

Relion<sup>®</sup> product family

The 611 series Preconfigured solutions for utility distribution and industrial applications



# Preconfigured solutions for utility distribution and industrial applications

The 611 series is part of ABB's Relion<sup>®</sup> protection and control relay family and it offers simplified yet powerful functionality for most applications. Once the applicationspecific parameter set has been entered, the installed protection relay is ready to be put into service. The further addition of communication functionality and interoperability between substation automation devices offered by the IEC 61850 standard adds flexibility and value to users as well as electrical system manufacturers.

The protection relays in the 611 series offer powerful functionality within basic protection and control configurations. There are product variants for feeder, motor, busbar and voltage protection applications.

The relays are designed for most utility substations and industrial power systems including radial, looped and meshed distribution networks that may also involve distributed power generation. The 611 series relays fully support the IEC 61850 standard for communication and interoperability of substation automation devices, including fast GOOSE (Generic Object Oriented Substation Event) messaging, and can now also benefit from the extended interoperability provided by edition 2 of the standard. The relays further support the parallel redundancy protocol (PRP) and the high-availability seamless redundancy (HSR) protocol. The 611 series relays are able to use IEC 61850 and Modbus® communication protocols simultaneously.

When high-accuracy time synchronization is required, IEEE 1588 V2 is available, with a time stamp resolution of not more than four microseconds. IEEE 1588 V2 is supported in all variants with an optional redundant Ethernet communication module.



#### Highlights of the 611 series:

- The relays are delivered preconfigured and factory-tested to shorten engineering and commissioning time
- The application-specific settings can be made via the local human-machine interface (HMI), the web browserbased HMI (web-HMI) or in the protection and control IED manager PCM600
- The web-HMI allows easy modification of the relay's signal configuration for both internal and external input and output signals
- The control of one circuit breaker is possible via remote communication or via the relay's local HMI

- Support for IEC 61850 edition 1 and 2, including GOOSE messaging, for less wiring and supervised communication
- Self-healing communication based on HSR/PRP redundancy using an optional Ethernet bus
- The compact design makes it suitable for both new and retrofit installations
- Withdrawable plug-in unit design for swift installation and testing



### Feeder protection with a powerful web-HMI

REF611 is a dedicated feeder relay for the protection, control, measurement and supervision of utility substations and industrial power systems including radial, looped and meshed distribution networks with or without distributed power generation. REF611 is available in three alternative configurations.

The feeder protection relay REF611 can be supplied either with directional or non-directional earth-fault protection. Directional earth-fault protection is mainly used in isolated neutral or compensated networks, whereas the nondirectional earth-fault protection is intended for directly or low-impedance-earthed neutral networks.

The relay can also be used for protection of ring-type and meshed distribution networks, as well as radial networks containing distributed power generation.

The relay offers directional and non-directional overcurrent and thermal overload protection as well as directional and non-directional earth-fault protection. The relay also features sensitive earth-fault protection, phase discontinuity protection, transient/ intermittent earth-fault protection, residual overvoltage protection, negative-sequence overcurrent protection and phase discontinuity protection.

REF611 measures three-phase current, residual current and residual voltage. Additionally, the standard configuration C includes three-phase voltage, frequency, three-phase power and energy measurements. As an option, the relay offers three-phase multi-shot autoreclosing functions for overhead line feeders.

- Powerful and user-friendly web-HMI including input/output (I/O) matrix with visual selections
- Simplified yet powerful functionality intended for most applications
- Application-specific preconfigured solutions result in a shorter relay set-up and commissioning time
- Support for IEC 61850, edition 1 and 2, including binary GOOSE messaging





Protection function overview of configuration C of REF611

# Motor protection for a variety of drives

REM611 is a dedicated motor protection relay for the protection, control, measurement and supervision of asynchronous motors in manufacturing and process industry. Typically, this motor protection relay is used with circuit breaker or contactor-controlled medium-sized or small motors in a variety of drives, such as pumps and conveyors, crushers and choppers, mixers and agitators and fans and aerators.

The REM611 offers all the functionality needed to manage motor starts and normal operation, including protection and fault clearance in abnormal situations.

The main features of the REM611 include thermal overload protection, motor startup time supervision, locked rotor protection and protection against too frequent motor starts. The protection relay also incorporates non-directional earth-fault protection, negative phase sequence current unbalance protection and backup overcurrent protection.

The relay also offers motor running stall protection, loss-ofload supervision and phase-reversal protection. In certain motor drives of special importance, there must be a possibility to override the motor thermal overload protection to perform an emergency start of a hot motor. To enable an emergency hot start, the relay offers a forced start execution feature.

- Motor protection both during motor start-up and normal run, available for a variety of drives
- Motor protection with motor start-up and loss of load supervision as well as thermal overload, motor load jam and phase-reversal protection
- Powerful and user-friendly web-HMI including input/output (I/O) matrix with visual selections
- Simplified yet powerful functionality intended for most applications
- Application-specific preconfigured solutions result in a shorter relay set-up and commissioning time
- Support for IEC 61850, edition 1 and 2, including binary GOOSE messaging





Protection function overview of configuration A of REM611

# Busbar and ideal multipurpose backup protection

REB611 is a dedicated busbar protection relay for phase-segregated short circuit protection, control and supervision of single busbars. REB611 is intended for use in high-impedance-based applications within utility substations and industrial power systems. In addition, the protection relay can be utilized in restricted earth-fault and residual earth-fault applications for the protection of generators, motors, transformers and reactors.

The REB611 offers phase-segregated (three phases) highimpedance differential protection and non-directional earthfault protection for busbars, motors and generators. REB611 also offers high-impedance differential-based restricted earth-fault protection for motors, generators, reactors and power transformers. REB611 is also ideally suited for backup protection.

The REB611 offers bus-differential protection in a single zone with bus-wire supervision. It also offers the possibility for bus-differential protection over two zones using two REB611 relays. REB611's high-impedance protection functions contain

a built-in blocking functionality which is provided by the buswire supervision functions to restrict faulty operations in case of faults in the measurement circuits.

The residual earth-fault protection can also be used as buswire supervision, especially in new or retrofitting applications where an earth-fault protection function is used for grounding the measurement circuits where short-circuiting or circuit breaks have occurred. The grounding can be done by an external relay.

- Busbar and ideal multi-purpose backup protection
- Powerful and user-friendly web-HMI including input/output (I/O) matrix with visual selections
- Application-specific preconfigured solutions result in a shorter relay set-up and commissioning time
- Support for IEC 61850, edition 1 and 2, including binary GOOSE messaging





Protection function overview of configuration A of REB611

## Compact and versatile voltage protection for power distribution systems

REU611 is a voltage protection relay preconfigured for voltage and frequency-based protection in utility substations and industrial power systems. The relay is used for a wide variety of applications, including busbar, power transformer, motor and capacitor bank applications.

The voltage protection relay REU611 is preconfigured for voltage and frequency-based protection in utility substations and industrial power systems. It is designed for over-voltage and under-voltage protection, sequence protection, residual over-voltage and additional 2-stage frequency protection of large-size power stations or small power units.

Once the application-specific parameters have been entered, the installed relay is ready to be put into service. Additionally, communication functionality and interoperability between substation automation devices offered by the IEC 61850 standard adds flexibility and value to both electrical system operators and manufacturers.

Extensive range of protection functionality for busbar voltage supervision, including over- and underfrequency protection, positive-sequence undervoltage protection and negativesequence overvoltage protection.

- Compact preconfigured voltage-based protection unit for utility distribution and industrial applications
- Powerful and user-friendly web-HMI including input/output (I/O) matrix with visual selections
- Application-specific preconfigured solutions result in shorter relay setup and commissioning time
- Parallel protocol availability with IEC 61850 and Modbus
- Support for IEC 61850, edition 1 and 2, including binary GOOSE messaging





Protection function overview of configuration A of REU611

### Preconfigured solutions

Standard	configu	rations

Description

Feeder protection, non-directional overcurrent and directional earth-fault protection

Feeder protection, non-directional overcurrent and non-directional earth-fault protection

Feeder protection, directional overcurrent and directional earth-fault protection

Motor protection, overcurrent and load protection

Busbar protection, high-impedance differential protection

Voltage protection, overvoltage and undervoltage protection

### Supported functions, codes and symbols

Supported functions, codes and symbols	IEC 61950	IEC 60617	
runctionality	IEC 01050	IEC 00017	IEC-ANSI
Protection			
Three-phase non-directional overcurrent protection, low stage, instance 1	PHLPTOC1	3l> (1)	51P-1 (1)
Three-phase non-directional overcurrent protection, high stage, instance 1	PHHPTOC1	3l>> (1)	51P-2 (1)
Three-phase non-directional overcurrent protection, high stage, instance 2	PHHPTOC2	3l>> (2)	51P-2 (2)
Three-phase non-directional overcurrent protection, instantaneous stage, instance 1	PHIPTOC1	3l>>> (1)	50P/51P (1)
Non-directional earth-fault protection, low stage, instance 1	EFLPTOC1	lo> (1)	51N-1 (1)
Non-directional earth-fault protection, low stage, instance 2	EFLPTOC2	lo> (2)	51N-1 (2)
Non-directional earth-fault protection, high stage, instance 1	EFHPTOC1	lo>> (1)	51N-2 (1)
Non-directional earth-fault protection, instantaneous stage	EFIPTOC1	lo>>>	50N/51N
Three-phase directional overcurrent protection, low stage, instance 1	DPHLPDOC1	3l> → (1)	67-1(1)
Three-phase directional overcurrent protection, low stage, instance 2	DPHLPDOC2	$3 \rightarrow (2)$	67-1(2)
Three-phase directional overcurrent protection, high stage, instance 1	DPHHPDOC1	3l>> → (1)	67-2(1)
Directional earth-fault protection, low stage, instance 1	DEFLPDEF1	lo> → (1)	67N-1 (1)
Directional earth-fault protection, low stage, instance 2	DEFLPDEF2	lo> → (2)	67N-1 (2)
Directional earth-fault protection, high stage	DEFHPDEF1	0>> →	67N-2
Transient / intermittent earth-fault protection	INTRPTEF1	lo> → IEF	67NIEF
Non-directional (cross-country) earth-fault protection, using calculated lo	EFHPTOC1	lo>> (1)	51N-2 (1)
Negative-sequence overcurrent protection, instance 1	NSPTOC1	l2> (1)	46 (1)
Negative-sequence overcurrent protection, instance 2	NSPTOC2	12> (2)	46 (2)
Negative-sequence overcurrent protection for machines, instance 1	MNSPTOC1	l2>M (1)	46M (1)
Negative-sequence overcurrent protection for machines, instance 2	MNSPTOC2	l2>M (2)	46M (2)
Phase discontinuity protection	PDNSPTOC1	2/ 1>	46PD
Residual overvoltage protection, instance 1	ROVPTOV1	Uo> (1)	59G (1)
Residual overvoltage protection, instance 2	ROVPTOV2	Uo> (2)	59G (2)
Residual overvoltage protection, instance 3	ROVPTOV3	Uo> (3)	59G (3)
Three-phase undervoltage protection, instance 1	PHPTUV1	3U< (1)	27(1)
Three-phase undervoltage protection, instance 2	PHPTUV2	3U< (2)	27(2)
Three-phase undervoltage protection, instance 3	PHPTUV3	3U< (3)	27(3)
Three-phase overvoltage protection, instance 1	PHPTOV1	3U> (1)	59(1)
Three-phase overvoltage protection, instance 2	PHPTOV2	3U> (2)	59(2)
Three-phase overvoltage protection, instance 3	PHPTOV3	3U> (3)	59(3)
Positive-sequence undervoltage protection, instance 1	PSPTUV1	U1< (1)	47U+(1)
Positive-sequence undervoltage protection, instance 2	PSPTUV2	U1< (2)	47U+(2)
Negative-sequence overvoltage protection, instance 1	NSPTOV1	U2> (1)	470-(1)
Negative-sequence overvoltage protection, instance 2	NSPTOV2	U2> (2)	470-(2)
Frequency protection, instance 1	FRPFRQ1	f>/f<,df/dt (1)	81(1)
Frequency protection, instance 2	FRPFRQ2	f>/f<,df/dt (2)	81(2)
Three-phase thermal protection for feeders, cables and distribution transformers	T1PTTR1	3lth>F	49F
Loss of load supervision	LOFLPTUC1	3I<	37

Standard configuration
REF611 configuration A
REF611 configuration B
REF611 configuration C
REM611 configuration A
REB611 configuration A
REU611 configuration A

REF611			REM611	REB611	REU611	
А	В	С	Α	Α	Α	
 x	x		x			
x	x					
х	х					
 x	x	x	x			
	<b>X</b> <sup>2)</sup>		<b>X</b> <sup>2)</sup>	<b>X</b> <sup>1)</sup>		
	<b>X</b> <sup>2)</sup>					
	<b>X</b> <sup>2)</sup>		<b>X</b> <sup>2)</sup>	<b>X</b> <sup>1)</sup>		
	<b>X</b> <sup>2)</sup>					
		х				
		x	*****			
 		x				
 <b>X</b> <sup>2) 3)</sup>		<b>X</b> <sup>2) 3)</sup>				
 <b>X</b> <sup>2) 3)</sup>		<b>X</b> <sup>2) 3)</sup>				
 <b>X</b> <sup>2) 3)</sup>		<b>x</b> <sup>2) 3)</sup>				
 ×		x				
 <b>x</b> <sup>4)</sup>		<b>x</b> <sup>4)</sup>				
 x	x	x				
 x	x	x				
 <u>^</u>	^	~	x			
 			x			
 x	x	x				
 <b>x</b> <sup>3)</sup>	^	<b>x</b> <sup>3)</sup>		<u>.</u>	x	
 <b>x</b> <sup>3)</sup>		<b>x</b> <sup>3)</sup>		:	x x	
 <b>x</b> <sup>3)</sup>		<b>x</b> <sup>3)</sup>			x x	
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 					X	
 					X	
 					X	
 					X	
 					X	
 X	X	x				
			: <b>v</b>	:	:	

 $\mathbf{x} =$ included,  $\mathbf{o} =$ optional

<sup>1)</sup> Io measured is always used
<sup>2)</sup> Io selectable by parameter and default value is Io measured
<sup>3)</sup> Uo measured is always used
<sup>4)</sup> Io selectable by parameter and default value is Io calculated

### Preconfigured solutions

#### Supported functions, codes and symbols Functionality

Functionality	IEC 61850	IEC 60617	IEC-ANSI
Protection			
Motor load jam protection	JAMPTOC1	lst>	51LR
Motor start-up supervision	STTPMSU1	ls2t n<	49,66,48,51LR
Phase reversal protection	PREVPTOC1	12>>	46R
Thermal overload protection for motors	MPTTR1	3lth>M	49M
Circuit breaker failure protection	CCBRBRF1	3l>/lo>BF	51BF/51NBF
Three-phase inrush detector	INRPHAR1	312f>	68
Master trip, instance 1	TRPPTRC1	Master Trip (1)	94/86 (1)
Master trip, instance 2	TRPPTRC2	Master Trip (2)	94/86 (2)
High-impedance differential protection for phase A, instance 1	HIPDIF1	dHi>(1)	87(1)
High-impedance differential protection for phase B, instance 2	HIPDIF2	dHi>(2)	87(2)
High-impedance differential protection for phase C, instance 3	HIPDIF3	dHi>(3)	87(3)
Switch onto fault	CBPSOF1	SOTF	SOTF
Control			
			20
Auto-reciosing	DARRECT	0-71	19
Condition Monitoring			
Phase segregated CT supervision function for Phase A, instance 1	HZCCASPVC1	MCS 1I(1)	MCS 1I(1)
Phase segregated CT supervision function for Phase B, instance 2	HZCCBSPVC1	MCS 11(2)	MCS 11(2)
Phase segregated CT supervision function for Phase C, instance 3	HZCCCSPVC1	MCS 11(3)	MCS 11(3)
Trip circuit supervision, instance 1	TCSSCBR1	TCS (1)	TCM (1)
Trip circuit supervision, instance 2	TCSSCBR2	TCS (2)	TCM (2)
Runtime counter for machines and devices	MDSOPT1	OPTS	OPTM
Logging			
Disturbance recorder	RDRE1	DR (1)	DFR(1)
Fault recorder	FLTRFRC1	-	FR
Measurement			
Three-phase current measurement, instance 1	CMMXU1	31	31
Sequence current measurement	CSMSQI1	11, 12, 10	1,  2,  0
Residual current measurement, instance 1	RESCMMXU1	lo	In
Three-phase voltage measurement, instance 1	VMMXU1	ЗU	3U
Three-phase voltage measurement, instance 2	VMMXU2	3U(B)	3U(B)
Sequence voltage measurement, instance 1	VSMSQI1	U1, U2, U0	U1, U2, U0
Residual voltage measurement	RESVMMXU1	Uo	Vn
Frequency measurement, instance 1	FMMXU1	f	f
Three-phase power and energy measurement, instance 1	PEMMXU1	P, E	P, E
VI Providencial			
Binary inputs			
Binary outputs			

REF611			REM611	REB611	REU611
Α	В	С	А	А	А
 			x		
			x		
			х		
			x		
 x	x	x	x	x	
 x	x	x			
 x	x	x	x	x	x
 v	v	v	~	v	v
 ···· ^	^	~		v v	<u>^</u>
 				×	
 				<b>X</b>	
 				X	
X	X	X			
_					
 x	x	X	x	X	x
 			x		
 0	0	0			
				х	
				x	
 				x	
 x	x	x	x	x	x
 v v	Y Y	v v	v	v	v
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			^		
 X	X	X	X	X	X
x	x	х	x	x	x
 x	x	x	x	X	
 x	x	x	x		
 x	x	х	x	x	
		х			х
					х
 		х			x
 x		x			x
 <u>^</u>		Y			v
 		~ V			^
				_	
 4	4	4	4	4	-
 1	-	5	-	-	5
 <b>3 (9)</b> <sup>5)</sup>	<b>4 (10)</b> <sup>5)</sup>	8	4	4	4
6(9) <sup>5)</sup>	6 (9) <sup>5)</sup>	6	6	6	6

#### $\mathbf{x} =$ included, $\mathbf{o} =$ optional

 $^{\scriptscriptstyle 5)}$  With optional ( ) binary I/O module REF611 configuration A and B

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