

ABB MEDIUM VOLTAGE PRODUCTS, DISTRIBUTION AUTOMATION

Substation merging unit SMU615

Product presentation

1MRS758641ext_A



Substation merging unit SMU615

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- Application examples
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- Functionality
- Designed for IEC 61850
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Product description

Product description

Substation merging unit SMU615



- Dedicated substation merging unit
- Intended for measuring current and voltage signals from the instrument transformers, merging and sending them to protective devices in the power system in a standard-based digital output format
- Physical interface between the primary equipment in the switchgear - instrument transformers, circuit breakers, disconnectors and earthing switches - and the protective devices in the power system
- Ready configured for acting as a merging unit in the power system
- Simplicity – no excess functions included



Main customer benefits

Main customer benefits

Substation merging unit SMU615 1(2)



- Dedicated merging unit for IEC 61850 process bus applications
- Pragmatic approach to application of process bus in medium-voltage substations for less wiring and supervised communication
- Communication capabilities with the redundant Ethernet solutions HSR and PRP
- Innovative, safe, cost and energy-saving measuring technology option with a digital interface, making it possible to connect ABB sensors to the IEC 61850-9-2 LE-based process bus
- IEEE 1588 V2 for high-accuracy time synchronization and maximum benefit of substation-level Ethernet communication
- Simplicity with no excess functions included – ready configured for acting as a merging unit in the power system

Main customer benefits

Substation merging unit SMU615 2(2)

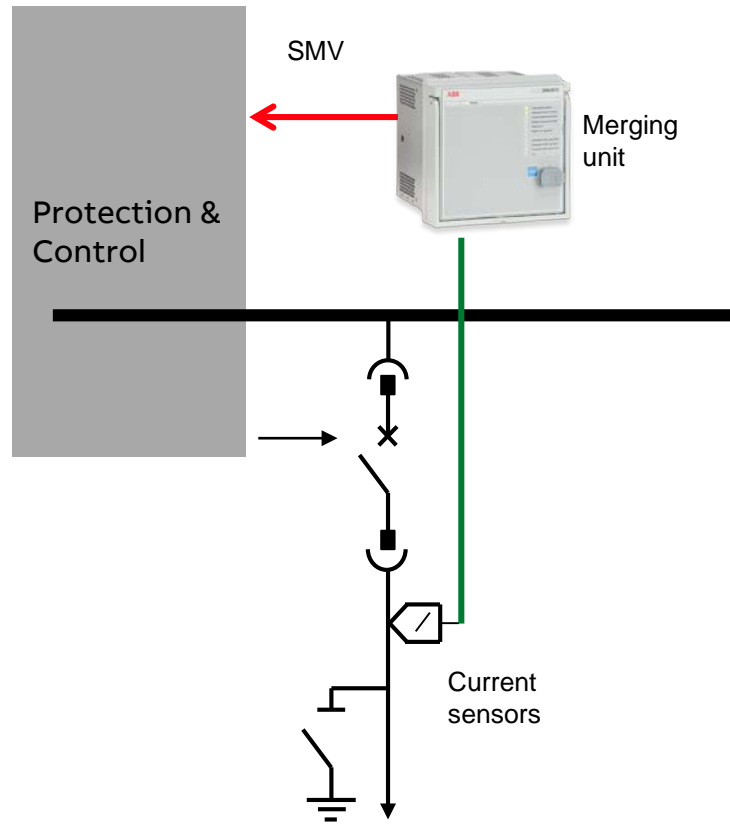


- Easy-to-use web browser-based HMI
- Compact size and withdrawable plug-in unit design for swift installation and testing
- Part of the Relion® product family

Application examples

Application examples

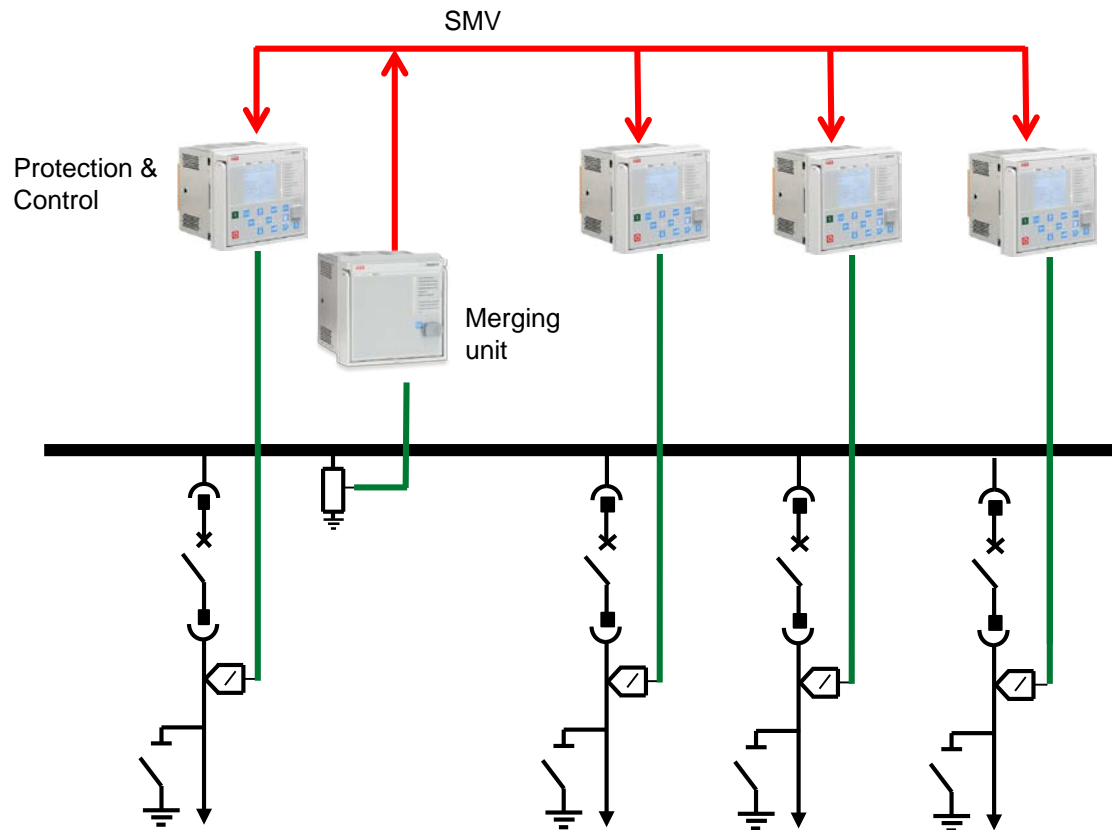
Example 1



- SMU615 is measuring the feeder currents using sensors and sending them forward as Sampled Measured Values (SMV) over Ethernet.
- The protection relay on the same feeder can receive the SMVs over Ethernet and use them for protection purposes.

Application examples

Example 2



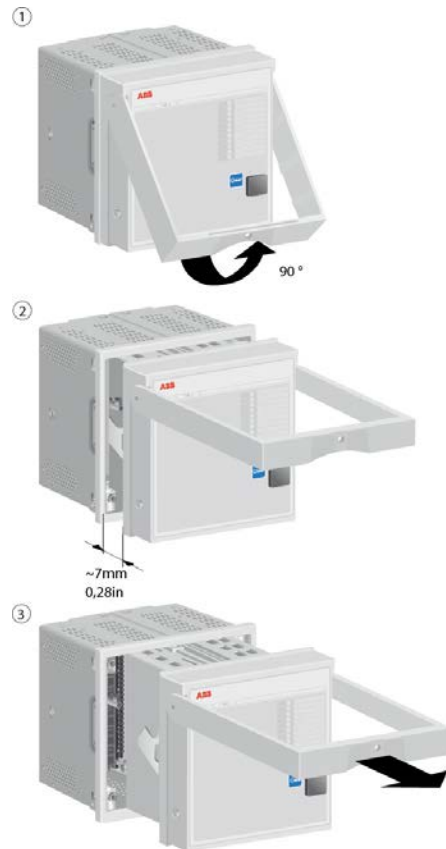
- SMU615 is measuring the voltages in the substation and sending them forward as Sampled Measured Values (SMV) over Ethernet.
- Protection relays in the substation with phase voltage-based functions can receive the SMVs over Ethernet and use them instead of physically measured voltages (using a VT or voltage sensor).



Hardware

Hardware

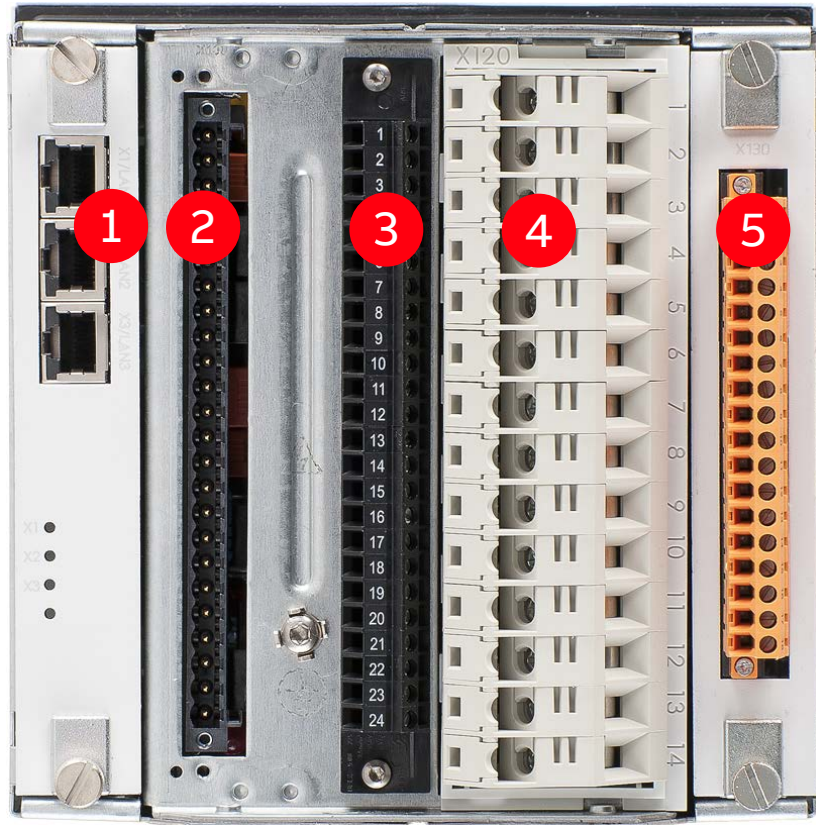
Patented and compact plug-in unit design



- Speeds up installation, maintenance and testing of the unit
- Shortened MTTR (mean time to repair) due to the plug-in unit design and modularity (with spare modules/units in stock)
- Allows the cases to be installed and wired before the plug-in units are inserted
- Mechanical coding system for preventing insertion of the wrong plug-in unit in a case
- Sealable and screw-secured pull-out handle to prevent accidental (or unauthorized) withdrawal of the plug-in unit

Hardware

Modules



- ① [X000] Optical or galvanic redundant Ethernet communication module with or without arc inputs
- ② [X100] Power supply and binary output module
- ③ [X110] Binary I/O module with high-speed outputs (application configuration B only)
- ④ [X120] Analog input module (4CT + 3VT)
Alt.
- ⑤ [X130] Sensor input module (3Is + 3Us + Io)

Hardware

Application configurations

Application configuration A (basic)

Merging unit with analog inputs

- 4 current inputs, 3 voltage inputs, 6BO

Application configuration B

Merging unit with analog inputs, binary I/O and remote control

- 4 current inputs, 3 voltage inputs, 8BI + 6BO + 3HSO

Analog Inputs options (for both A&B)

- Application configuration A and B can both be selected either with conventional CT/VT inputs or alternatively with sensor inputs.
- The SMVs include four currents and four voltages – phase and residual currents as well as phase and residual voltages. The residual voltage is calculated from the measured phase voltages.



Functionality

Functionality

Supported functions 1(2)

Application configuration	IEC 61850	A	B
Measurement			
Disturbance recorder	RDRE	1	1
Three-phase current measurement	CMMXU	1	1
Sequence current measurement	CSMSQI	1	1
Residual current measurement	RESCMMXU	1	1
Three-phase voltage measurement	VMMXU	1	1
Sequence voltage measurement	VSMSQI	1	1
Three-phase power and energy measurement	PEMMXU	1	1
Frequency measurement	FMMXU	1	1
IEC 61850-9-2 LE sampled value sending	SMVSENDER	1	1
Condition monitoring and supervision			
Circuit-breaker condition monitoring	SSCBR		1
Trip circuit supervision	TCSSCBR	2 ¹⁾	2
Current circuit supervision	CCSPVC	1	1
Fuse failure supervision	SEQSPVC	1	1
Arc detection	ARCDSEARC	(3)	(3)

1,2,... = Number of included instances. The instances of a function represent the number of identical function blocks available in the application configuration.

() = Optional

¹⁾ = Not included in the default application

Functionality

Supported functions 2(2)

Application configuration	IEC 61850	A	B
Control			
Circuit-breaker control	CBXCBR		1
Disconnecter control	DCXSWI		2
Earthing switch control	ESXSWI		1
Disconnecter position indication	DCSXSWI		2
Earthing switch indication	ESSXSWI		1
Other			
Minimum pulse timer (2 pcs)	TPGAPC	4	4
Minimum pulse timer (2 pcs, second resolution)	TPSGAPC	1	1
Minimum pulse timer (2 pcs, minute resolution)	TPMGAPC	1	1
Pulse timer (8 pcs)	PTGAPC	2	2
Time delay off (8 pcs)	TOFGAPC	4	4
Time delay on (8 pcs)	TONGAPC	4	4
Set-reset (8 pcs)	SRGAPC	4	4
Move (8 pcs)	MVGAPC	2	2
Generic control point (16 pcs)	SPCGAPC	2	2
Master trip	TRPPTRC	2 ¹⁾	5

¹⁾ = Not included in the default application



Designed for IEC 61850

Design for IEC 61850

Native support for standardized substation communication



IEC 61850
COMPLIANT

- Native support for IEC 61850 communication
- Selectable Edition 2/Edition 1 modes
- IEC 61850 allows horizontal communication between substation devices:
 - Fast GOOSE
 - Sampled values over process bus
- Optical or galvanic redundant Ethernet solution
 - High availability seamless redundancy (HSR)
 - Parallel redundancy protocol (PRP)

Design for IEC 61850

Process bus with sampled values 1(2)



- SMU615 acts as a merging unit, measuring currents and voltages in the substation and sending them as Sampled Measured Values (SMVs) over Ethernet to other device(s).
- The SMVs are transferred using the IEC 61850-9-2 LE protocol.
- SMU615 uses IEEE 1588 V2 Precision Time Protocol (PTP) with Power Profile for high-accuracy time synchronization.
- The SMVs include four currents and four voltages - phase and residual currents as well as phase and residual voltages. The residual voltage is calculated from the measured phase voltages.
- Sending of SMVs is enabled by default.
- Other device(s) in the substation can receive the SMVs over Ethernet and use them for protection purposes.

Design for IEC 61850

Process bus with sampled values 2(2)

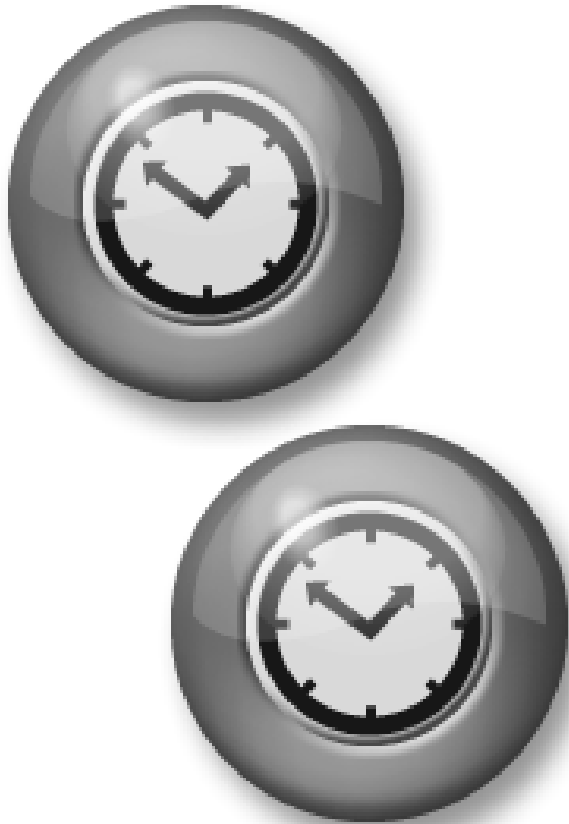
Sampled Measured Values accuracy

Phase current	20%...6000% I_n ¹⁾
	Amplitude: 1% or $\pm 0.003 \times I_n$
	Angle: $\pm 2^\circ$
Residual current	1%...5% I_n
	Amplitude: $0.001 \times I_n$
	Angle: $\pm 4^\circ$
	5%...6000% I_n
	Amplitude: $\pm 1\%$
	Angle: $\pm 1^\circ$
Phase voltage	80%...120% of U_n
	Amplitude: $\pm 0.5\%$
	Angle: $\pm 1^\circ$
Residual voltage (calculated)	1%...100% of U_n
	Amplitude: $\pm 0.5\%$ or $\pm 0.001 \times U_n$
	Angle: $\pm 2^\circ$

¹⁾ For sensor applications the maximum range depends on the application nominal.

Design for IEC 61850

IEEE 1588 time synchronization



- IEEE 1588 V2 for high-accuracy time synchronization and maximum benefit of substation-level Ethernet communication
 - Power Profile
 - Provides high-accuracy time synchronization of 1 μ s
- Required in process bus applications with sampled values using protocol IEC 61850-9-2 LE

Design for IEC 61850

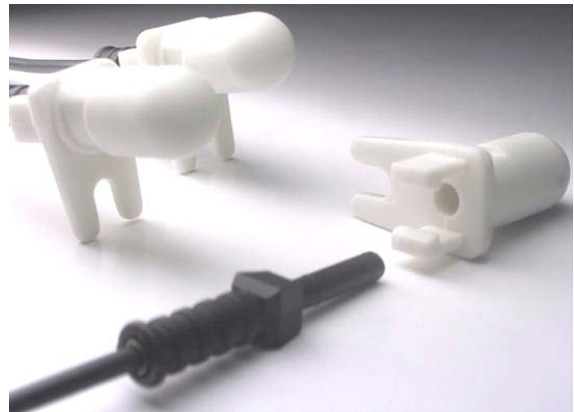
Sensor support



- SMU615 enables the use of sensors (three combi-sensors) with RJ-45 connectors.
- Separate current and voltage sensors can be used together with adapters.
- Adapters also allow using sensors with twin-BNC connectors.
- Sensors enable the use of a merging unit in compact MV switchgear with limited space for conventional measuring transformers.
- Compact MV switchgear (SafeRing, SafePlus and UniGear) is used in:
 - Compact primary substations
 - Compact secondary substations
 - Wind turbine power plants
 - Small industry installations
 - Large buildings

Design for IEC 61850

Arc-fault detection (option)



- Three arc light detection input signals that can be further transferred to protection devices via GOOSE, for instance
- Continuous supervision of the circuit-breaker, cable and busbar compartment of the metal-enclosed switchgear
- Increased personnel safety during maintenance work
- Reduced material damage
- Minimized system downtime
- Same lens and optic fiber as for feeder relay REF615
- Automatic reference level adjustment based on background light intensity
- Typical operate time
 - 10 ms (light only)
 - 4-6 ms shorter with high-speed output (HSO)



Human-machine interface

Human-machine interface

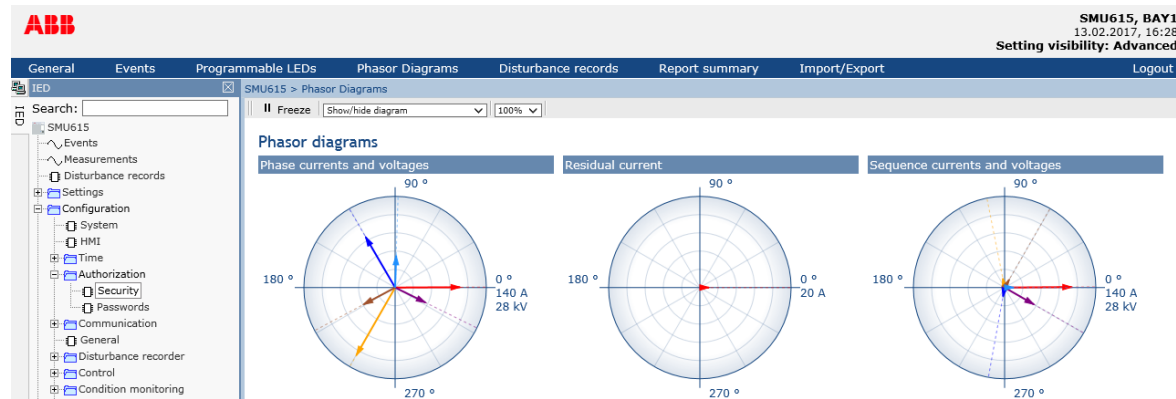
Local HMI



- ① Dedicated ready LED
- ② 11 programmable LEDs
- ③ CLEAR button
- ④ Front communication port

Human-machine interface

Secure web browser-based user interface 1(2)



- Local or remote access using Internet Explorer as web browser
 - Enabled by default on the rear communication port (remote)
 - Always enabled on the front communication port (local)
- Secured communication (HTTPS)
- User access level authentication

Human-machine interface

Secure web browser-based user interface 2(2)

- The following features are available both when the web-browser based HMI is accessed remotely via the rear port and locally via the front communication port:
 - Programmable LEDs
 - Event lists
 - System supervision
 - Parameter settings
 - Measurement display
 - Disturbance records
 - Phasor diagram
 - Importing/Exporting parameters
 - Report summary
- If the web browser-based HMI is accessed locally via the front communication port, the following additional features are available:
 - Setting the merging unit to test mode and testing of outputs
 - Trip circuit lockout reset
 - Restoring factory settings



Tools

Tools

Engineering tools and versions

- The configuration and setting tool PCM600 contains all the necessary sub-tools needed to manage SMU615:
 - Application Configuration
 - Signal Matrix
 - Signal Monitoring
 - Parameter Setting
 - IED Compare
 - Event Viewer
 - Disturbance recorder handling and viewing
 - IEC 61850 (GOOSE and process bus) communication configuration
 - Access control management
 - Online monitoring
 - HMI event filtering (for web browser-based HMI)
 - IED Configuration Migration



Tools	Version
PCM600	2.7 or later
Web browser-based user interface (compatibility verified)	IE 8.0, 9.0, 10.0 or 11.0
SMU615 Connectivity Package	1.0 or later

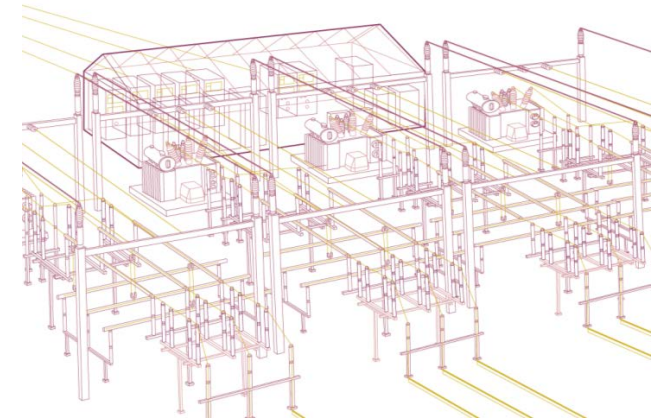


Conclusion

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Substation merging unit SMU615

- Dedicated merging unit for IEC 61850 process bus applications
- Communication capabilities with redundant Ethernet solutions - HSR and PRP
- Innovative, safe, cost and energy-saving measuring technology option with a digital interface, making it possible to connect ABB sensors to the IEC 61850-9-2 LE-based process bus
- IEEE 1588 V2 for high-accuracy time synchronization and maximum benefit of substation-level Ethernet communication
- Simplicity with no excess functions included – ready configured for acting as a merging unit in the power system
- Easy-to-use web browser-based HMI
- Compact size and withdrawable plug-in unit design for swift installation and testing
- Part of the Relion® product family



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