SMP™ SG-4250 substation gateway

General

Eaton leverages more than 20 years of hardware and software development with its SMP™ SG-4250 automation platform and delivers one of the most advanced substation automation solutions on the market. With its robust, performant and scalable design, the SMP SG-4250 automation platform is an evolving solution that adapts to new market requirements.

- Get the most flexible integration platform with up to 10 Ethernet ports and 32 serial ports

- Leverage best in the industry processing power to implement the most demanding projects

- Protect your investments by integrating your legacy equipment with newest technologies including IEC 61850

- Avoid getting trapped in a single vendor solution with a truly interoperable platform

- Strengthen cybersecurity with secured SCADA protocols, encryption, and certificate based authentication

- Comply with NERC/CIP requirements; don't let security slow you down

- Get the most of your system using built-in alarm management system and advanced HMIs

- Add intelligent control using the built-in IEC 61131-5 compliant Soft PLC engine

- Retrieve and manage non-operational data such as fault records and Digital Fault Recorder (DFR) files

- Rely on a robust substation-grade platform with advanced redundancy features

- Save time and get all the performance of the SMP SG-4250 gateway with a complete custom length cable offering

- Maximize availability with the Advanced Ethernet optional module which uses standard Ethernet and PRP/HSR protocols for advanced network management and reduncancy; PTP is coming soon

FAT•N

Powering Business Worldwide

Features

SMP Gateway automation platforms are rugged, reliable, and tailored to our customer's requirements. They are easy to setup and use. Thousands of SMP Gateways have been installed worldwide. Eaton has decades of experience in substation gateway design, making our SMP product line one that utilities can rely on.

Following are a listing of the general features, protocols, and security features offered in the SMP SG-4250 substation gateway.

Table 1. Features

General Features	Supported Protocols	Security Features
Data concentration	DNP3 with Secure Authentication v5	Integrated firewall
Protocol translation	IEC 61850-ed2, GOOSE	Secure maintenance connection (SSL/TLS)
NERC CIP compliant security	IEC 61400-25	Secure SCADA protocol (SSL/TLS)
Hardware and software redundancy	IEC 60870-5-101/103/104	AES-128/256 encryption
Modular- and field-upgradable hardware and software	SEL Fast Meter and ASCII	X.509 certificates
Up to 10 1Gb/s Ethernet ports	IEEE Std C37.118™-2005 standard synchrophasor	Secure remote access for IED maintenance (passthrough)
Ethernet NIC teaming	MODBUS	Account management:
Ethernet multihoming	Secure ICCP	Strong passwords
VLAN tag support	IEC 62056	User accounts and user groups
Integrated web server	AREVA Courier, K-BUS	Detailed group permissions
Automation functions	ABB Standard Ten Bytes, SPABus	Access management
IEC 61131 compatible Soft PLC	Algodue	Access attempts logs
(CODESYS)	Beckwith	Account lock upon failed access attempts
Passthrough connections to IEDs	BlueTree	Retrievable access logs for auditing
IED event file retrieval	Conitel	Syslog support for remote log storage
Offline and template-driven configuration tool	Cooper Form 6	All system components digitally signed
SEL relays autoconfiguration	Cooper 2179	Continuous file monitoring for system integrity
Microsoft Windows®-based maintenance tools, including protocol analyzer	FTP	Achilles certification
Commissioning tool with communication dashboard and MS Excel add-in	GE (D20, EGD, SR, UR, Syprotec)	Nessus compliance
Local/remote HMI with single-line capabilities	Harris 5000/6000	
Alarm annunciator	Hathaway	
Open Interface based on RESTful Web services	Mehta Tech	
External communication radio support	Morgan Schaffer (Calisto)	
Secure file transfer	Motorola MDAC	
Integrated self-diagnostics	Landis+Gyr (LG8979)	
Integrated watchdog timer	Opto 22 (Optomux)	
Power supply monitoring	OSIsoft PI server interface	
High-accuracy real-time clock	RuggedCom	
(with battery backup)	Schneider Electric (ION)	
Internal clock synchronization using IRIG-B, IEEE Std 1588™-2008 standard, SNTP, or via protocols	SES-92	
Device clock synchronization using IRIG-B (demodulated), IEEE Std 1588™-2008 standard, SNTP, or via protocols	SDI-12	
Alarm contacts	VALMET (TEJAS)	
No moving parts		
Panel mount ready		
Custom-length shielded cables available		

Figure 1. SMP SG-4250 front panel

Figure 2. SMP SG-4250 rear panel

The SMP SG-4250 base unit includes:
- Intel CPU module
- Power supply
- Two (2) Ethernet ports
- One (1) serial port
- Three (3) USB ports
- One (1) DVI-I video port
- IRIG-B input/output
- Two (2) output relays

The SMP SG-4250 can be ordered with up to four (4) communication modules. The available modules are:
- Eight (8) asynchronous serial ports (RS-232, 2-wire RS-485, 4-wire RS-485)
- Four (4) Ethernet ports (10/100/1000BASE-T)
- Four (4) fiber optic Ethernet ports with ST connectors (100BASE-FX)
- Four (4) fiber optic Ethernet ports with LC connectors (100BASE-FX)
- Four (4) Ethernet ports on Advanced Ethernet module (Standard/PRP/HSR)* (10/100/1000BASE-T)
- Four (4) fiber optic Ethernet ports on Advanced Ethernet module (Standard/PRP/HSR) with ST connectors (100BASE-FX)*
- Four (4) fiber optic Ethernet ports on Advanced Ethernet module (Standard/PRP/HSR)* with LC connectors (100BASE-FX)
- Four (4) universal ports with DB25 connectors (RS-232, 2-wire RS-485, 4-wire RS-485) and a BNC connector for modulated IRIG-B input

*: PTP is coming soon
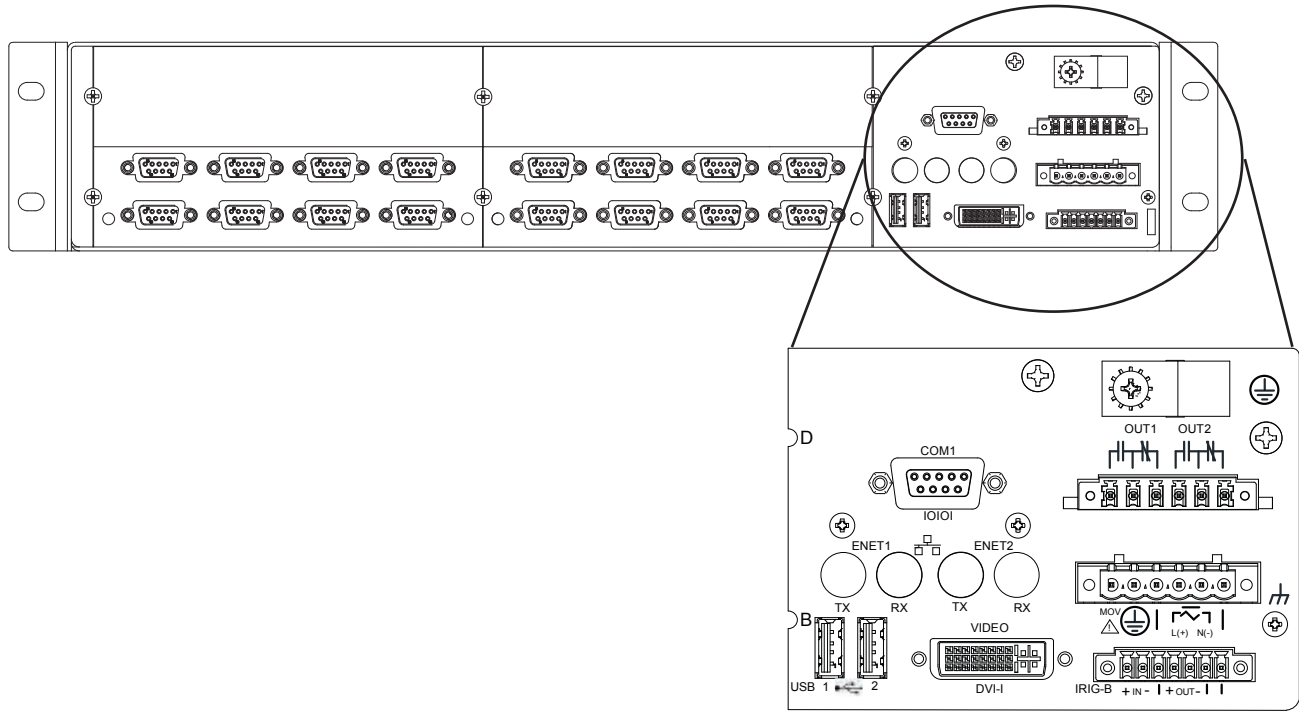
SMP SG-4250 modules configuration overview

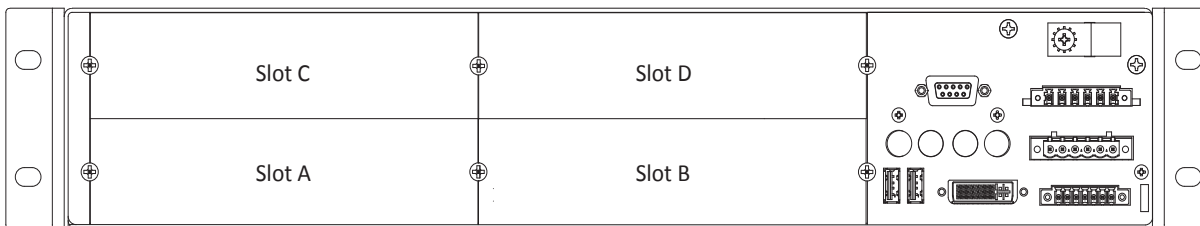**Figure 3. SMP SG-4250 base unit ports (optional fiber optic Ethernet is shown).**

Figure 4. Available slots for communication modules.

The following table shows module availability for each slot.

Table 2. SMP SG-4250 Module Availability

Module	Serial	Ethernet (CU, ST or LC)	Advanced Ethernet (PRP/HSR) PTP* (CU, ST or LC)	Universal Communication **
Slot A	Option	No	No	Option
Slot B	Option	No	No	Option
Slot C	Option	Option	Option	Option
Slot D	Option	Option	Option	Option

*: PTP is coming soon

**: maximum of three (3) Universal communication modules per SMP SG-4250

SMP SG-4250 specifications

Table 3. General Specifications

Dimensions	Rack unit: 2U	
	3.3 in. H x 19 in. W x 12.875 in. L	
	84 mm H x 482 mm W x 327 mm L	
	(15 lbs max)	
Degrees of protection provided by enclosure	IEC 60529:IP30	
Warranty	5-year limited	
Operating temperature	-40 °C to 85 °C (-40 °F to 185 °F)	Safety marking is based on temperature derating table
Storage temperature	-40 °C to 85 °C (-40 °F to 185 °F)	
Humidity	5 to 95%, non-condensing	
MTBF	Telcordia SR-332	8.74 years at 24 °C
Maximum altitude	2000 m	
Internal temperature sensor	High-temperature alarm	
Internal Battery	Lifetime: > 20 years	

Table 4. CPU

Processor Architecture	x86
Operating System	Windows Embedded Compact 7.0
Processor	Intel Atom Dual Core 1.8 GHz

Table 5. Memory

RAM	2 GB (DDR2)	
Storage	1 GB Compact Flash	For OS, application and user data
Additional storage options	8 GB Compact Flash	For user data
	32 GB SLC Solid-State Drive	
	64 GB SLC Solid-State Drive	
	128 GB SLC Solid-State Drive	

Table 6. Power Supply Options

Low Voltage		
Rated supply voltage	24 – 48 Vdc	As per IEC 60870-2-1 (DC3)
Input voltage range	19 – 56 Vdc	
Inrush current	48 A at 24 Vdc (t=1.5 ms)	
	95 A at 48 Vdc (t=1.5 ms)	
Power consumption	35 W to 75 W	
High Voltage		
Rated supply voltage	110-230 Vac / 125-250 Vdc	As per IEC 60870-2-1 (AC3 / DC3)
Input voltage range	88-264 Vac / 100-287.5 Vdc	
Frequency range	50/60 Hz	
Inrush current	38.9 A at 120 Vac (t=1.5 ms)	
	78.3 A at 240 Vac (t=1.5 ms)	
	28.6 A at 125 Vdc (t=1.5 ms)	
Power consumption	High end series: 35 W to 75 W	

Table 7. Base Unit Communication Ports

2 Ethernet Ports	10/100/1000BASE-T	RJ45 connectors
	or	
	100BASE-FX, Multimode 1300 (option)	ST or LC connectors available Class 1 laser product
1 Serial Port	For touchscreen connectivity or RS-232 communications Up to 115200 b/s	DB9 connector
	Common mode TVS protection	91 A 8/20us
3 USB 2.0 Ports	1 client port for maintenance	Type B connector (front panel)
	2 host ports for touchscreen/mouse/keyboard	Type A connector (rear panel)

Table 8. Time Synchronization

Demodulated IRIG-B	Via terminal block (back panel)	Isolated
Input	2 V high-level detection,	Current sink at 5 V IRIG-B; 5 mA
	Vin max up to 12 Vdc, Opto-isolated	Current sink at 10 V IRIG-B; 14 mA
	IEEE Std 1344™-1995 standard	Input impedance = 850-1000 Ω
	Accuracy: ± 1 µs	
	Differential mode TVS protection	91 A 8/20 µs
Distribution	5 or 10 V, software-configurable (jumperless).	$Load_{MAX}$ = 40 Ω for 10 V and 20 Ω for 5 V
	Accuracy: ± 1 µs	
	Common mode TVS protection	91 A 8/20 µs

Table 9. Video

DVI / VGA port	DVI-I connector, single display	VGA requires DVI-I to VGA adapter Maximum resolution DVI - 1366 x 768 @60 Hz Maximum resolution VGA - 2048 x 1536 @ 60 Hz

Table 10. Output Relays

2 Form C relays	Normally open and normally closed contacts	Resistive load
	1st relay is available for system health monitoring	12 Vdc 6 A maximum
	2nd relay is available for system applications and can be activated through a system data point	24 Vdc 5 A maximum
		48 Vdc 1 A maximum*
		125 Vdc 400 mA maximum*
		250 Vdc 300 mA maximum*
		110/120/220/240 Vac 3 A maximum
		Inductive load (PF = 0.4)
		3 A 250 Vac inductive
		Operating time 10 msec maximum
		Release time 5 msec maximum
		Mechanical durability 20 M no load operations
		2500 Vac dielectric, Dry contacts protected by MOV 125J

* Safety marking not applicable if more than 30 Vdc

Table 11. Communication Modules

Metallic Ethernet ports (Ethernet and Advanced Ethernet modules)	4 ports 10/100/1000BASE-T	RJ45 connectors
	IEEE Std 1588™-2008 standard hardware ready	
Fiber Optic Ethernet ports (ST) (Ethernet and Advanced Ethernet modules)	4 ports 100BASE-FX	ST connectors
	Multimode 1300 nm	Class 1 laser product
	IEEE Std 1588™-2008 standard hardware ready	
Fiber Optic Ethernet ports (LC) (Ethernet and Advanced Ethernet module)	4 ports 100BASE-FX	LC connectors
	Multimode 1300 nm	Class 1 laser product
	IEEE Std 1588™-2008 standard hardware ready	
Asynchronous Serial Ports	8 ports	DB9 connectors
	RS-232, 2-wire RS-485, 4-wire RS-485	Data rate up to 115200 bps
	Software configurable	
	Demodulated IRIG-B distribution	5 V or 10 V
	5 Vdc Power supply	250 mA max. per port, 350 mA max. per module
	Common mode TVS protection	91 A 8/20 μs
Universal module		
4 universal ports	Software configurable	DB25 connectors
	RS-232, 2-wire RS-485, 4-wire RS-485 and synchronous communications	Data rate up to 115200 bps
	Demodulated IRIG-B distribution	5 or 10 V
	Configurable 1-PPS output	
	5 Vdc power supply	250 mA max. per port
		1 A max. per module
	Common mode TVS protection	91 A 8/20 μs
Modulated IRIG-B input	High state ≤ 16 Vpp	High-impedance BNC connector
	Low state ≥ 0.8 Vpp	Input impedance = 9 kΩ
	Accuracy: ± 1ms	
	Differential mode TVS protection	91 A 8/20 μs

Table 12. Certification and Standard Compliancy

CB Scheme Test Report	IEC 61010-1 ed3.0 (2010-06)	
cTUVus Marking	IEC 61010-1 ed 3.0 (2010-06, CAN/CSA-C22.2 No 61010-1-12 and ANSI/UL 61010-1-2012)	
RoHS	2002/95/EC	
REACH	Regulation (EC) No 1907/2006	
ISO : Equipment is designed and manufactured using ISO 9001 certified quality program		ISO 9001:2008 certificate of conformance was awarded by an independent certification authority. The corresponding certificate, quality manual and quality policy are available on demand.
Achilles Certification	Level 1	
CE Marking	2006/95/EC Low Voltage Directive	
	2004/108/CE EMC Directive	
	2006/1907 (EC) (REACH)	
	2011/65/EU (ROHS)	
Substation Grade	IEC 61850-3 ed1.0 (2002)	Comply to immunity requirements for protection and teleprotection device
		Climatic: Class C3 (3K7)
		Mechanical: Class Cm (3M6)
		Seismic: Class S3
	IEEE Std 1613™-2009 standard IEEE Std 1613a™-2011 standard	Class 2 on all ports (error free)
Industrial Generic	IEC 61000-6-2 ed2.0 (2005-01) IEC 61000-6-4 ed2.0 (2006-07)	Exceed the requirements of the IEC 61000-6-2 and IEC 61000-6-4. The conformity report is available on demand.

Substation grade compliancy notes

Table 13. Substation Grade Compliance

Compliancy	Notes
IEC 61850-3 ed1.0 2002	The SMP SG-4250 is a communication device designed to achieve the highest immunity required in power stations to provide local, field and high voltage signal port connections. It can be installed in low, medium and high voltage substations, in any weather-protected unconditioned environment.
	It meets or surpasses IEC 61850-3 following classes: Climatic: Class C3 (3K7), Mechanical: Class Cm (3M6), Seismic: Class S3.
	The SMP SG-4250 comply with the immunity requirements for the following normalized functions (as per IEC 61850-3): - Protection and teleprotection - Online processing and regulation - Metering - Command and control - Supervision - Man-machine interface - Alarm - Data transmission and telecommunication - Data acquisition and storage - Measurement - Off-line processing - Passive surveillance
	Due to the importance of selecting good cable quality EMC test has been performed with Eaton cables.
	The SMP SG-4250 compliance with the IEC 61850-3 standard was validated by an independent certified testing laboratory and under the surveillance of a world class power utility.. The compliance test reports are available on demand.
IEEE Std 1613™--2009 standard IEEE Std 1613a™-2011 standard	The SMP SG-4250 also meets or surpasses IEEE Std 1613 requirements as Class 2 networking device for serial (RS-232, 4-wire RS-485 and 2-wire RS-485) and Ethernet communications (copper and fiber-optic). SG4000 ensures error free uninterrupted communications required for Class 2 critical processes and protections.
	Due to the importance of selecting good cable quality EMC test has been performed with Eaton cables.
	The SMP SG-4250 compliance with the IEEE 1613 standard was validated by an independent certified testing laboratory and under the surveillance of a world class power utility. The compliance test reports are available on demand.
CB Scheme	The CB Scheme is an international program created by the (IECEE) for the acceptance of product safety test results among participating laboratories and certification organizations around the world.
	The SMP SG-4250 CB Scheme compliance was validated by an independent certified testing laboratory. The certification reports are available on demand.
Achilles certification	The SMP SG-4250 meets the formal and comprehensive Achilles Level 1 Certification set of requirements and conformance, which verifies the network robustness of industrial control devices.
	The SMP SG-4250 Achilles compliance was validated by Wurltech laboratory. The certification reports are available on demand.
cTUVus	The SMP SG-4250 is cTUVus marked. It ensures the end user that the SG4250 is safe.
	The SMP SG-4250 cTUVus certification was validated by an independent certified testing laboratory. The marking reports are available on demand.

Type tests details

This section presents all tests that were conducted on the SMP SG-4250 platform.

Table 14. IEC 61850-3 (2002)

Electromagnetic Compatibility (EMC)

Conducted Emissions	CISPR 22 (2008)	Class A
Radiated Emissions	CISPR 22 (2008)	Class A 30 MHz-6 GHz
Electrostatic Discharge Immunity	IEC 61000-4-2 (2008)	Contact: ±6 kV
		Air: ±8 kV
Radiated Electromagnetic Field Immunity	IEC 61000-4-3 (2006)	80 MHz-1 GHz: 20 V/m + 1 kHz 80%AM
	A1 (2008) A2 (2010)	1 GHz-3 GHz: 10 V/m + 1 kHz 80%AM
		Additional frequency:
		5.15 Ghz-5.75 Ghz : 10 V/m + 1 kHz 80 %AM
Electrical Fast Transient Immunity	IEC 61000-4-4 (2012)	Power: ±4 kV / 5 kHz and 100 kHz
		I/O Ports: ±2 kV / 5 kHz
		Communication Ports: ±2 kV / 5 kHz
Surge Immunity	IEC 61000-4-5 (2005)	110-230 Vac/125-250 Vdc supply: ±2 kV (CM) / ±1 kV (DM) *
		24-48 Vdc Supply: ±2 kV (CM) / ±1 kV (DM)
		I/O Ports : ±2 kV (CM) / ±1 kV (DM)
		Communication Ports: ±2 kV (CM) / ±1 kV (DM)
		* Surge immunity on 110-230 Vac/125-250 Vdc supply can be increased to 4 kV (CM) / ±2 kV (DM) by activating internal MOV (Part 210FA0062R required). Refer to installation guide for more information.
Conducted Immunity	IEC 61000-4-6 (2008)	Power: 10 V_{rms}
		I/O Ports: 10 V_{rms}
		Communication Ports: 10 V_{rms}
Power Frequency Magnetic Field Immunity	IEC 61000-4-8 (2009)	Continuous Field: 100 A/m / 50 Hz & 60 Hz
		Short duration field: 1000 A/m / 50 Hz & 60 Hz
Damped Oscillatory Magnetic Field Immunity	IEC 61000-4-10 (1993) A1 (2000)	Field strength: 100 A/m
		Oscillation frequency: 100 kHz & 1 MHz
Voltage Dips, Short Interruptions and Voltage Variation Immunity	IEC 61000-4-11 (2004) IEC 61850-3 (2002)	Voltage dips:
		70 % during 1 cycles
		40 % during 50 cycles
		Short interruptions:
		0 % during 10 ms
		0 % during 5 cycle
		0 % during 50 cycles
AC Supply variation Immunity	IEC 60870-2-1 (1995) IEC 61850-3 (2002)	Tolerance of nominal voltage: +15 % to -20 % (AC3)
		Tolerance of nominal frequency: +/- 5 % (F3)
DC Voltage Tolerance & Earthing Arrangements	IEC 60870-2-1 (1995) IEC 61850-3 (2002)	Tolerance of nominal voltage: +15 % to -20 % (DC3)
		Earthing Arrangements duration: 5 min
Conducted Common Mode Disturbances in the Frequency Range 0Hz-150kHz	IEC 61000-4-16 (1998) A1 (2001) A2 (2009)	Frequency: 50 Hz & 60 Hz
		Continuous: 30 V_{rms} / Dwell time: 10 sec
		Short duration: 300 V_{rms} / Dwell time: 1 sec
Ripple on DC Input Power Port Immunity	IEC 61000-4-17 (1999)	% of nominal DC voltage: 10 %
	A1 (2002) A2 (2009)	Test duration: 10 min
Damped Oscillatory Wave Immunity	IEC 61000-4-18 (2006) A1 (2011)	Power: 2.5 kV CM / 1 kV DM f = 1 MHz
		Signal ports: 1 kV CM / 0.5 kV DM f = 1 MHz

Table 14. IEC 61850-3 (continued)

Voltage Dips, Short Interruptions and Voltage Variation on DC Power Port Immunity	IEC 61000-4-29 (2000)	Voltage dips:	
		40%Un during 100 ms*	
		70%Un during 100 ms*	
		Short interruptions:	
		0% during 10 ms	
		0% during 50 ms	
		* Exception for 24-48 Vdc Power Supply operating at 24 Vdc:	
		Voltage short interruptions:	
		0% during 25 ms	
		Voltage dips:	
		40%Un during 25 ms	
		70%Un during 20 ms	
Polarity Reversal	IEC 61850-3 (2002)		
Climatic Environment Conditions			
Dry heat	IEC 60068-2-2 (2007) Test Bd	85 °C, 16 h 5 warm boot	
Cold	IEC 60068-2-1 (2007) Test Ad	-40 °C, 16 h 5 cold boot	
Damp Heat, Steady State:	IEC 60068-2-78 (2012) Test Cab	40 °C, 93 %, 96 h	
Damp Heat, Cyclic:	IEC 60068-2-30 (2005) Test Db	40 °C, 2 cycles, 95 %RH	
Change of temperature	IEC 60068-2-14 (2009) Test Nb	-40 °C +25 °C, 2 cycles, 1 °C/min, t^t=3h	
Mechanical Environmental Conditions			
Sinusoidal Vibration - Endurance	IEC 60068-2-6 (2007)	20 cycles, 2 g, 7,5 mm, 20 mm/s^2, 3 axes	
Sinusoidal Vibration - Seismic	IEC 60255-21-3 (1993)	Class 2, method A	
Shock–Bump	IEC 60068-2-27 (2008)	Semi-sinusoidal	
		300 m/s^2 , 6 ms, Shocks by direction: 3, 3 axes	
		Additional tests:	
		50 m/s^2, 5 g, 11 ms, 3 impulsions, 3 axes	
		150 m/s^2, 15 g, 11 ms, 3 impulsions, 3 axes	
		100 m/s^2, 10 g, 16 ms, 1000 impulsions, 3 axes	
Static Load	IEC 60870-2-2 (1996)	5 kPa, 1 min	
Free Fall	IEC 60068-2-31 (2008)	1 m with packaging	
		25 cm without packaging	

Table 15. IEEE Std 1613™-2009 Standard

Electromagnetic Compatibility (EMC)

DC Rated Control Power Input	IEEE Std 1613™-2009 standard	Min: 80 %Un: 5 min
		Max: as per table 3: 5 min
AC Rated Control Power Input	IEEE Std 1613™-2009 standard	Min: 85 %Un: 5 min
		Max: 110 %: 5 min
		85 % f min: 5 min
		85 % f max: 5 min
		100 % f min: 5 min
		100 % f max: 5 min
		115 % f max : 5 min
		115 % f min : 5 min
Electrostatic Discharge Immunity	IEEE Std C37.90.3™-2001 standard	Contact: ±8 kV
		Air: ±15 kV
		Communication profiles: Heavy load, Typical load and idle.
Radiated Electromagnetic Field Immunity	IEEE Std C37.90.2™-2004 standard	80 MHz-1 GHz: 20 V/m + 80 %AM
		80 MHz-1 GHz: 20 V/m + 100 %PM
		(1:2/200Hz)
		Spot frequencies according to Table 10 of the standard
		900 Mhz : 20 V/m + 100 %PM (1:2/200 Hz)
SWC: Fast Transient Waveform	IEEE Std C37.90.1™-2002 standard	±4 kV / 2.5 kHz
		Communication profiles: Heavy load, Typical load and idle.
SWC : Oscillatory Waveform	IEEE Std C37.90.1™-2002 standard	2.5 kV CM /2.5 kV DM
		Oscillation frequency: 1 MHz
		Communication profiles: Heavy load, Typical load and idle.
Ripple on DC Input Power Port Immunity	IEEE Std 1613™-2009 standard	% of nominal DC voltage: 5 %
		Test duration: 10 min
Impulse Voltage Withstand Test	IEEE Std C37.90™-2007 standard	Power: ±5 kV
		I/O: ±5 kV
		Ethernet: ±2.5 kV
Dielectric Test	IEEE Std C37.90™-2007 standard	24-48 Vdc Supply @1000 Vdc
		110-230 Vac/125-250 Vdc Supply @2000 Vac
		Output relays @2500 Vac
		Demodulated IRIG-B IN @2000 Vac
		RJ45 Ethernet @1500 Vac
		Modulated IRIG-B IN @2000 Vac
Climatic Environment Conditions		
Dry heat	IEC 60068-2-2 (2007) Test Bd	85 °C, 16 h 5 warm boot
Cold	IEC 60068-2-1 (2007) Test Ad	-40 °C, 16 h 5 cold boot
Damp Heat, Steady State:	IEC 60068-2-78 (2012) Test Cab	40 °C, 93%, 96 h
Damp Heat, Cyclic:	IEC 60068-2-30 (2005) Test Db	40 °C, 2 cycles, 95% RH
Mechanical Environmental Conditions		
Sinusoidal Vibration - Endurance	IEC 60068-2-6 (2007)	20 cycles, 2 g, 7,5 mm, 20 mm/s^2, 3 axes
Sinusoidal Vibration - Response	IEC 60068-2-6 (2007)	10-150 Hz, 0.5 g, 0,035 mm, 3 axes
Shock–Bump	IEC 60068-2-27 (2008)	Semi-sinusoidal
		300 m/s^2 , 6 ms, Shocks by direction: 3, 3 axes
		Additional tests:
		50 m/s^2, 5 g, 11 ms, 3 impulsions, 3 axes
		150 m/s^2, 15 g, 11 ms, 3 impulsions, 3 axes
		100 m/s^2, 10 g, 16 ms, 1000 impulsions, 3 axes
Free Fall	IEC 60068-2-31 (2008)	1 m with packaging
		25 cm without packaging

Temperature derating

The SMP SG-4250 can support operating temperatures between
-40 °C and +85 °C per the IEC 60068-2-2 ed5.0 and IEC 60068-2-1 ed6.0 standards.

Note: The SMP SG-4250 meets the Dry Heat test requirements of 16 hours at 85 °C when equipped with CompactFlash disk storage (no SSD).

To be compliant with the IEC 61010-1 certification, the SMP SG-4250 can be used between the temperature range that is function of the total power consumption of the unit, as described by the tables below. If the SMP SG-4250 is equipped with fiber-optic LC connectors, the maximum operating temperature is the smallest value between the one provided by the second table or 60 °C.

Table 16. Temperature Derating-Power Consumption Evaluation

System Configuration		Power Consumption (W)	Power Consumption Evaluation (W)
SMP SG-4250 Substation Gateway (Basic Consumption)		23	23
Optional Features			
Memory Expansion	Solid State Drive (SSD) Expansion*	2	
Built-in Ethernet	2x Ethernet 10BASE-T/100BASE-TX/1000BASE-T Ports	4	
	2x Ethernet 100BASE-FX, Fiber Optic ST Connectors	5	
	2x Ethernet 100BASE-FX, Fiber Optic LC Connectors**	5	
Slot A	8x Serial RS-232/485 Ports (DB9)	3	
	4x Universal Communication Ports (DB25)	4.2	
Slot B	8x Serial RS-232/485 Ports (DB9)	3	
	4x Universal Communication Ports (DB25)	4.2	
Slot C	8x Serial RS-232/485 Ports (DB9)	3	
	4x Universal Communication Ports (DB25)	4.2	
	4x Ethernet 10/100/1000BASE-TX Ports	8	
	4x Ethernet 100BASE-FX, Fiber Optic ST Connectors	11.5	
	4x Ethernet 100BASE-FX, Fiber Optic LC Connectors**	11.5	
	Advanced Ethernet module copper (PHP/HSR), PTP***	13.5	
	Advanced Ethernet module Optical ST (PHP/HSR) PTP***	13.5	
	Advanced Ethernet module Optical LC (PHP/HSR) PTP***	13.5	
Slot D	8x Serial RS-232/485 Ports (DB9)	3	
	4x Universal Communication Ports (DB25)	4.2	
	4x Ethernet 10/100/1000BASE-TX Ports	8	
	4x Ethernet 100BASE-FX, Fiber Optic ST Connectors	11.5	
	4x Ethernet 100BASE-FX, Fiber Optic LC Connectors**	11.5	
	Advanced Ethernet module copper (PHP/HSR), PTP***	13.5	
	Advanced Ethernet module Optical ST (PHP/HSR) PTP***	13.5	
	Advanced Ethernet module Optical LC (PHP/HSR) PTP***	13.5	
	Total Power Consumption (W):		

* Maximum operating temperature with SSD storage is 70 °C.

** Maximum operating temperature with LC fiber optic Ethernet connector is 60 °C .

*** The maximum opterating temperature with the Advanced Ethernet module (PRP/HSR) is 55 °C. The Advanced Ethernet module PTP feature is coming soon.

Table 17. Temperature Derating per Power Consumption Range

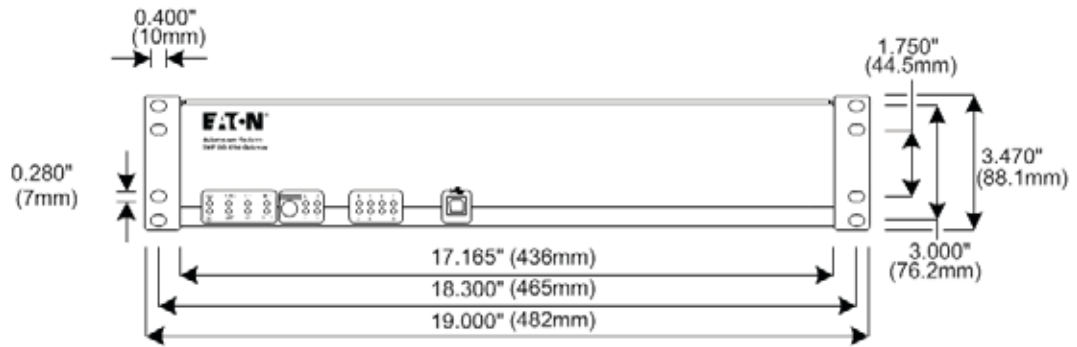| Total Power Consumption (W)	Normal Operating Temperature (°C)
< 40	70 °C
> 40 W to 50 W	65 °C
> 50 W to 65 W	55 °C

Dimension drawings

Figure 5. Front panel view.

Figure 6. Side view.
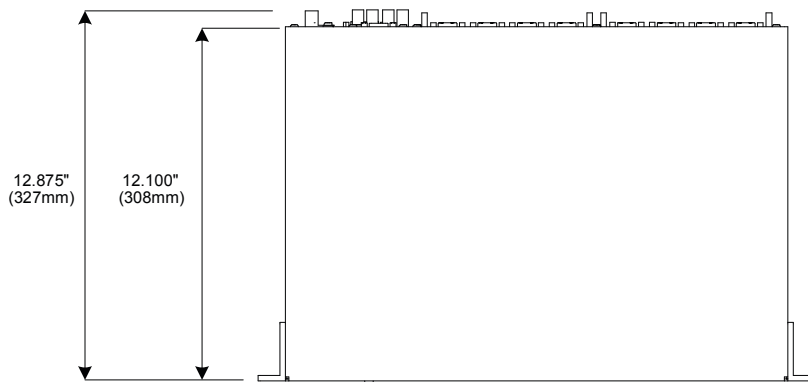
Figure 7. Top view.

Table 18. System Configuration Chart

Description	SMP	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Family																	
SG4 Substation Gateway 4000		SG4															
Format																	
Rackmount 2U Base Unit			2														
Model																	
High performance				5													
Special/Customer Custom #1																	
NONE					0												
General Option/Customer Custom #2																	
NONE						0											
Basic Ethernet Option																	
2 Ethernet 10/100/1000 BASE-TX							A										
2 Ethernet 100 Optical, ST Connectors							B										
2 Ethernet 100 Optical, LC Connectors							C										
Basic and Expansion Flash Memory																	
BASIC 1 GB, No Expansion Flash								A									
BASIC 1 GB, Expansion 8 GB CF								B									
BASIC 1 GB, Expansion 32 GB SSD								D									
BASIC 1 GB, Expansion 64 GB SSD								E									
Basic 1 GB, Expansion 128 GB SSD								F									
Power Supply																	
24-48 Vdc									B								
110-230 Vac, 125-250 Vdc									C								
Expansion Slot A																	
NONE										0							
8x Serial RS-232/485 (DB9)										A							
4x Universal Communication Port (DB25) with IRIG-B Modulated Input										B							
Expansion Slot B																	
NONE											0						
8x Serial RS-232/485 (DB9)											A						
4x Universal Communication Port (DB25) with IRIG-B Modulated Input											B						
Expansion Slot C																	
NONE												0					
8x Serial RS-232/485 (DB9)												A					
4x Universal Communication Port (DB25) with IRIG-B Modulated Input												B					
4x Ethernet 10/100/1000BASE-T												C					
4x Ethernet Optical 100 ST Connector												D					
4x Ethernet Optical 100 LC Connector												E					
4x Advanced Ethernet 100/1000BASE-T(PRP/HSR)												K					
4x Advanced Ethernet Optical 100 ST (PRP/HSR)												L					
4x Advanced Ethernet Optical 100 LC (PRP/HSR)												M					
Expansion Slot D																	
NONE													0				
8x Serial RS-232/485 (DB9)													A				
4x Universal Communication Port (DB25) with IRIG-B Modulated Input													B				
4x Ethernet 10/100/1000BASE-TX													C				
4x Ethernet Optical 100 ST Connector													D				
4x Ethernet Optical 100 LC Connector													E				
4x Advanced Ethernet 100/1000BASE-T(PRP/HSR)													K				
4x Advanced Ethernet Optical 100 ST (PRP/HSR)													L				
4x Advanced Ethernet Optical 100 LC (PRP/HSR)													M				

Table 18. System Configuration Chart (continued)

Description	SMP	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Expansion Slot E																	
NONE														0			
Expansion Slot F																	
NONE															0		
Expansion Slot G																0	
NONE																0	
Expansion Slot H																	
NONE																	0

Table 19. Individual Communication Module

Part Number	Description
SMP-SG-4000-1001	8x Serial RS-232/485 Ports (DB9)
SMP-SG-4000-1002	4x Universal Communication Ports (DB25) with IRIG-B Modulated Input
SMP-SG-4000-1003	4x Ethernet 10/100/1000BASE-TX
SMP-SG-4000-1004	4x Ethernet Fiber-Optic 100BASE-FX ST Connectors
SMP-SG-4000-1005	4x Ethernet Fiber-Optic 100BASE-FX LC Connectors
SMP-SG-4000-1007	Advanced Ethernet Module 4 x 100/1000BASE-TX (PRP/HSR), PTP*
SMP-SG-4000-1008	Advanced Ethernet Module Fiber-Optic 4 x 100BASE-FX ST Connectors (PRP/HSR), PTP*
SMP-SG-4000-1009	Advanced Ethernet Module Fiber-Optic 4 x 100BASE-FX LC Connectors (PRP/HSR), PTP*

*: PTP is coming soon

Table 20. Accessories

Part number	Description
210VA0004R	DVI to VGA converter
210FA0062R	MOV jumper option for 110-230 Vac, 125-250 Vdc power supply. Included with power supply 24-48 Vdc. Refer to Surge immunity section in Table 14

Table 21. Cables

Part number	Description
Shielded Power Cable	
P-CABC-0303-00	AC Power Cable Shielded Nema 5-15-Wire
	Note: Must be used for Demo or laboratory only
P-CABC-0306-00	Power Cable Shielded Wire-Wire 1.8 m
P-CABC-0318-10	Power Cable Shielded Wire-Wire 10 m
P-CABC-0318-03	Power Cable Shielded Wire-Wire 3 m
P-CABC-0318-01	Power Cable Shielded Wire-Wire 1 m
P-CABC-0318-xx*	Power Cable Shielded Wire-Wire x m
USB cable	
600AB0008R	Replacement USB Cable, Shielded
	Note: For USB Console Port
Ethernet MultiMode Fiber	
ST-ST	
P-CABC-0317-0050	Multimode Fiber OM1 62.5/125µm ST-ST 50 m
P-CABC-0317-0025	Multimode Fiber OM1 62.5/125µm ST-ST 25 m
P-CABC-0317-0010	Multimode Fiber OM1 62.5/125um ST-ST 10 m
P-CABC-0317-0003	Multimode Fiber OM1 62.5/125µm ST-ST 3 m
P-CABC-0317-0001	Multimode Fiber OM1 62.5/125um ST-ST 1 m
P-CABC-0317-xxxx*	Multimode Fiber OM1 62.5/125um ST-ST x m
LC-LC	
P-CABC-0315-0050	Multimode Fiber OM1 62.5/125um LC-LC 50 m
P-CABC-0315-0025	Multimode Fiber OM1 62.5/125um LC-LC 25 m
P-CABC-0315-0010	Multimode Fiber OM1 62.5/125um LC-LC 10 m
P-CABC-0315-0003	Multimode Fiber OM1 62.5/125um LC-LC 3 m
P-CABC-0315-0001	Multimode Fiber OM1 62.5/125um LC-LC 1 m
P-CABC-0315-xxxx*	Multimode Fiber OM1 62.5/125um LC-LC x m

Table 21 Cables continued

Part number	Description
ST-LC	
P-CABC-0316-0050	Multimode Fiber OM1 62.5/125um ST-LC 50 m
P-CABC-0316-0025	Multimode Fiber OM1 62.5/125um ST-LC 25 m
P-CABC-0316-0010	Multimode Fiber OM1 62.5/125um ST-LC 10 m
P-CABC-0316-0003	Multimode Fiber OM1 62.5/125um ST-LC 3 m
P-CABC-0316-0001	Multimode Fiber OM1 62.5/125um ST-LC 1 m
P-CABC-0316-xxxx*	Multimode Fiber OM1 62.5/125um ST-LC x m
Ethernet RJ45 Shielded Cable	
P-CABC-0310-025	Copper Ethernet Cable RJ45 CAT6 25 m
P-CABC-0310-010	Copper Ethernet Cable RJ45 CAT6 10 m
P-CABC-0310-003	Copper Ethernet Cable RJ45 CAT6 3 m
P-CABC-0310-001	Copper Ethernet Cable RJ45 CAT6 1 m
P-CABC-0310-xxx*	Copper Ethernet Cable RJ45 CAT6 x m
DB9 Serial Shielded Cable	
RS-232 Null Modem cable DB9M-DB9M	
P-CABC-0311-10	RS232 Null Modem Cable DB9M-DB9M 10 m
P-CABC-0311-03	RS232 Null Modem Cable DB9M-DB9M 3 m
P-CABC-0311-01	RS232 Null Modem Cable DB9M-DB9M 1 m
P-CABC-0311-xx*	RS232 Null Modem Cable DB9M-DB9M x m
RS-232 Straight shielded cable DB9M-DB9M	
P-CABC-0312-10	RS232 Straight Cable DB9M-DB9M 10 m
P-CABC-0312-03	RS232 Straight Cable DB9M-DB9M 3 m
P-CABC-0312-01	RS232 Straight Cable DB9M-DB9M 1 m
P-CABC-0312-xx*	RS232 Straight Cable DB9M-DB9M x m
RS-232 Straight shielded cable DB9M-DB9F	
P-CABC-0313-10	RS232 Straight Cable DB9M-DB9F 10 m
P-CABC-0313-03	RS232 Straight Cable DB9M-DB9F 3 m
P-CABC-0313-01	RS232 Straight Cable DB9M-DB9F 1 m
P-CABC-0313-xx*	RS232 Straight Cable DB9M-DB9F x m
RS-485 4-Wires + IRIG-B shielded cable DB9-Wires	
P-CABC-0308-0010	RS485-4wires Serial Cable DB9M-Wire 10 m
P-CABC-0308-0003	RS485-4wires Serial Cable DB9M-Wire 3 m
P-CABC-0308-0001	RS485-4wires Serial Cable DB9M-Wire 1 m
P-CABC-0308-xxxx*	RS485-4wires Serial Cable DB9M-Wire x m
RS-485 2-Wires + IRIG-B shielded cable DB9-Wires	
P-CABC-0309-0010	RS485-2wires Serial Cable DB9M-Wire 10 m
P-CABC-0309-0003	RS485-2wires Serial Cable DB9M-Wire 3 m
P-CABC-0309-0001	RS485-2wires Serial Cable DB9M-Wire 1 m
P-CABC-0309-xxxx*	RS485-2wires Serial Cable DB9M-Wire x m
SEL Relay shielded cable DB9M-DB9M	
P-CABC-0321-10	SG-4250/SEL relay cable DB9M-DB9M 10 m
P-CABC-0321-03	SG-4250/SEL relay cable DB9M-DB9M 3 m
P-CABC-0321-01	SG-4250/SEL relay cable DB9M-DB9M 1 m
P-CABC-0321-xx*	SG-4250/SEL relay cable DB9M-DB9M x m
Y-Cable RS232 null modem shielded DB9M-DB9M	
P-CABC-0324-01-10	RS232 Y-Cable Dual DB9M-DB9M null 1&10 m
P-CABC-0324-01-03	RS232 Y-Cable Dual DB9M-DB9M null 1&3 m
P-CABC-0324-01-01	RS232 Y-Cable Dual DB9M-DB9M null 1&1 m
P-CABC-0324-xx-yy*	RS232 Y-Cable Dual DB9M-DB9M null x&y m
Y-Cable RS232 straight shielded DB9M-DB9F	
P-CABC-0307-01-10	RS232 Y-Cable Dual DB9M-DB9F 1&10 m
P-CABC-0307-01-03	RS232 Y-Cable Dual DB9M-DB9F 1&3 m
P-CABC-0307-01-01	RS232 Y-Cable Dual DB9M-DB9F 1&1 m
P-CABC-0307-xx-yy*	RS232 Y-Cable Dual DB9M-DB9F x&y m

Table 21 Cables continued

Part number	Description
DB25 Universal Card Shielded Cable	
RS-232 Null Modem shielded cable DB25M-DB25M	
P-CABC-0319-10	RS232 Null Modem Cable DB25M-DB25M 10 m
P-CABC-0319-03	RS232 Null Modem Cable DB25M-DB25M 3 m
P-CABC-0319-01	RS232 Null Modem Cable DB25M-DB25M 1 m
P-CABC-0319-xx*	RS232 Null Modem Cable DB25M-DB25M x m
RS-485 4-wires/2-Wires + IRIG-B shielded cable DB25M-Wire	
P-CABC-0322-0010	RS485 4-wires/2-Wires DB25M-Wire 10 m
P-CABC-0322-0003	RS485 4-wires/2-Wires DB25M-Wire 3 m
P-CABC-0322-0001	RS485 4-wires/2-Wires DB25M-Wire 1 m
P-CABC-0322-xxxx*	RS485 4-wires/2-Wires DB25M-Wire x m
GE D20-IO shielded cable	
P-CABC-0256-03	SG-4250/GE D20-IO Cable DB25M-DB9M 3 m
P-CABC-0256-01	SG-4250/GE D20-IO Cable DB25M-DB9M 1 m
P-CABC-0256-xx*	SG-4250/GE D20-IO Cable DB25M-DB9M x m
Time Synchronisation Shielded Cable	
Irig-B BNC cable	
P-CABC-0245-25	IRIG-B modulated Cable RG58 BNC-BNC 25 m
P-CABC-0245-10	IRIG-B modulated Cable RG58 BNC-BNC 10 m
P-CABC-0245-03	IRIG-B modulated Cable RG58 BNC-BNC 3 m
P-CABC-0245-01	IRIG-B modulated Cable RG58 BNC-BNC 1 m
P-CABC-0245-xx*	IRIG-B modulated Cable RG58 BNC-BNC x m
4 Twisted Pairs Shielded cable : Irig-B ; RS-485 4-Wires/2-Wires Wire-Wire	
P-CABC-0320-25	4 Twisted Pairs Cable Wire-Wire 25 m
P-CABC-0320-10	4 Twisted Pairs Cable Wire-Wire 10 m
P-CABC-0320-03	4 Twisted Pairs Cable Wire-Wire 3 m
P-CABC-0320-01	4 Twisted Pairs Cable Wire-Wire 1 m
P-CABC-0320-xx*	4 Twisted Pairs Cable Wire-Wire x m

* Some cables can have special length according to customer request. For a special length, you must choose the length that you need and create your cable code.
    Contact your Eaton representative to validate the maximum length possible for your application.

    Example: a cable P-CABC-0310-xxx with 2 meters length will be P-CABC-0310-002 (always use length in meters)

Contact your Eaton representative for other cable requirements.

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