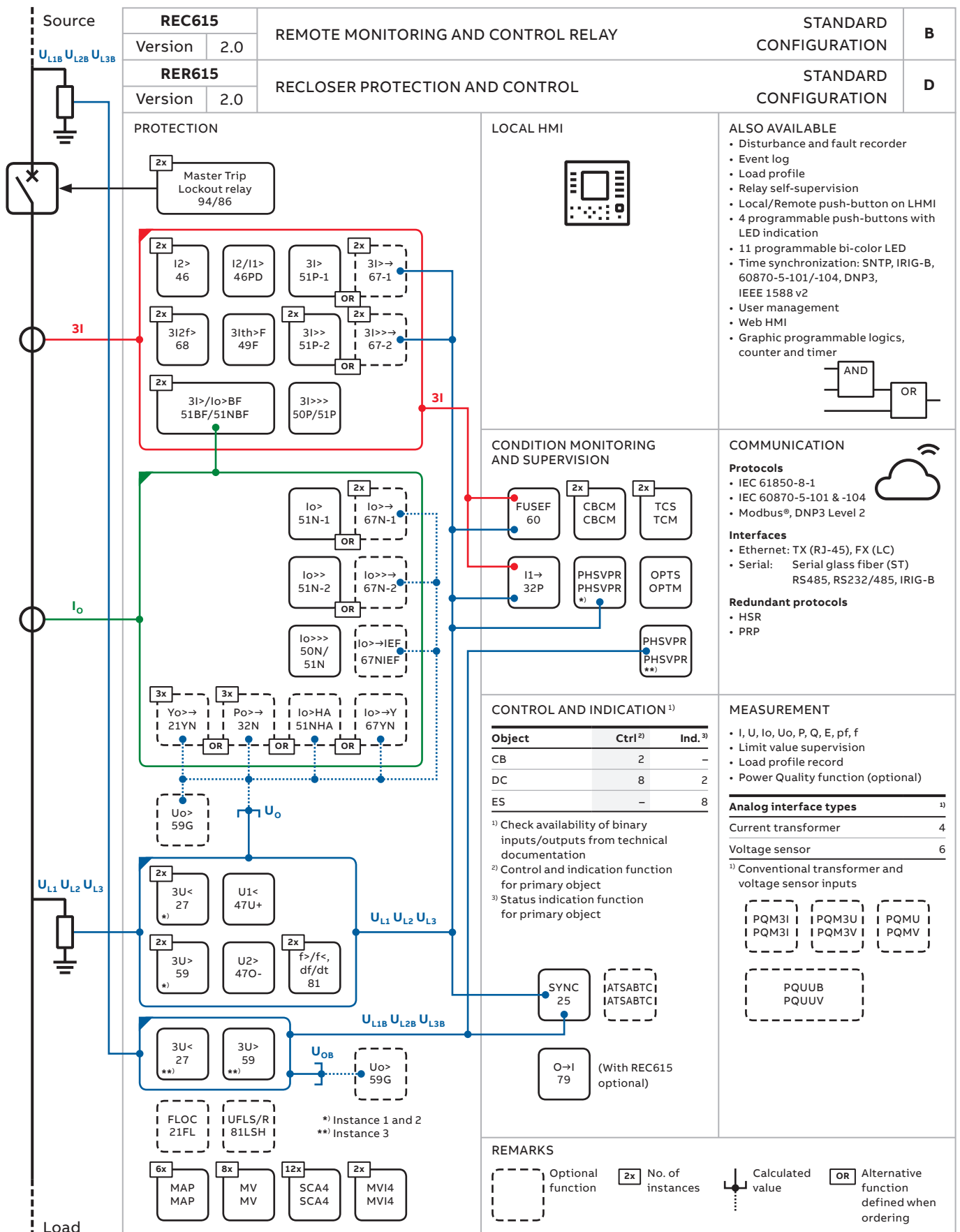


Standardized communication

REC615 and RER615 support a variety of communication protocols for remote communication, such as IEC 60870-5-101/104, DNP3 level 2 and Modbus, simultaneously also supporting IEC 61850 with GOOSE messaging.

Function overview





Standard configurations

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

Configuration	Code			REC615 / RER615					
Function	IEC 61850	IEC 60617	IEC-ANSI	A / A	B / D	C / -	E / E	F / -	G & H / -
Protection									
Three-phase non-directional overcurrent protection, low stage	PHLPTOC	3I>	51P-1	(1)	(1)	(1)	(1)		
	FPHLPTOC	F3I>	F51P-1	(1)	(1)	(1)	(1)		
Three-phase non-directional overcurrent protection, high stage	PHHPTOC	3I>>	51P-2	(1)	(1)	(1)	(1)		
Three-phase non-directional overcurrent protection, instantaneous stage	PHIPTOC	3I>>>	50P/51P	1	1	1	1	1	2 ⁶⁾
Three-phase directional overcurrent protection, low stage	DPHLPDOC	3I> →	67-1	(2)	(2)	(2)	(2)	2 ⁷⁾	4 ^{3) 6) 7)}
	FDPHLPDOC	F3I> →	F67-1	(2)	(2)	(2)	(2)		
Three-phase directional overcurrent protection, high stage	DPHHPDOC	3I>> →	67-2	(1)	(1)	(1)	(1)	2 ⁷⁾	4 ^{3) 6) 7)}
Non-directional earth-fault protection, low stage	EFLPTOC	Io>	51N-1	(1)	(1)	(1)	(1) ⁴⁾		
	FEFLPTOC	Flo>	F51N-1	(1)	(1)	(1)	(1) ⁴⁾		
Non-directional earth-fault protection, high stage	EFHPTOC	Io>>	51N-2	(1)	(1)	(1)	(1) ⁴⁾		
Non-directional earth-fault protection, instantaneous stage	EFIPTOC	Io>>>	50N/51N	1	1	1	1 ⁴⁾	1	1
Directional earth-fault protection, low stage	DEFLPDEF	Io> →	67N-1	(2) ¹⁾	(2) ¹⁾	(2) ¹⁾	(2) ^{1) 4)}	2 ⁷⁾	4 ^{1) 2) 3) 5) 6) 7)}
	FDEFLPDEF	Flo> →	F67N-1	(2) ¹⁾	(2) ¹⁾	(2) ¹⁾	(2) ^{1) 4)}		
Directional earth-fault protection, high stage	DEFHPDEF	Io>> →	67N-2	(1) ¹⁾	(1) ¹⁾	(1) ¹⁾	(1) ^{1) 4)}	2 ⁷⁾	4 ^{1) 2) 3) 5) 6) 7)}
Transient / intermittent earth-fault protection	INTRPTEF	Io> → IEF	67NIEF	(1) ¹⁾	(1) ¹⁾	(1) ¹⁾	(1) ^{1) 4)}		
Admittance based earth-fault protection	EFPADM	Yo> →	21YN	(3) ¹⁾	(3) ¹⁾	(3) ¹⁾	(3) ^{1) 4)}		
Wattmetric based earth-fault protection	WPWDE	Po> →	32N	(3) ¹⁾	(3) ¹⁾	(3) ¹⁾	(3) ^{1) 4)}		
Harmonics based earth-fault protection	HAEPPTOC	Io>HA	51NHA	(1)	(1)	(1)	(1) ⁴⁾		
Multi-frequency Admittance based earth fault protection	MFADPSDE	Io> → Y	67YN	(1) ¹⁾	(1) ¹⁾	(1) ¹⁾	(1) ^{1) 4)}	1 ⁷⁾	2 ^{1) 2) 5) 7)}
Negative-sequence overcurrent protection	NSPTOC	I2>	46	2	2	2	2		
Phase discontinuity protection	PDNSPTOC	I2/I1>	46PD	1	1	1	1	1	1
Residual overvoltage protection	ROVPTOV	Uo>	59G	(1) ¹⁾	(2) ^{1) 2)}	(1) ¹⁾	(2) ^{1) 2)}	1 ⁷⁾	2 ^{1) 7)}
Three-phase undervoltage protection	PHPTUV	3U<	27	(3)	(3) ³⁾	(3)	(3) ³⁾	1 ⁷⁾	2 ^{3) 7)}
Three-phase overvoltage protection	PHPTOV	3U>	59	(3)	(3) ³⁾	(3)	(3) ³⁾	1 ⁷⁾	2 ^{3) 7)}
Positive-sequence undervoltage protection	PSPTUV	U1<	47U+	(1)	(1)	(1)	(1)		
Negative-sequence overvoltage protection	NSPTOV	U2>	47O-	(1)	(1)	(1)	(1)		
Loss of phase (undercurrent)	PHPTUC1	3I< (1)	37 (1)						2 ⁶⁾
Frequency protection	FRPFRQ	f>/f<,df/dt	81	(2)	(2)	(2)	(2)	17)	2 ^{3) 7)}
Three-phase thermal protection for feeders, cables and distribution transformers	T1PTTR	3Ith>F	49F	1	1	1	1	1	1
Circuit breaker failure protection	CCBRBRF	3I>/Io>BF	51BF/51NBF	2	2	2	2 ⁴⁾	1	2 ^{5) 6)}
Three-phase inrush detector	INRPHAR	3I2f>	68	1	1	1	1	1	1
Master trip	TRPPTRC	Master Trip	94/86	2	2	2	2	2	2
Multi-purpose protection	MAPGAPC	MAP	MAP	6	6	6	6	2	2
Load shedding and restoration	LSHDPFRQ	UFLS/R	81LSH	(1)	(1)	(1)	(1)	1 ⁷⁾	2 ^{3) 7)}
Fault locator	SCEFRFLO	FLOC	21FL	(1)	(1)	(1)	(1)	1 ⁷⁾	1 ⁷⁾
Phase power directional function	DPSRDIR	I1→	32P	1	1	1	1	1	2 ^{3) 6)}
Power Quality									
Current total demand distortion	CMHAI	PQM3I	PQM3I	(1)	(1)	(1)	(1)		
Voltage total harmonic distortion	VMHAI	PQM3U	PQM3V	(1)	(1)	(1)	(1)		
Voltage variation	PHQVVR	PQMU	PQMV	(1)	(1)	(1)	(1)		
Voltage unbalance	VSQVUB	PQUUB	PQVUB	(1)	(1)	(1)	(1)		

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

Configuration	Code			REC615 / RER615					
Function	IEC 61850	IEC 60617	IEC-ANSI	A / A	B / D	C / -	E / E	F / -	G & H / -
Control									
Circuit-breaker control	CBXCBR	I ↔ O CB	I ↔ O CB	2	2	2	2	1	2
Disconnecter control	DCXSWI	I ↔ O DCC	I ↔ O DCC	8	8	8	8	4	8
Disconnecter position indication	DCSXSWI	I ↔ O DC	I ↔ O DC	2	2	2	2	1	2
Earthing switch indication	ESSXSWI	I ↔ O ES	I ↔ O ES	8	8	8	8	4	8
Auto-reclosing	DARREC	O → I	79	(1)/1	(1)/1	(1)	(1)/1	1 ⁷⁾	2 ⁷⁾
Synchronism and energizing check	SECRSYN	SYNC	25		1		1	1	
Automatic transfer switch,instance	ATSABTC	ATSABTC	ATSABTC	(1)	(1)	(1)	(1)	1 ⁷⁾	1 ⁷⁾
Condition Monitoring Control									
Circuit-breaker condition monitoring	SSCBR	CBCM	CBCM	2	2	2	2	1	2 ⁶⁾
Trip circuit supervision	TCSSCBR	TCS	TCM	2	2	2	2	2	2
Fuse failure supervision	SEQSPVC	FUSEF	60	1	1	1	1	1	2 ^{3) 6)}
Runtime counter for machines and devices	MDSOPT	OPTS	OPTM	1	1	1	1		
Voltage Precense	PHSVPR	PHSVPR	PHSVPR	1	2 ³⁾	1	2 ³⁾	1	2 ³⁾
Measurement and Logging									
Three-phase current measurement	CMMXU	3I	3I	1	1	1	1	1	2 ⁶⁾
Sequence current measurement	CSMSQI	I1, I2, IO	I1, I2, IO	1	1	1	1	1	2 ⁶⁾
Residual current measurement	RESCMMXU	Io	In	1	1	1		1	1
Three-phase voltage measurement	VMMXU	3U	3V	1	2 ³⁾	1	2 ³⁾	1	2 ³⁾
Residual voltage measurement	RESVMMXU	Uo	Vn					1	
Sequence voltage measurement	VSMSQI	U1, U2, U0	V1, V2, V0	1	2 ³⁾	1	2 ³⁾		2 ³⁾
Three-phase power and energy measurement	PEMMXU	P, E	P, E	1	1	1	1	1	2 ^{3) 6)}
Single-phase power and energy measurement	SPEMMXU	SP, SE	SP, SE	1	1	1	1	1	2 ^{3) 6)}
Frequency measurement	FMMXU	f	f	1	2 ³⁾	1	2 ³⁾	1	2 ³⁾
Load profile	LDPRLC	LOADPROF	LOADPROF	1	1	1	1	1	1
Other									
Minimum pulse timer (2 pcs)	TPGAPC	TP	TP	2	2	2	2	2	2
Minimum pulse timer (2 pcs, second resolution)	TPSGAPC	TPS	TPS	1	1	1	1	1	1
Minimum pulse timer (2 pcs, minute resolution)	TPMGAPC	TPM	TPM	1	1	1	1	1	1
Pulse timer (8 pcs)	PTGAPC	PT	PT	2	2	2	2	2	2
Time delay off (8 pcs)	TOFGAPC	TOF	TOF	2	2	2	2	2	2
Time delay on (8 pcs)	TONGAPC	TON	TON	2	2	2	2	2	2
Set reset (8 pcs)	SRGAPC	SR	SR	2	2	2	2	2	2
Move (8 pcs)	MVGAPC	MV	MV	8	8	8	8	8	8
Generic control point (16 pcs)	SPCGAPC	SPC	SPC	2	2	2	2	2	2
Remote generic control points	SPCRGAPC	SPCR	SPCR	2	2	2	2	2	2
Local generic control points	SPCLGAPC	SPCL	SPCL	1	1	1	1	1	1
Generic up-down counters	UDFCNT	UDCNT	UDCNT	3	3	3	3	3	3
Analog value scaling function	SCA4GAPC	SCA4	SCA4	12	12	12	12	12	12
Integer value moving function	MVI4GAPC	MVI4	MVI4	2	2	2	2	2	2
Daily timer function	DTMGAPC	DTMGAPC	DTMGAPC	2	2	2	2	2	2
Programmable buttons (4 buttons)	FKEY4GGIO1	FKEY4GGIO1	FKEY4GGIO1	1	1	1	1	1	1
Logging functions									
Disturbance recorder	RDRE	DR	DFR	1	1	1	1	1	1
Fault recorder	FLTRFRC	FAULTREC	FAULTREC	1	1	1	1	1	1

¹⁾ Uo calculated; ²⁾ UoB calculated; ³⁾ Voltage group B; ⁴⁾ Io calculated; ⁵⁾ IoB calculated; ⁶⁾ Current group B;

⁷⁾ Specific functional package to be selected for functional package 1 (G,H), 2 (C,D) and 3 (D)

Note that all directional protection functions can also be used in non-directional mode.

The instances of a protection function represent the number of identical function blocks available in the standard configuration.



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