Accelerate learning on low voltage switchboard 19 Feb 2009

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Feeder Protection REF615 Ver. 1.1

Technical Presentation





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1MRS756407 C

Self Introduction

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ABB Distribution Automation





- Global market leader in protection relays
- Over 1 million units installed
- Present in over 80 countries
- Secures the power distribution of utilities and in industrial plants
- ABB offers a complete product range, from basic protetion relays to fully integrated network control systems

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DA - Protection relay and terminal overview - today



SPACOM series



610 series



500 series



“New product series”

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Feeder Protection REF615

- Introduction
- Application examples
- Hardware and options
- Functionality highlights
- Communication
- Mechanical design
- Front panel HMI
- Tools
- Conclusions



Introduction

Feeder Protection REF615



REF615 *is a dedicated feeder protection relay designed for the protection, measurement and supervision of utility substations and industrial power systems*

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Feeder Protection REF615



- Designed for general applications calling for **over-current** and **earth-fault protection**
- Main application area: **cable or overhead line feeders** in solidly earthed, resistance earthed, isolated or compensated networks
- Designed for **IEC 61850**
- Optional three-channel **arc protection** system

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REF615 A pre-configured relay

REF615 - Signal Matrix



		L9-LEDS	L10-LEDS
		OR	OR
- AND1 (1)	O-AND		
- ARCSARC1 (11)	OPERATE		X
	ARC_FLT_DET		
- ARCSARC2 (21)	OPERATE		X
	ARC_FLT_DET		
- ARCSARC3 (31)	OPERATE		X
	ARC_FLT_DET		
- CBXCBR1 (1)	SELECTED		
	EXE_OP		
	EXE_CL		
	OPENPOS		
	CLOSEPOS		
	OKPOS		
- CCBRBRF1 (1)	CB_FAULT_AL		
	TRBU		
	TRRET		

- Four different standard configurations available
- Possibility to add, delete and change signal connections for binary inputs, binary outputs and between function blocks using PCM600
- The number and type of function blocks is fixed

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REF615 Standard configurations





- **Std configuration A**
  Overcurrent and **dir. E/F** protection **without** CB condition monitoring
- **Standard configuration B**
  Overcurrent and **dir. E/F** protection **with** CB condition monitoring and interlocking schemes
- **Standard configuration C**
  Overcurrent and **non-dir E/F** protection **without** CB condition monitoring
- **Standard configuration D**
  Overcurrent and **non-dir. E/F** protection **with** CB condition monitoring and interlocking schemes

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REF615 Standard configurations

Standard configurations	Overcurrrent and directional earth-fault protection		Overcurrrent and non-directional earth-fault protection	
Protection functions	**Conf. A**	**Conf. B**	**Conf. C**	**Conf. D**
Three-phase non-directional overcurrent, low stage	●	●	●	●
Three-phase non-directional overcurrent, high stage, instance 1	●	●	●	●
Three-phase non-directional overcurrent, high stage, instance 2	●	●	●	●
Three-phase non-directional overcurrent, high stage, instantaneous stage	●	●	●	●
Directional earth-fault, low stage, instance 1	●	●	-	-
Directional earth-fault, low stage, instance 2	●	●	-	-
Directional earth-fault, high stage	●	●	-	-

● = included, o = optional at the time of order

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REF615 Standard configurations, cont'd

Standard configurations	Overcurrrent and directional earth-fault protection		Overcurrrent and non-directional earth-fault protection	
Protection functions, cont'd	**Conf. A**	**Conf. B**	**Conf. C**	**Conf. D**
Non-directional earth-fault, high-set stage (cross country earth-fault)	●	●	-	-
Transient/intermittent earth-fault	●	●	-	-
Non-directional earth-fault, low stage	-	-	●	●
Non-directional earth-fault, high stage	-	-	●	●
Non-directional earth-fault, inst. stage	-	-	●	●
Non-directional sensitive earth-fault	-	-	●	●
Negative sequence overcurrent, instance 1	●	●	●	●
Negative sequence overcurrent, instance 2	●	●	●	●
Phase discontinuity	●	●	●	●

● = included, o = optional at the time of order

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REF615 Standard configurations, cont'd

Standard configurations	Overcurrrent and directional earth-fault protection		Overcurrrent and non-directional earth-fault protection	
Protection functions, cont'd	**Conf. A**	**Conf. B**	**Conf. C**	**Conf. D**
Thermal overload	●	●	●	●
Circuit-breaker failure	●	●	●	●
Three-phase inrush current detection	●	●	●	●
Arc protection with three sensors	o	o	o	o
Control functions				
Circuit-breaker control with basic interlocking	●	●	●	●
Circuit-breaker control with extended interlocking	-	●	-	●
Auto-reclosing of one circuit breaker	o	o	o	o

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● = included, o = optional at the time of order



REF615 Standard configurations, cont'd

Standard configurations	Overcurrrent and directional earth-fault protection		Overcurrrent and non-directional earth-fault protection	
Supervision and monitoring functions	**Conf. A**	**Conf. B**	**Conf. C**	**Conf. D**
Circuit-breaker condition monitoring	-	●	-	●
Trip-circuit supervision of two trip circuits	●	●	●	●
Measurement functions				
Transient disturbance recorder	●	●	●	●
Three-phase current measurement	●	●	●	●
Current sequence components	●	●	●	●
Residual current measurement	●	●	●	●
Residual voltage measurement	●	●	-	-

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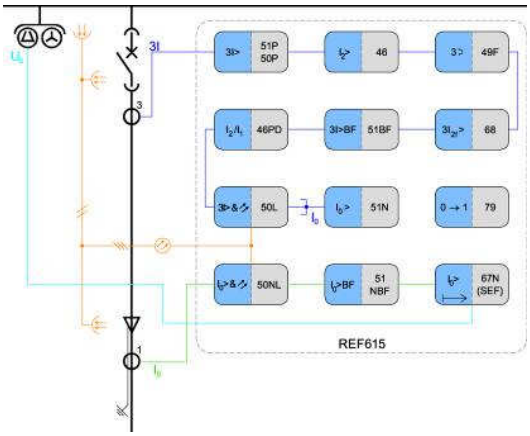
● = included, o = optional at the time of order





Application examples

REF615 in isolated networks



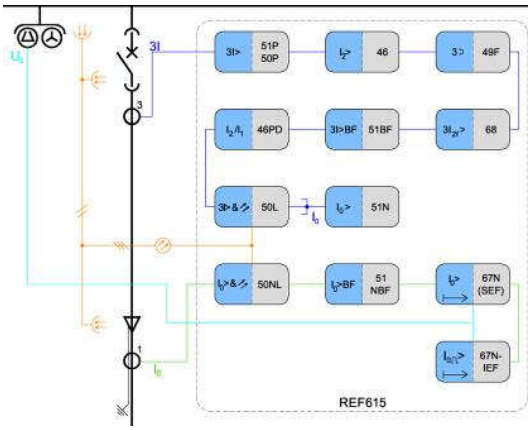
REF615 applied for an <u>overhead line feeder</u> in an isolated or compensated network

(1)

- Main protection: 3I>, I_0> →
- Directional E/F protection, sensitive E/F protection, core-balance CT connection
- Phase discontinuity protection
- Auto-reclosing
- Thermal overload protection
- Breaker failure protection
- Arc protection for reduced cubicle damage and increased personal safety

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REF615 in isolated networks



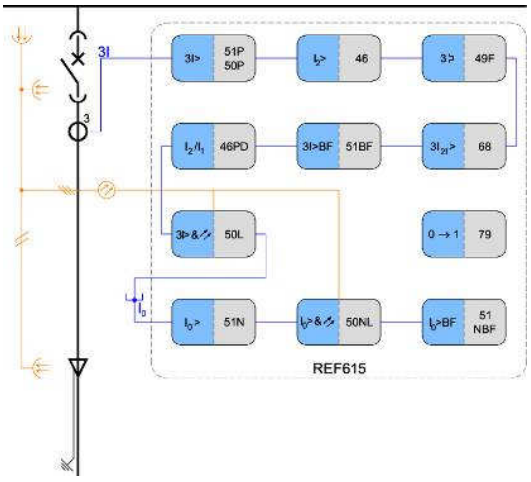
- Main protection: 3I>, I_0> →
- Directional E/F protection, sensitive E/F protection, transient/intermittent E/F protection, core balance CT connection
- Thermal overload protection
- Breaker failure protection
- Arc protection for reduced cubicle damage and increased personal safety

REF615 applied for a <u>cable feeder</u> in an isolated or compensated network

(2)

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REF615 in low-impedance earthed networks



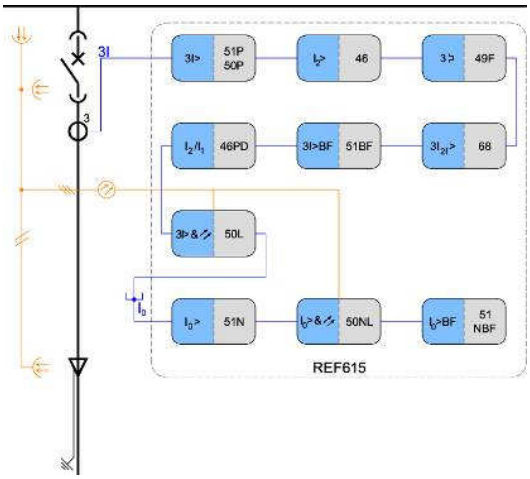
- Main protection: 3I>, I_0>
- Non-dir E/F protection, residual connection
- Phase discontinuity protection
- Breaker failure protection
- Auto-reclosing
- Arc protection for reduced cubicle damage and increased personal safety

REF615 for an <u>overhead line feeder</u> in a directly or low impedance earthed network

(3)

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REF615 in low-impedance earthed networks



- Main protection: 3I>, I_0>
- E/F protection, residual connection
- Thermal overload protection
- Breaker failure protection
- Arc protection for reduced cubicle damage and increased personal safety

REF615 for a <u>cable feeder</u> in a directly or low impedance earthed network

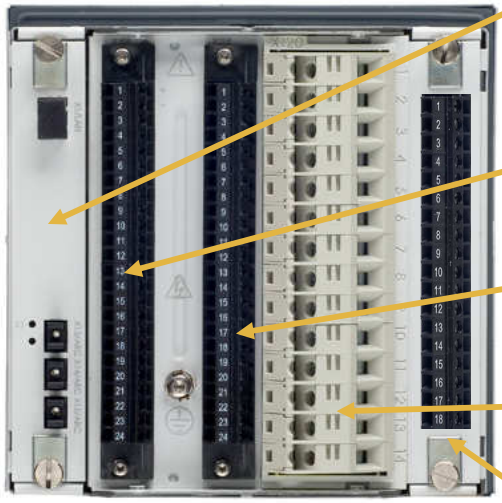
(4)

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Hardware and options

REF615 Hardware modules

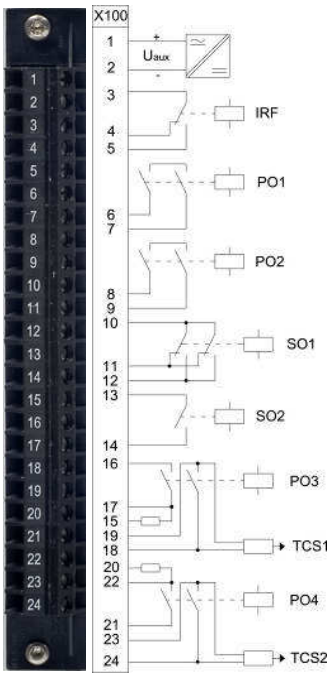


- **[X000]** Communication module **(option)** with or without arc-protection
- **[X100**] Power supply and binary output module
- **[X110]** Additional binary I/O module **(std conf. B and D)**
- **[X120]** Basic analog input module
- **[X130]** Optional binary I/O module **(std conf. B and D)**

RoHS compliant 2002/95/EC

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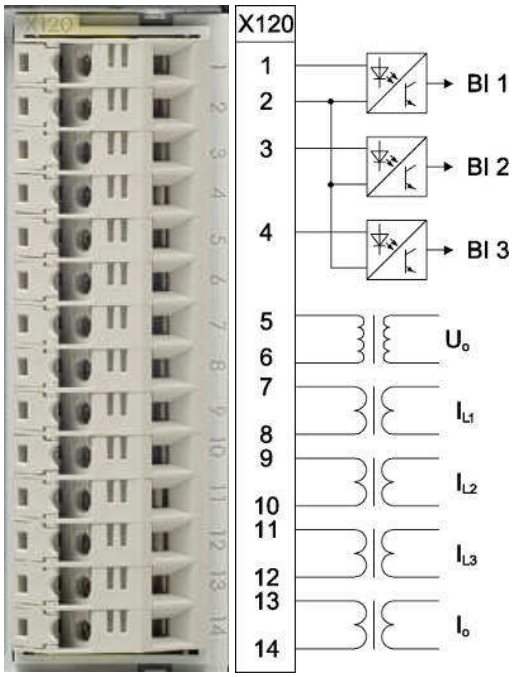
Power supply and binary output modules [X100]



- Power supply options:
  - 48 V…250 V DC, 100 V…240 V AC, 24…60 V DC
- Four power output contacts capable of direct CB operation
  - Two contacts with integrated trip circuit supervision; also to be used with double-pole operation
  - The TCS can be disconnected by excluding the resistor from the trip circuit
- Two signal output contacts
  (1 normally open contact, 1 changeover contact)
- IRF output for self-supervision signalling

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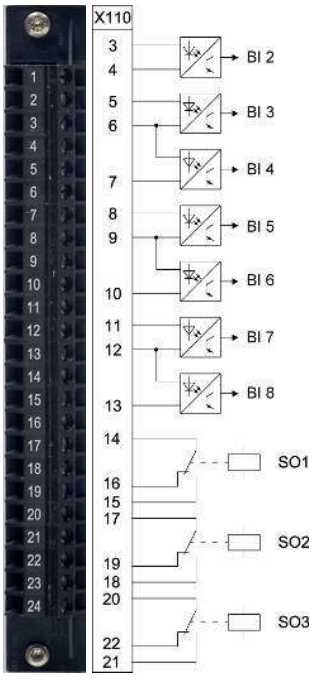
Basic analog input modules [X120]



- Four analog current inputs
  - (I_0 ,I_{L1}, I_{L2}, and I_{L3}), user selectable 1 A or 5 A
  - I_0 optionally user selectable 0.2 A / 1 A
- One voltage input U_0 (std. conf A and B) alt. a fourth binary input with dedicated ground
- Three binary inputs (common ground), thresholds selectable
- Both for ring and pin type wire terminals 
- Max. wire 1 x 6 mm^2 or 2 x 2.5 mm^2

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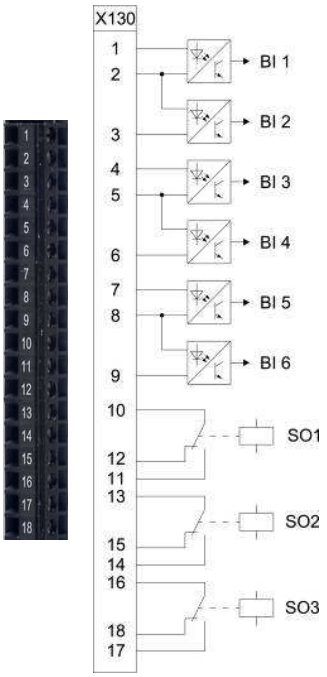
Option: Additional binary I/O module [X110]



- 7 binary inputs
  - 6 inputs, grouped (common ground)
  - 1 input, separated
- 3 binary outputs
  - 3 outputs, changeover contacts
- Selectable binary input thresholds (17 – 186 V DC)

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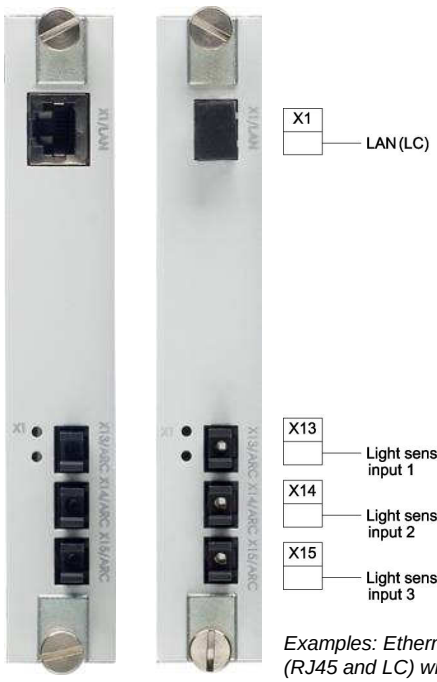
Option: Additional binary I/O module [X130]



- 6 binary inputs
  - 6 inputs, grouped (common ground)
- 3 binary outputs
  - 3 outputs, changeover contacts
- Selectable binary input thresholds (17 – 186 V DC)

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Option: Communication modules [X000]



Examples: Ethernet modules (RJ45 and LC) with optional arc sensors

- Ethernet options:
  - 100BASE-TX with an RJ45 connector
  - 100BASE-FX with a fibre-optic LC connector
- RS485 options:
  - 10-pin screw terminal connector
  - 2-wire or 4-wire connection
- Three arc sensors (option)

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REF615 Communication modules

Modules / Protocols	*Without arc protection*			*With arc protection*		
	100BASE-TX RJ45	100BASE-FX LC	RS485 +IRIG-B	100BASE-TX RJ45 +3ARC	100BASE -FX LC +3ARC	RS485 +IRIG-B +3ARC
IEC 61850-8-1	●	●	-	●	●	-
MODBUS RTU/ASCII	-	-	●	-	-	●
MODBUS TCP	●	●	-	●	●	-

● = supported, - = not supported

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REF615 Input/output overview

Input / output overview	Analog inputs	Binary inputs	Binary outputs	Optional arc sensors
Standard configuration A, including: Directional E/F without CB condition monitoring	**4I+U_0**	**3**	**6**	**(3)**
Standard configuration B, including: Directional E/F with CB condition monitoring	**4I+U_0**	**10(16)***	**9(12)***	**(3)**
Standard configuration C, including: Non-directional E/F without CB condition monitoring	**4I**	**4**	**6**	**(3)**
Standard configuration D, including: Non-directional E/F with CB condition monitoring	**4I**	**11(17)***	**9(12)***	**(3)**

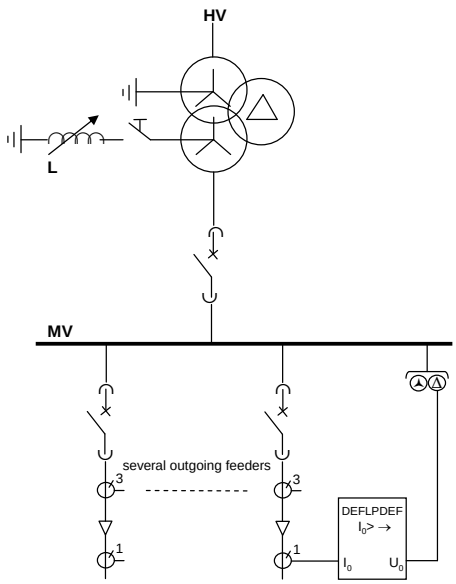
( )* = with optional I/O module

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Functionality highlights

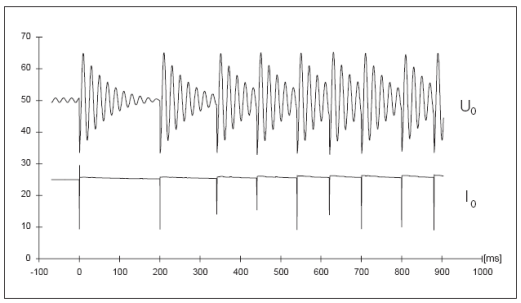
REF615 Directional E/F protection



- Mostly used in isolated or compensated networks
- Relay characteristic angle (RCA) control via binary input or horizontal GOOSE communication, based on the state of the compensation coil
- Alternatively, the extended phase angle characteristic can be used for both compensated and isolated conditions

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REF615 Transient / intermittent E/F protection

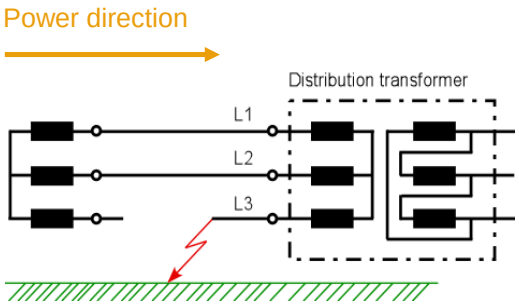


Intermittent earth-fault example

- Intermittent E/F operation mode:
  - Typically used for cable feeders in compensated networks
  - The operation is initiated by a number of transients in the residual current
  - Transients in the residual voltage only for directional comparison
- Transient E/F operation mode:
  - Typically used for mixed cable and overhead line feeders in compensated networks
  - The operation is initiated by the first transient in the residual current and voltage
  - The residual voltage has to be above the set level

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REF615 Phase discontinuity protection

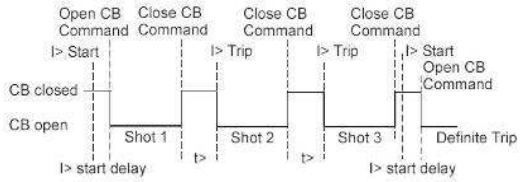


Line break down and single phase earth-fault on the load side

- Used to detect unbalance situations caused by a broken conductor
- Phase discontinuity situations may:
  - Be hard to detect by using E/F protection schemes
  - Cause danger to human life due to a live downed conductor
- Operation based on the ratio between the negative and positive sequence current
  - The ratio is approximately constant under normal conditions despite varying load
  - A constant ratio enables lower settings and increases protection sensitivity

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REF615 Optional auto-reclosing



- Used to clear most transient and semi-transient faults in overhead line feeders
- De-energization of the fault location for a selected period of time, followed by an automatic reclosure
- Five independently programmable auto-reclose shots
- Can be used with any CB suitable for auto-reclosing
- Can be coordinated with external synchro-checking and remote-end auto-reclosing

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REF615 Control functions

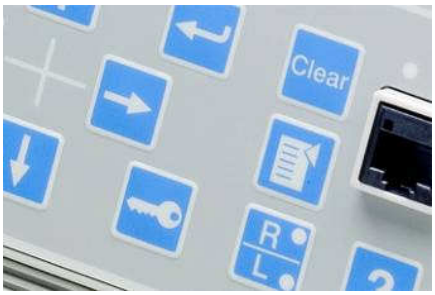


- Control of one circuit breaker
- Dedicated push-buttons for opening and closing of the CB
- Interlocking schemes
- Auto-reclosing of a CB (option)

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REF615 Operation traceability



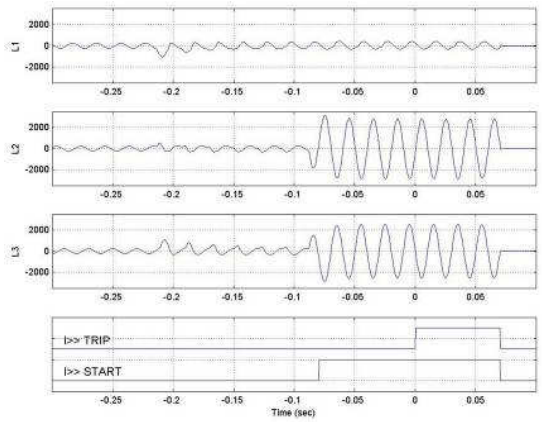


*) = already part of the 1.0 release

- **Non-volatile memory for:**
  - Setting values*)
  - Configuration*)
  - Trip lock-out *)
  - Disturbance recorder data*)
  - Up to 50 event codes
  - Recorded data of the four latest events with time stamp
  - CB conditioning monitoring values
  - Thermal overload protection temperature
  - Number of AR shots and starts/trips of the protection stages
- **Operation indications and alarm LEDs show the status of the relay**

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REF615 Disturbance recorder

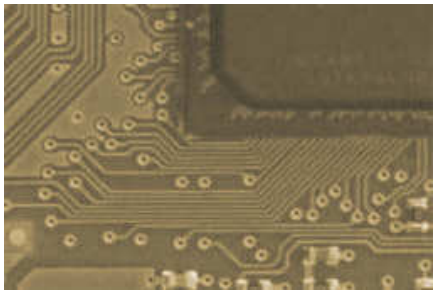


- 12 analog channels and 64 binary channels
- Triggering by:
  - Analog or binary channel
  - Manual or periodic command
- Recording modes:
  - Wave form or trend
- Selectable sampling rate, 32/16/8 samples per cycle
- Max 2 X 10 sec with the highest sampling rate and the maximum number of recorded channels.
- Max 4 X 10 sec if six analog channels are recorded

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REF615 Self-supervision





Continuous monitoring of:

- Memory circuits (RAM, ROM, EEPROM)
- CPU operation and program execution
- Internal supply voltages
- Output relay supervision
- External trip circuit (TCS)
- Light sensor inputs
- Hardware and software configuration

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REF615 CB condition monitoring



- Circuit-breaker gas pressure
- Circuit-breaker spring charging
- Slow breaker detection and breaker travel time
- Circuit-breaker operation counter
- Electric wear
- Scheduled maintenance

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REF615 Access control





- Individual user accounts with role-based access control
- Four access levels: viewer, operator, engineer and administrator level
- Applies to:
  - Front-panel user interface
  - Web-browser based user interface
  - PCM600
- Administrator programmable passwords

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REF615 Arc protection (option)



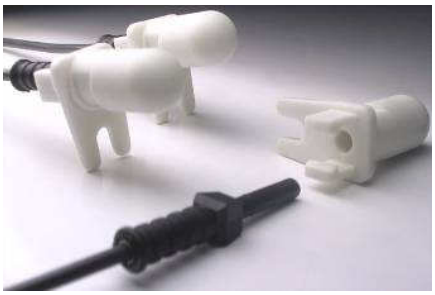


- Increases safety during maintenance work
- Reduces material damage
- Minimizes system downtime
- Continuously supervises the CB, cable and busbar compartment of the metal-enclosed switchgear
- Same lens and optic fibre as for REA 107
- Automatic reference level adjustment based on background-light intensity

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REF615 Arc protection (option), cont'd





- Arc trip based on:
  - Current and light
  - Current and binary input signal
  - Light only
- Separate trip value settings for phase currents and earth-fault current
- Operate time typically
  - 12 ms (current and light)
  - 10 ms (light only)
- Possible to block the function or change operation mode via a binary input

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REF615 Functions, codes and symbols

Protection functions O/C & E/F	IEC 61850	IEC 60617	ANSI
Three-phase non-directional overcurrent, low stage	PHLPTOC	3I>	51P-1
Three-phase non-directional overcurrent, high stage	PHHPTOC	3I>>	51P-2
Three-phase non-directional overcurrent, instantaneous stage	PHIPTOC	3I>>>	50P/51P
Directional earth-fault, low-set stage	DEFLPDEF	I_0> →	67N-1
Directional earth-fault, high-set stage	DEFHPDEF	I_0>> →	67N-2
Transient/intermittent earth-fault	INTRPTEF	I_0> → IEF	67N-IEF
Non-directional earth-fault, low-set stage (sensitive earth-fault))	EFLPTOC	I_0>	51N-1
Non-directional earth-fault, low-set stage	EFLPTOC	I_0>	51N-1
Non-directional earth-fault, high-set stage	EFHPTOC	I_0>>	51N-2
Non-directional earth-fault, inst. stage	EFIPTOC	I_0>>>	50N/51N

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REF615 Functions, codes and symbols, cont'd

Protection functions O/C & E/F	IEC 61850	IEC 60617	ANSI
Negative-sequence overcurrent	NSPTOC	I2>	46
Phase discontinuity	PDNSPTOC	I2/I1>	46PD
Thermal overload, one time constant	T1PTTR	$3I_{th}$>	49F
Circuit-breaker failure protection	CCBRBRF	3I>/ I_0>BF	51BF/51NBF
Three-phase inrush current detector	INRPHAR	3I2f>	68
Arc protection	ARCSARC	ARC	50L/50NL

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REF615 Functions, codes and symbols, cont'd

Measurement functions	IEC 61850	IEC 60617	ANSI
Three-phase current	CMMXU	3I	3I
Current sequence components	CSMSQI	I_1, I_2, I_0	I_1, I_2, I_0
Residual current	RESCMMXU	I_0	I_N
Residual voltage	RESVMMXU	U_0	V_N
Transient disturbance recorder	DRRDRE	DREC	DREC

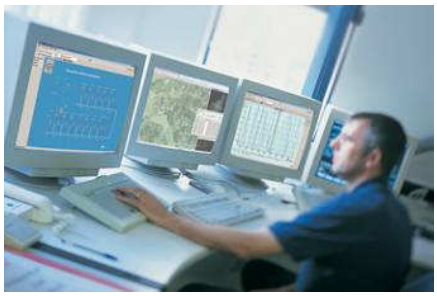
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Communication

REF615 Designed for IEC 61850

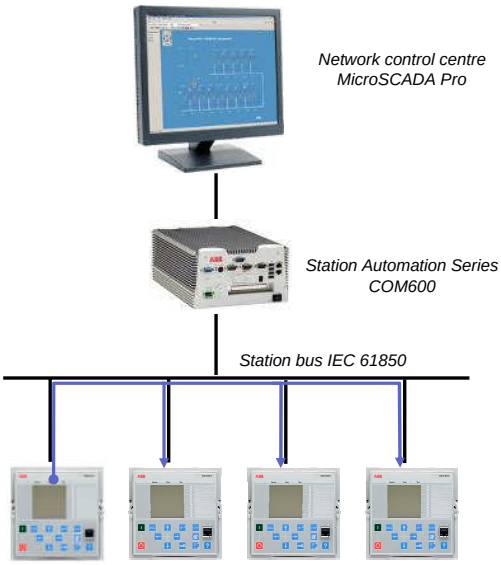


IEC 61850 COMPLIANT

- REF615 implements **IEC 61850** communication between devices in substations
- IEC 61850 enables “GOOSE” (Generic Object Oriented Substation Event) horizontal communication between relays
- REF615 can simultaneously report events to five different clients on the station bus.
- REF615 also supports the industry standard **Modbus**® protocol
  - Modbus RTU / ASCII
  - Modbus TCP

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REF615 IEC 61850 GOOSE communication

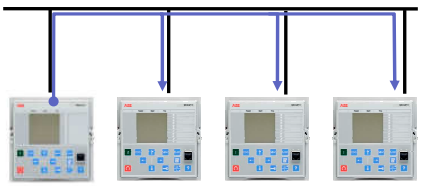


- Standardized horizontal communication enables interoperability between any relays supporting GOOSE communication
- Used for transmitting binary process data to peer relays within a substation
- Ethernet technology offers a fast and reliable station bus for the transfer of data
- The publisher-subscriber principle allows the relays to send and/or receive time critical data

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REF615 GOOSE communication benefits

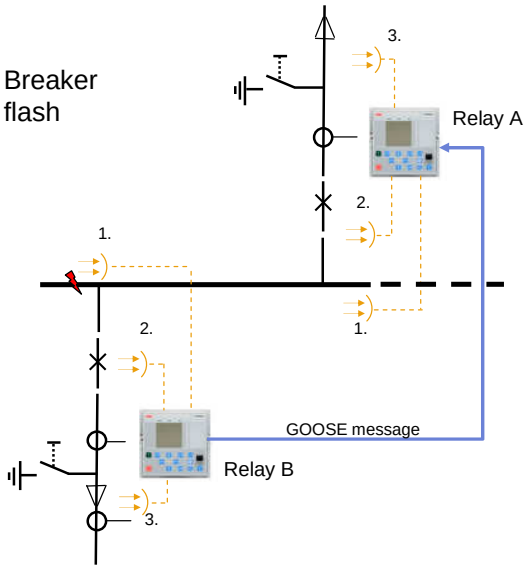




- Expandability and flexibility:
  - Flexible modifications without changing the wiring between the relays
  - No relay I/Os are needed for the transer of data between the relays
  - Reduced wiring between the relays
  - Possible to add functionality like interlocking schemes between the cubicles in existing switchgear (retrofit)
- Supervised data transfer (connection and data quality)
- REF615 meets the highest GOOSE performance requirements defined by the IEC 61850 standard

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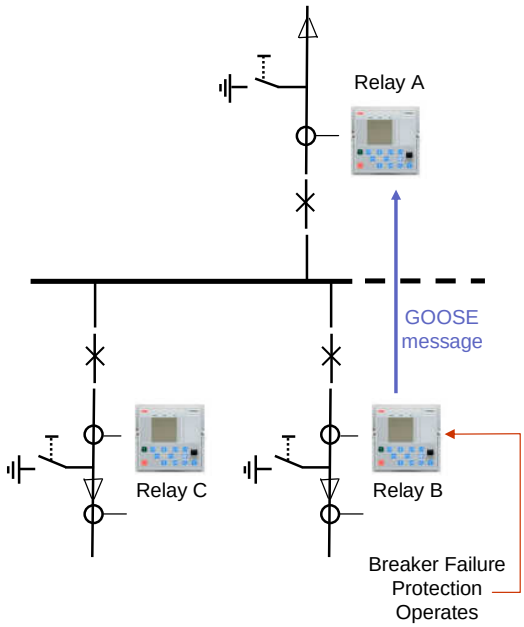
REF615 GOOSE - Arc protection



- Both relay A (incoming feeder) and relay B (outgoing feeder) are equipped with three arc sensors
- Relay B detects an arc in the busbar compartment via sensor 1 and sends a related GOOSE message to relay A
- After receiving the GOOSE message relay A checks the current level and issues a trip command to breaker A
- GOOSE communication enables fast and stationwide supervised arc protection schemes

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REF615 GOOSE - Breaker failure protection



- On detecting a fault on the outgoing feeder relay B sends a trip command to CB “B” and initiates the CB failure protection function
- CB “B” fails to open
- The CB failure protection function of relay B sends a trip command to relay A using GOOSE
- The use of GOOSE communication eliminates the need for dedicated wiring
- CB failure protection can be added without renewing the wiring and with minimum disturbance to the process

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REF615 Time synchronization methods



- Ethernet-based time synchronization:
  - SNTP (Simple Network Time Protocol)
- With special time synchronization wiring:
  - IRIG-B (Inter-Range Instrumentation Group - Time Code Format B
- Time stamp resolution:
  - +/- 1 ms

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REF615 Front port communication



- RJ45 Ethernet connector
- Relay configuration using PCM600
- Relay access using the web-browser-based HMI
- LED indication on the local HMI during data transfer
- Both crossover and regular cables can be used

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Mechanical design

REF615 Patented and compact plug-in design





- Speeds up installation, maintenance and testing of the relay
- Possibility to install and prewire empty cases in the switchgear
- Automatically acting contacts for short-circuiting the CT secondaries when the plug-in unit is withdrawn
- Mechanical coding for plug-in unit type identification
- The pull-out handle can be sealed

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REF615 Relay case and plug-in unit



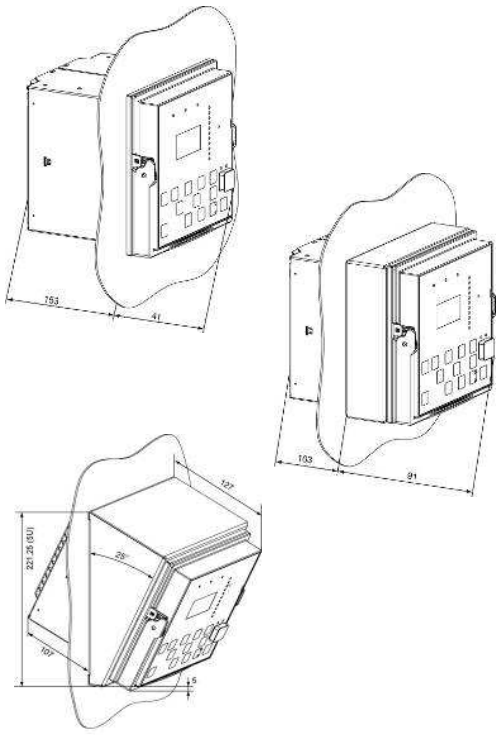


- **Height:** frame 177 mm, case 164 mm
- **Width:** frame 177 mm (4U), case 160 mm
- **Depth:** case 155 mm

IP classification	
IP54	When panel-mounted
IP40	Top, sides and bottom
IP20	Rear side

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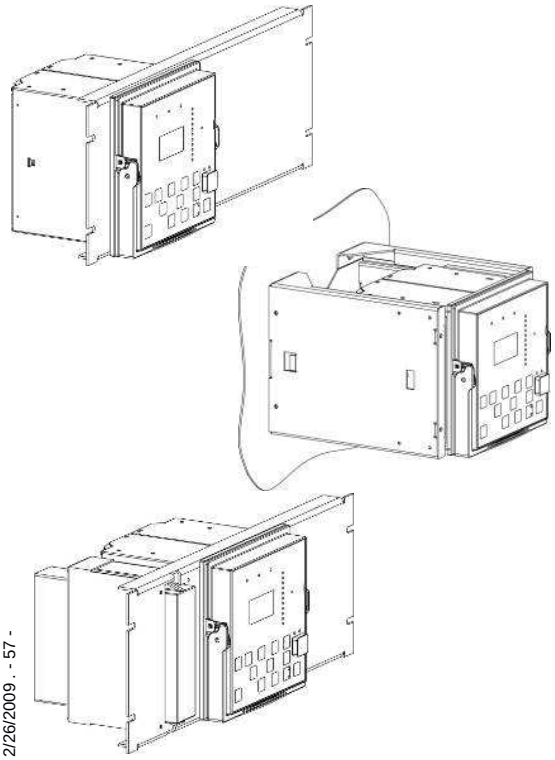
REF615 Mounting alternatives



- Flush mounting
  - The same cut-out on the cubicle front as for REF610 (height: 161.5 ±1, width: 165.5 ±1)
- Semi-flush mounting
  - With a 50 mm rising frame
- Semi-flush mounting in a 25° angle
  - With special accessories

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REF615 Mounting alternatives, cont'd



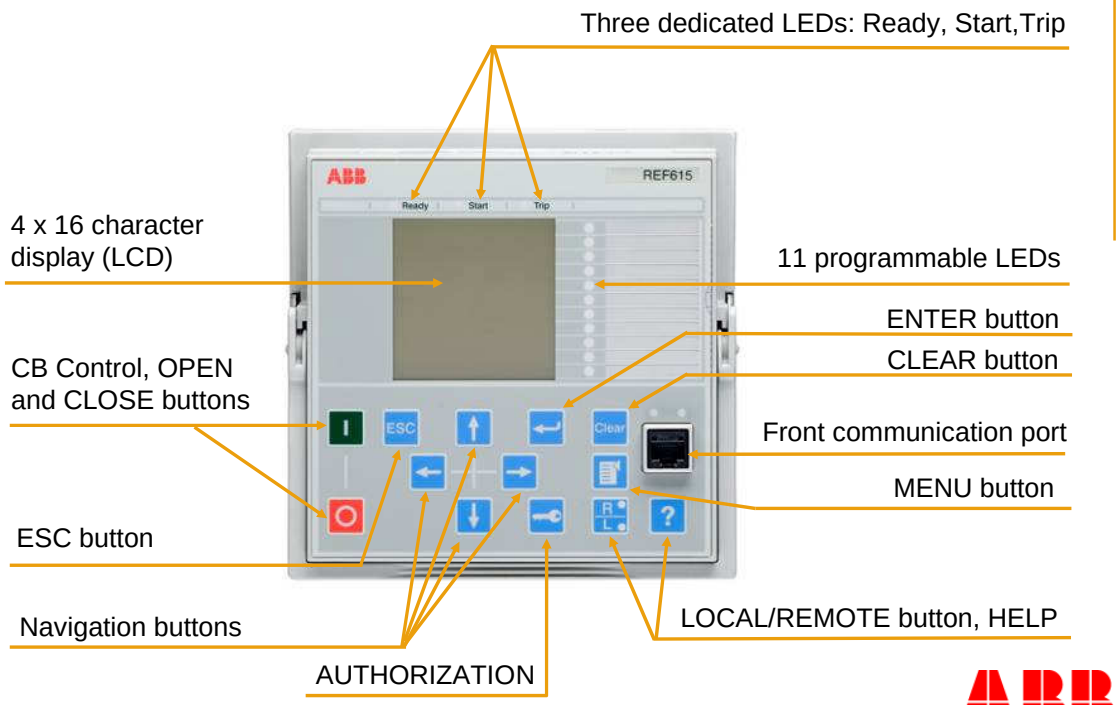
- Mounting using a 19" mounting panel
  - One or two relays
- Wall mounting
  - The relay can be tilted for easy access to the connectors
- Mounting with an RTXP 18 test switch in a 19" rack
  - For routine testing purposes

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Front panel HMI

REF615 Front panel HMI



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REF615 LCD display options





- **Small LCD**, mono-spaced 4 x 20 characters, variable width 4 x 8 (or more) characters
- **Large LCD**, mono-spaced 10 x 20 characters, variable width 8 x 8 (or more) characters
- Background light with power-saving mode

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REF615 LCD display readouts





- IEC 61850 naming, “classic” IEC symbols or ANSI codes: **(PHLPTOC1, 3I>, 51P-1)**
- Fault indications
- Four fault recordings with time stamp
- Measurements:
  - Currents
  - Historical data
  - Number of auto-reclosures (ARs) etc.

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REF615 LCD display readouts, cont’d



- Name or code of protected objects
- Settings in 4 setting groups
- Configurations such as protocol settings etc.
- Product information, serial number, software version, identification etc.

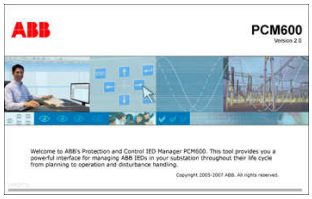
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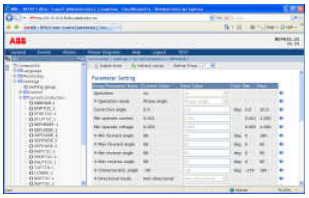


Tools

REF615 Tools

Configuration, setting and SA system tools	Version
PCM600	2.0 SP1 or later
Web-browser-based user interface	IE 7.0 or later
REF615 connectivity package	1.2 or later
MicroSCADA Pro	9.2 SP1 or later
Station Automation Series COM600	3.2 or later

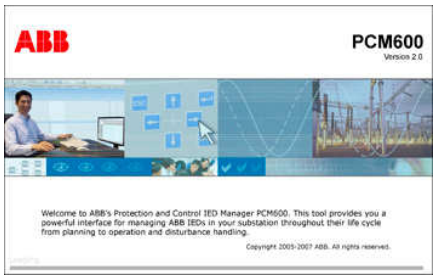






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PCM600 Management tool

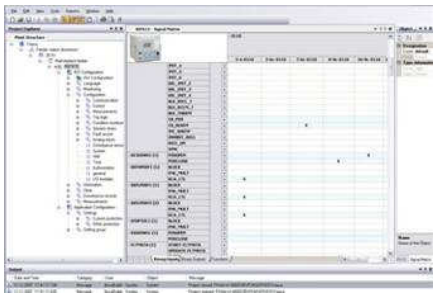


- A common tool for new and existing protection relays and terminals
- Relay-specific connectivity packages enable the use PCM600 for different ABB protection relays and terminals
- Supports IEC 61850
- GOOSE messaging configuration (PCM600 Engineering Pro)
- Relay interaction using:
  - Corporate LAN/WAN
  - The relay's communication port

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PCM600 Tools

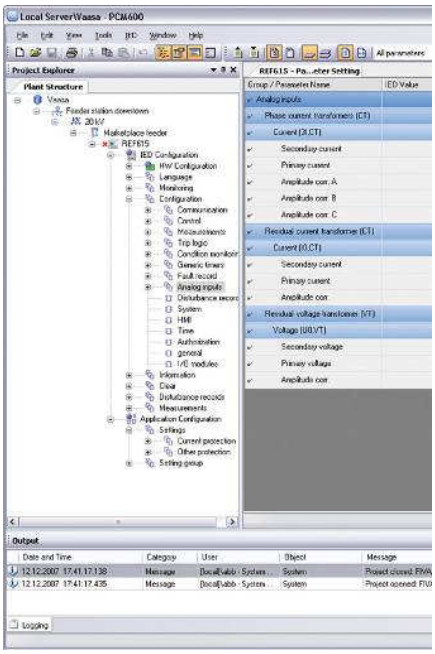




- All tools needed to manage REF615 are included in PCM600:
  - Signal matrix tool
  - Signal monitoring
  - Relay parameter setting
  - Disturbance recorder handling and viewing
  - IEC 61850 (GOOSE) communication configuration
  - Modbus communication configuration
  - User management

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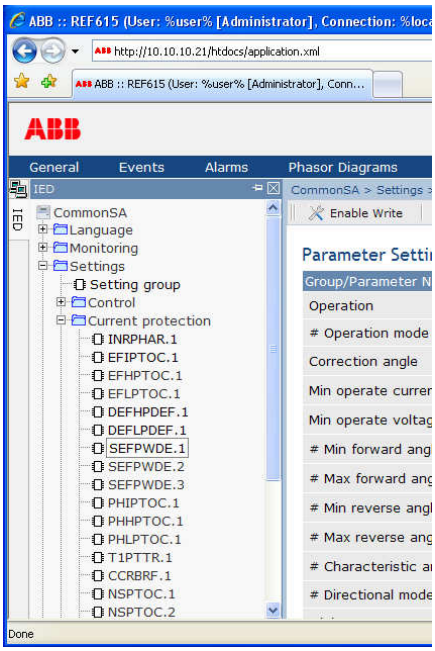
PCM600 Power system overview



- PCM600 offers the possibility to create a tree-structure representing your individual power system, including:
  - Project name
  - Substations
  - Voltage levels
  - Bays
  - Relays/terminals

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REF615 Web-browser based user interface



- Local or remote relay access using an IE 7.0 (or later) web browser
- Disabled by default, enabled by PCM600 or the local front-panel interface
- Functions:
  - Viewing of alarm LEDs and event lists
  - Saving of event data
  - Parameter setting
  - Signal monitoring
  - Measurement viewing
  - Phasor diagram viewing
- User access level authentication

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Conclusions

REF615 Product summary





- IEC 61850 communication including GOOSE messaging
- Comprehensive earth-fault protection functionality
- Arc protection, three sensors
- CB control buttons on the HMI
- All I/Os are fully matrixed, thus enabling optimal use
- Rapid set-up and commissioning, pre-configured relays
- Patented plug-in / draw-out design
- Optimized size - suitable for retrofit purposes
- Versatile tools

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REF615 Selection and ordering data

HBFCACABNBB1ACN1XB

#	DESCRIPTION	
1	**Relay**	
	615 series relay (including case)	**H**
2	**Standard**	
	IEC	**B**
3	**Main application**	
	Feeder protection	**F**

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REF615 Selection and ordering data

HBFCACABNBB1ACN1XB

#	DESCRIPTION				
4	**Functional application** [1]				
	Standard configuration	**A**	**B**	**C**	**D**
5-6	**Analog inputs**				
	4 I + U_0 (I_0 1/5 A)	**AA**	**AA**		
	4 I + U_0 (I_0 0.2/1 A)	**AB**	**AB**		
	4 I (I_0 1/5 A)			**AC**	**AC**
	4 I (I_0 0.2/1 A)			**AD**	**AD**
7-8	**Binary inputs/outputs**				
	3 BI + 6 BO	**AA**			
	4 BI + 6 BO			**AB**	
	10 BI + 9 BO		**AC**		
	11 BI + 9 BO				**AD**
	16 BI + 12BO		**AE**		
	17 BI + 12 BO				**AF**

[1] The selected standard configuration defines the required and optional hardware. Select the correct digits from the standard configuration column A, B, C or D.

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REF615 Selection and ordering data

H B F C A C A B **N B B** 1 A C N 1 X B

#	DESCRIPTION				
9	**Communication serial**				
	RS485	**A**	**A**		
	None			**N**	**N**
10	**Communication Ethernet**				
	Ethernet 100BaseFX (LC)		**A**	**A**	
	Ethernet 100BaseTX (RJ45)		**B**	**B**	
	None	**N**			**N**
11	**Communication protocol** [1]				
	IEC 61850			**A**	**A**
	Modbus	**B**		**B**	
	IEC 61850 and Modbus		**C**	**C**	

[1] The selected communication module (digit 9-10) specifies the available communication protocols. Select your protocol from the relevant column.

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REF615 Selection and ordering data

H B F C A C A B N B B 1 A C N 1 X B

#	DESCRIPTION	
12	**Language**	
	English	**1**
13	**Front panel**	
	Small LCD	**A**
	Large LCD	**B**
14	**Option 1**	
	Reclosing	**A**
	Arc protection [1]	**B**
	Arc protection and reclosing [1]	**C**
	None	**N**
15	**Option 2**	
	None	**N**
16	**Power supply**	
	48...250 V DC, 100...240 V AC	**1**
	24...60 V DC	**2**
17	**Vacant digit**	
	Vacant	**X**
18	**Version**	
	Version 1.1	**B**

[1] The arc protection hardware is located on the communication module (digit 9-10). Thus a communication module is always required to enable arc protection.

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REF615 Selection and ordering data

Example code: H B F C A C A B N B B 1 A C N 1 X B

Your ordering code:

Digit (#)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Code																		

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REF615 Product pages on the web



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