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DESCRIPTIVE BULLETIN

REG615 ANSI
Generator protection and control

REG615 is a dedicated generator protection relay perfectly aligned for the protection, control, measurement and supervision of power generators in utility and industrial power distribution systems.

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REG615 ANSI 5.0 FP1

REG615 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 REG615, the 615 series includes the following relays:
- REF615 Feeder protection and control
- RED615 Line differential protection and control
- RET615 Transformer protection and control
- REM615 Motor protection and control

Application
REG615 is a dedicated generator protection relay for protection, control, measurement and supervision of power generators in utility and industrial power distribution systems.

REG615 has been designed to be the main protection for small synchronous generators, and offer full protection during start-up and normal run for both the generator and the prime mover. REG615 can also be used as backup protection for medium-sized generators in applications where an independent and redundant protection system is required. The main protection functionality includes generator differential protection, out-of-step protection and 100% stator ground-fault protection. REG615 is typically used in small and medium-sized diesel, gas, hydroelectric, combined heat and power (CHP), and steam power plants.

To minimize the effects of an arc fault, REG615 can be equipped with high-speed outputs decreasing the operate time by four to six milliseconds compared to conventional binary outputs.

Human-machine interface (HMI)
As a member of the Relion® product family, REG615 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.

REG615 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 grounding 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.
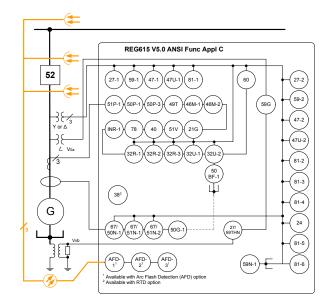
Standardized communication and redundancy
REG615 fully supports the IEC 61850 standard for communication and interoperability of substation automation devices, including fast GOOSE messaging, IEC 61850-9-2 LE and Edition 2, offering substantial benefits in terms of extended interoperability. The generator and interconnection 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. REG615 is able to use two communication protocols simultaneously.

For redundant Ethernet communication, REG615 offers either two optical or two galvanic Ethernet network interfaces. A third port with a galvanic Ethernet network interface provides connectivity of 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 REG615 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 both analog voltages and currents, in addition to receiving sampled values of voltages, is supported. The sampled values can be used for synchro-check as well 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, REG615 supports synchronization over Ethernet using SNTP or over a separate bus using IRIG-B.
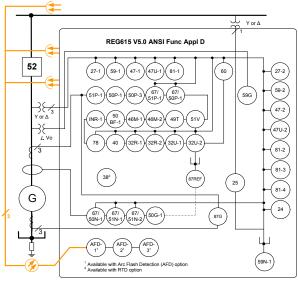
1. Protection function overview of REG615 standard configuration C

2. Protection function overview of REG615 standard configuration D

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REG615 V5.0 ANSI Func Appl C

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REG615 V5.0 ANSI Func Appl D

Main benefits

- Withdrawable plug-in unit design for swift installation and testing
- Extensive range of protection functionality for both synchronous generators and interconnection points of distributed generation units
- Ready-made standard configurations for fast and easy setup with tailoring capabilities
- Extensive generator protection with 100% stator ground- fault, generator differential and out-of-step protection
- Advanced interconnection protection fulfilling the latest grid codes for higher grid stability and reliability
- 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
- Ring type terminals in the back

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.
Generator protection with 100% stator ground-fault protection	C
Generator protection with generator differential and directional overcurrent protection and synchrocheck	D

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Supported functions

Function	IEC 61850	ANSI	C	D
Protection				
Three-phase non-directional overcurrent protection, low stage	PHLPTOC	51P	1	1
Three-phase non-directional overcurrent protection, high stage	PHHPTOC	50P	1	1
Three-phase non-directional overcurrent protection, instantaneous stage	PHIPTOC	50P	1	1
Three-phase directional overcurrent protection, low stage	DPHLPDOC	67/51P		1 TR
Three-phase directional overcurrent protection, high stage	DPHHPDOC	67/50P		1 TR
Three-phase voltage-dependent overcurrent protection	PHPVOC	51V	1	1
Non-directional ground-fault protection, high stage	EFHPTOC	50G	1	1
Directional ground-fault protection, low stage	DEFLPDEF	67/51N	2	2
Directional ground-fault protection, high stage	DEFHPDEF	67/50N	1	1
Transient/intermittent ground-fault protection	INTRPTEF	-		
Negative-sequence overcurrent protection	NSPTOC	-		
Negative-sequence overcurrent protection for machines	MNSPTOC	46M	2	2
Residual overvoltage protection	ROVPTOV	59G 59N	2	2
Three-phase undervoltage protection	PHPTUV	27	2	2
Three-phase overvoltage protection	PHPTOV	59	2	2
Positive-sequence undervoltage protection	PSPTUV	47U	2	2
Negative-sequence overvoltage protection	NSPTOV	47	2	2
Frequency protection	FRPFRQ	81	6	4
Overexcitation protection	OEPVPH	24	1	1
Three-phase thermal protection for feeders, cables and distribution transformers	T1PTTR	-		
Three-phase thermal overload protection, two time constants	T2PTTR	49T	1	1
Circuit breaker failure protection	CCBRBRF	50BF	1 2)	1 2)
Three-phase inrush detector	INRPHAR	INR	1	1
Master trip	TRPPTRC	86/94	3(6) 3)	3(6) 3)
Arc protection	ARCSARC	AFD	2	2
Multipurpose protection	MAPGAPC	MAP	18	18
Stabilized and instantaneous differential protection for machines	MPDIF	87G		1
Third harmonic-based stator ground-fault protection	H3EFPSEF	27/59THN	1	
Underpower protection	DUPPDPR	32U	2	2
Reverse power/directional overpower protection	DOPPDPR	32R-32	3	2
Three-phase underexcitation protection	UEXPDIS	40	1	1
Three-phase underimpedance protection	UZPDIS	21G	1	
Out-of-step protection	OOSRPSB	78	1	1
Interconnection functions				
Directional reactive power undervoltage protection	DQPTUV	-		
Low-voltage ride-through protection	LVRTPTUV	-		
Voltage vector shift protection	VVSPPAM	-		
Power quality				
Current total demand distortion	CMHAI	PQI	(1) 4)	(1) 4)
Voltage total harmonic distortion	VMHAI	PQVPH	(1) 4)	(1) 4)
Voltage variation	PHQVVR	PQSS	(1) 4)	(1) 4)
Voltage unbalance	VSQVUB	PQVUB	(1) 4)	(1) 4)
Control				
Circuit-breaker control	CBXCBR	PQI	1	1
Disconnector control	DCXSWI	29DS	2	2

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Supported functions

Function	IEC 61850	ANSI	C	D
Control				
Disconnector position indication	DCSXSWI	52-TOC	3	3
Grounding switch indication	ESSXSWI	29GS	2	2
Synchronism and energizing check	SECRSYN	25		1
Condition monitoring and supervision				
Circuit-breaker condition monitoring	SSCBR	52CM	1	1
Trip circuit supervision	TCSSCBR	TCM	2	2
Current circuit supervision	CCSPVC	-		
Fuse failure supervision	SEQSPVC	60	1	1
Runtime counter for machines and devices	MDSOPT	OPTM	1	1
Measurement				
Disturbance recorder	RDRE	-	1	1
Load profile record	LDPRLRC	LoadProf	1	1
Fault record	FLTRFRC	-	1	1
Three-phase current measurement	CMMXU	IA, IB, IC, IA, IB, IC (2)	1	2
Sequence current measurement	CSMSQI	I1, I2, I0	1	1
Residual current measurement	RESCMMXU	IG	1	1
Three-phase voltage measurement	VMMXU	VA, VB, VC, VA, VB, VC,(2)	1	2
Residual voltage measurement	RESVMMXU	VG	2	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)	(1)	(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)
Other				
Minimum pulse timer (2 pcs)	TPGAPC	62TP	4	4
Minimum pulse timer (2 pcs, second resolution)	TPSGAPC	62TPS	1	1
Minimum pulse timer (2 pcs, minute resolution)	TPMGAPC	62TPM	1	1
Pulse timer (8 pcs)	PTGAPC	62PT	2	2
Time delay off (8 pcs)	TOFGAPC	62TOF	4	4
Time delay on (8 pcs)	TONGAPC	62TON	4	4
Set-reset (8 pcs)	SRGAPC	SR	4	4
Move (8 pcs)	MVGAPC	MV	2	2
Generic control point (16 pcs)	SPCGAPC	SPC	2	2
Analog value scaling (4 pcs)	SCA4GAPC	SCA4	4	4
Integer value move (4 pcs)	MVI4GAPC	1	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

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1) "Io measured" is always used.

2) "Io calculated" is always used.

3) 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.

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

5) Available only with IEC 61850-9-2

6) Available only with COM0031...0037

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