SMP IO-2330-K
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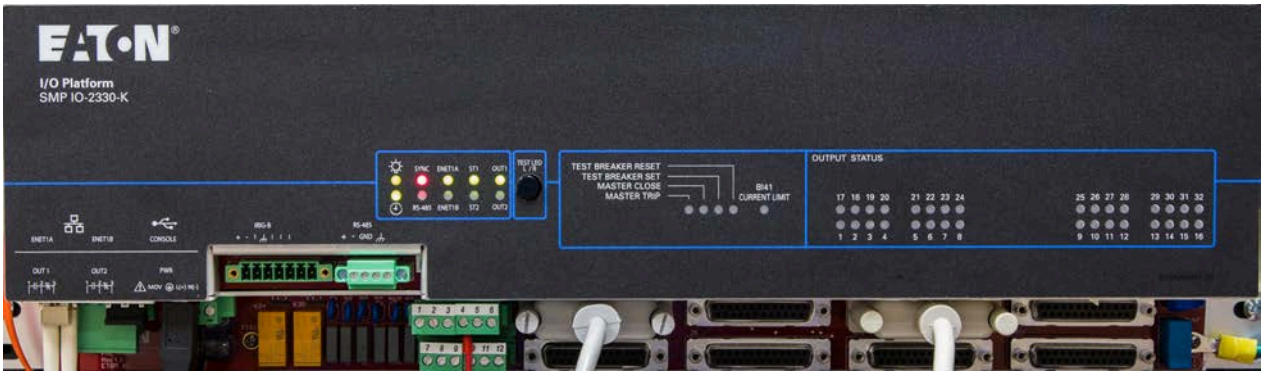
RTU upgrade solution and Distributed I/O
SMP IO-2330-K



Powering Business Worldwide

Contents

The SMP IO-2330 system

Description

The SMP IO-2330-K is a distributed I/O unit which is part of Eaton's SMP IO-2000 series and is used with the SMP Gateway automation platform for Eaton's RTU upgrade solution, to replace legacy RTU systems.

The hardware layout of the SMP IO-2330-K is based on the legacy GE D20 I/O peripheral of the same type, matching exactly the I/O mapping of the legacy product. However, the functionality is based on the SMP IO-2000 series, our latest generation of distributed I/O platform.

RTU upgrade solution

Eaton’s RTU upgrade solution provides utilities with a cost-effective answers to upgrading legacy RTUs with cybersecurity as a priority. Based on the utility hardened and proven Eaton’s SMP family of substation automation products, the SMP SG-42xx automation platform and on the SMP IO-2330 distributed I/O unit, our RTU upgrade solution supports most legacy RTU configurations. Eaton's RTU upgrade solution is easily adaptable to any specific RTU deployment scenarios (e.g. GE D20), is wall- and rack- mountable and all connections are at the front of the units.

The solution keeps the legacy RTU existing field wiring, allowing for great cost savings on field installation man-hours and service interruptions.

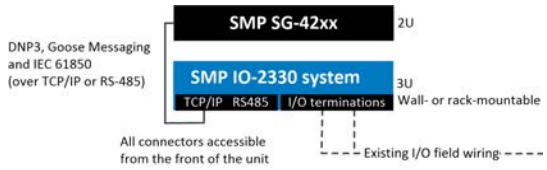


Figure 1: Eaton's complete upgrade solution

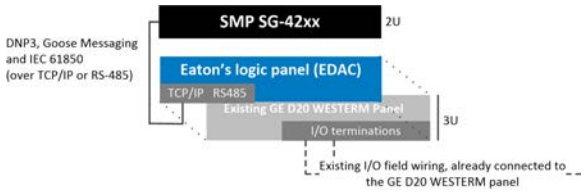


Figure 2: Eaton's open frame option (Eaton's EDAC over existing GE D20 WESTERM)

SMP Gateway automation platform

Both Eaton’s SMP SG-42xx automation platform models are substation-grade gateways with a proven history in data acquisition and distribution automation applications, as protocol conversion device and integration solution for secure IED remote access. They are recognized as one of the most efficient and reliable automation platforms on the market and are perfect for distributed automation.

SMP IO-2330 system

SMP IO-2330's software functionality is based on Eaton’s SMP IO-2000 series which is specially designed to meet modern industry and utility requirements. It is fully integrated with the SMP Manager and Tools application for device configuration and maintenance. It integrates seamlessly with the SMP Gateway automation platforms–simplifying both system setup and commissioning. The hardware layout is however different from the SMP IO-2230 unit to accommodate customers' needs with a 3U form factor, smaller depth and all connectors located at the front of the device which makes it perfect for a wall-mount installation in a confined space.

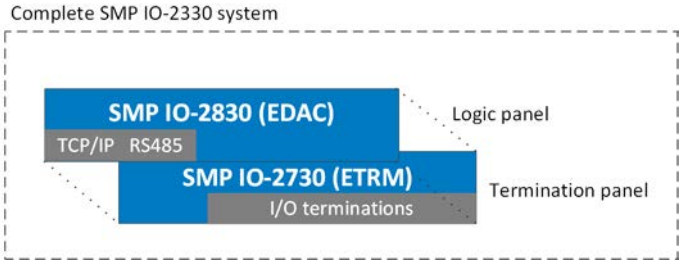
The SMP IO-2330 system uses a template-driven configuration tool, SMP Config, and includes numerous cybersecurity features to help utilities meet their compliance requirements, including NERC CIP (certified under UL 2900-1 for firmware version 2.0).

Open frame options

The SMP IO-2330 system can be acquired in different sections based on your needs. The open frame options include the logic panel for data acquisition and communications (EDAC, SMP IO-2830) and the terminations panel (ETRM, SMP IO-2730), for each offered model.

An EDAC panel can be associated to an existing Eaton's ETRM panel or to a GE D20 WESTERM panel of the same model. An ETRM panel is only compatible with an Eaton's EDAC panel of the same model; it can be used to replace a defective WESTERM panel that is connected to an Eaton's EDAC logic panel.

General features



Hardware

- Form factor: 3U wall- or rack-mount, all connections located at the front of the device
- Pre-mapped I/O offer with 4 models
- Individual LEDs for each I/O and application LEDs
- No moving part
- Two built-in Form C relays for system alarm and control (configurable)
- System status LEDs
- Application LEDs (model-dependent)
- Multi-function button (Local/Remote selector and Test LED)
- USB 2.0 maintenance port (Type B)
- Protected against polarity reversal for power supply
- Supported polarity reversal for Inputs/Outputs

Protocols

- DNP3, IEC 61850, GOOSE (Serial or TCP/IP links)
- DNP3 event queue (up to 1000 events/slave)
- Up to 5 server instances

Communication and Web interface

- RS-485 serial interface
- 2 x 10/100 Mb/s Ethernet ports or 2 x 100 Mb/s optical Ethernet ports
- Daisy chain Ethernet capabilities
- Web interface for I/O commissioning
- Secured remote maintenance using transparent connection (SMP Gateway and IMS passthrough)

Software

- Linux®-based operating system
- Seamless integration with the SMP Gateway
- Access to SMP Manager's Tools
- Remote management (firmware upgrade, setting changes, license update)
- Configuration with SMP Config (also for standalone units), multi- protocols/instances, configurable point mapping
- Offline and template-driven configuration
- Use of SMP Stats, SMP Log and SMP Trace
- Micro PLC for local programmable logic (fast and complete PLC functions)
- Ready for remote management via Enterprise Management Software (IMS)
- System alarms

Mapping

- Predefined mappings
- Serial number, version, internal status, current time, last reset time and more are available in the protocol mapping
- Exportable DNP3 protocol device XML profile

System

- Integrated self-diagnostics
- Integrated watchdog timer
- Real-time clock (with battery backup)
- Internal clock synchronization using IRIG-B, NTP or via protocols
- Local/Remote switching mechanism and state (logical points)

Cybersecurity

- UL2900-1 compliant for firmware version 2.0: Standard for Software Cybersecurity for Network-Connectable Devices
- IEEE 1686-2013 compliant
- Integrated Ethernet firewall
- Ability to disable any unused port (report enabled-disabled ports)
- Secure maintenance connection (TLS) via SMP Gateway Passthrough or via direct SMP Manager connection
- AES-128/256 encryption
- Secure USB maintenance port
- Access management (log, lockup, etc.)
- Account management:
  - Strong passwords
  - Single Admin account
  - User accounts and user groups
  - Detailed group permissions
- All system components digitally signed
- Settings integrity validation
- Factory reset in case of Admin password loss

Benefits

With its robust and scalable design, Eaton's RTU upgrade solutions are flexible and adapts to evolving automation requirements.

Reliability

- Designed to evolve through regular software and firmware updates, ensuring a future-proof automation system
- Helps meet NERC CIP requirements by securing IED remote access and enhancing SCADA communication links

Scalability

- Use of open industry protocols (standard DNP3, GOOSE messaging or IEC 61850 over a TCP/IP or RS-485 link) with over 80 protocols to integrate other IEDs in the substation via the automation platform

Easy integration

- Complete support for the SMP Tools
- Easy configuration using SMP Manager's SMP Config
- Simplified pre-loading operation of existing configuration into the SMP Gateway prior to installation

Productivity

- 70% labor cost reduction compared to a traditional RTU upgrade solution due to the use of existing wiring
- Offline configuration tools
- Web interface for I/O commissioning
- Uses the same management applications as the SMP Gateway automation platform (SMP Manager)
- Seamless I/O integration between the SMP Gateway and distributed I/O unit
- Enhanced automation capabilities using the IEC 61131-3 SoftPLC of the SMP Gateway automation platform and/or the micro PLC of the SMP IO-2330 distributed I/O unit

System architecture and I/O features

The following I/O features are available for the RTU upgrade solutions, I/Os types availability depends on the specific model.

Analog inputs

- High/Low warning support
- Deadband, scaling and units
- User calibration at fixed ambient temperature

Binary outputs

- Output protection against single component failure
- Trip/close pair, Raise/Lower, latch, pulse and pulse pair support
- Pulse train command support
- Persisted operation counter/operation time
- Binary points software polarity reversal
- Control queuing allows up to 10 parallel requests, sequentially processed when the same point is targeted

Binary inputs

- DC inputs
- Tolerance/Intolerance filtering
- Chatter protection
- Fail safe circuit (active level in normal state)
- Binary points software polarity reversal
- Timetag at the beginning or end of the filtering (setting)
- Persisted counters (total transitions, up/down direction), with deadband, scaling and roll over detection.
- Freeze, clear, freeze and clear counters support

Table 1: RTU upgrade solution, available models

Type	Model	Available I/Os
Wall-mount or Rack-mount (3U)	SMP IO-2330-A	Complete system for 32 analog inputs: disconnect terminations
Open frame EDAC (3U)	SMP IO-2830-A	Logic panel for communications and for 32 analog inputs. This panel can be connected to an Eaton ETRM panel or GE D20 WESTERM panel of the same type.
Open frame ETRM (3U)	SMP IO-2730-A	Termination panel for 32 analog inputs. This panel can be connected to an Eaton EDAC panel of the same type. Can be used to replace a defective GE D20 WESTERM panel.
Wall-mount or Rack-mount (3U)	SMP IO-2330-C1	Complete Combo system offering : • 16 status and alarm inputs: disconnect terminations • 8 control outputs: disconnect terminations with 2 x DB25 connectors for connection to existing GE D20 interposing relays • 16 analog inputs: disconnect terminations
Open frame EDAC (3U)	SMP IO-2830-C1	Logic panel for communications and for the combo unit: • 16 status and alarm inputs • 8 control outputs • 16 analog inputs This panel can be connected to an Eaton ETRM panel or GE D20 WESTERM panel of the same type.

Table 1: RTU upgrade solution, available models

Type	Model	Available I/Os
Open frame ETRM (3U)	SMP IO-2730-C1	Termination panel for the combo unit: • 16 status and alarm inputs: disconnect terminations • 8 control outputs: disconnect terminations with 2 x DB25 connectors for connection to existing GE D20 interposing relays • 16 analog inputs: disconnect terminations This panel can be connected to an Eaton EDAC panel of the same type. Can be used to replace a defective GE D20 WESTERM panel.
Wall-mount or Rack-mount (3U)	SMP IO-2330-K	Complete system for 32 binary outputs: disconnect terminations (K) or DB25 connectors (KR)
Open frame EDAC (3U)	SMP IO-2830-K	Logic panel for communications and for 32 binary outputs. This panel can be connected to an Eaton ETRM panel or GE D20 WESTERM panel of the same type.
Open frame ETRM (3U)	SMP IO-2730-K	Termination panel for 32 binary outputs: disconnect terminations (K) or DB25 connectors (KR) This panel can be connected to an Eaton EDAC panel of the same type. Can be used to replace a defective GE D20 WESTERM panel.
Wall-mount or Rack-mount (3U)	SMP IO-2330-S	Complete system for 64 status and alarm inputs: disconnect terminations
Open frame EDAC (3U)	SMP IO-2830-S	Logic panel for communications and for 64 status and alarm inputs. This panel can be connected to an Eaton ETRM panel or GE D20 WESTERM panel of the same type.
Open frame ETRM (3U)	SMP IO-2730-S	Termination panel for 64 status and alarm inputs: disconnect terminations This panel can be connected to an Eaton EDAC panel of the same type. Can be used to replace a defective GE D20 WESTERM panel.

The SMP IO-2330-K configuration is fixed at 32 control outputs + 2 built-in binary outputs + 1 universal binary input, the following features apply to this SMP IO-2330 system:

- Matrix function supported on the KR model (DB25 connectors)
- Test Breaker Trip/Close
- Relays can be configured separately
- Possible control output configurations:
  - 32 Trip/Close pairs
  - 24 Trip/Close pairs and 4 Raise/Lower pairs
  - 16 Trip/Close pairs and 8 Raise/Lower pairs
  - 8 Trip/Close pairs and 12 Raise/Lower pairs
  - 16 Raise/Lower pairs
  - 32 isolated Form C contact control outputs
- Master Close/Trip logic
- Local/Remote switch via the test LED L/R button
- Can be configured to be connected to a D20 KI interposing relay or to an LPL
- Control output methods (hardware and software adjustable):
  - Pulse duration
  - Latched-output (discrete timed/latch relay functionality supported)
- One universal binary input available for alarm or status:
  - Voltage range is software configurable
  - Low voltage: 24-48 VDC / 24-48 VAC

Front panel

This section describes the front panel of the SMP IO-2330-K, all main components are identified.

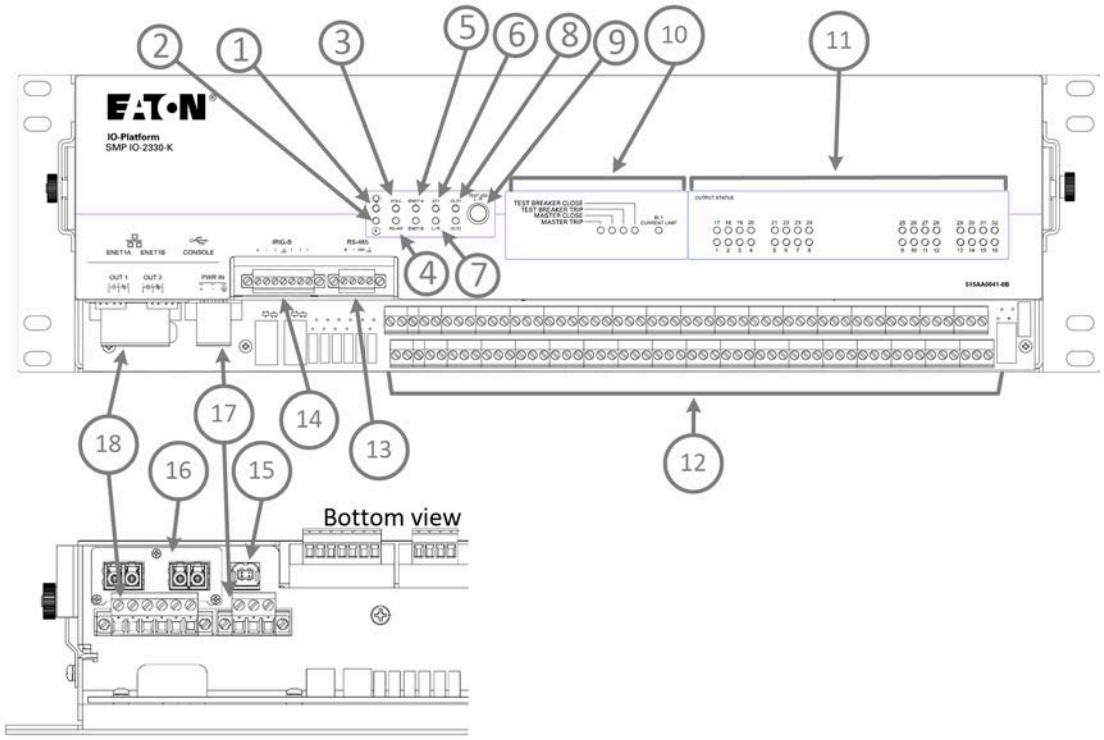


Figure 3: The front panel of the SMP IO-2330-K

The following table describes the front panel components related to the previous figure:

Table 2: Front panel components of the SMP IO-2330-K

#	ID	Description
1	Power LED	Power LED This LED indicates the status of the SMP IO-2330 system internal power supply. **Note:** Additional information about the power supply is also available from the SMP IO-2330 system, using the SMP Stats program.
2	Watchdog LED	Watchdog timer status LED
3	SYNC LED	Clock synchronization LED This LED indicates the synchronization status of the SMP IO-2330 system connected to an IRIG-B synchronization source.
4	RS-485 LED	Built-in RS-485 serial port activity LED
5	LEDs ENET1A, ENET1B	Built-in ENET1A and ENET1B2 port activity LEDs The two Ethernet ports are used as Ethernet switches for daisy-chain connections. Each LED indicates the speed and activity level of the corresponding Ethernet port (switch).

Table 2: Front panel components of the SMP IO-2330-K

#	ID	Description
6	ST1 LED	Status LED 1 This LED indicates the various steps the SMP IO-2330 system goes through during the startup sequence.
7	L/R LED	Local / Remote control status LED The local/remote interlock mechanism is a safety measure which totally disables the operation of control outputs when set to Local.
8	LEDS OUT1 / OUT2	On board relay status LEDs, OUT1 and OUT2
9	Button Test LED or L/R	Multi-function button used to: • Test the SMP IO-2330 system front panel LEDs. When pressed, all LEDs should light. • Switch the operation between Local and Remote operation. To do so, press and hold the button during the first five (5) seconds during steady operation of the device (boot-up sequence must be terminated), until the LEDs light up. The SMP IO-2330-K will then switch between Local and Remote modes. • Force the system to boot into rescue mode. To do so, press and hold the button during the first five (5) seconds during the boot-up sequence, until the LEDs light up. The SMP IO-2330-K will then boot in rescue mode.
10	Application LEDs	LEDs specific to the SMP IO-2330-K model. They are: • TEST BREAKER CLOSE • TEST BREAKER TRIP • MASTER CLOSE • MASTER TRIP • BI 1 CURRENT LIMIT The Test breaker CLOSE and TRIP relay (2 Form C contacts) operates in conjunction with the Master Trip and Master Close relays to provide latched close and trip outputs. The Master Close and Master Trip relays (Form A) are used for hardware control security measure.
11	I/O Status LEDs	I/Os activity/state for control outputs status 1 to 32 Each LED indicates the input status of the point.
12	Terminal blocks or DB25 connectors	Terminal blocks (K) or DB25 connectors (KR) for connecting up to 32 Binary outputs. The connectors are used to connect the existing field wiring to the SMP IO-2330-K. When configured in wetting mode (Trip/Close and Raise-Lower/Latch output configurations only), a 2 A TL fuse is protecting the circuit.
13	RS-485 serial port	Terminal block reserved for the serial RS-485 communication (COM1) • 2 wire RS-485 support (multidrop) • Up to 1200 m (4000 ft.) • Up to 32 devices (multidrop) Baud rates supported on this port: 300, 600, 1200, 1800, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps
14	IRIG-B port	Terminal block reserved for the reception of a demodulated IRIG- B signal. Eaton recommends the use of a shielded cable with twisted 22 — 16 AWG wires for the IRIG-B terminal block.

Table 2: Front panel components of the SMP IO-2330-K

#	ID	Description
15	CONSOLE port	Type-B USB 2.0 port This port is used for maintenance and configuration of the SMP IO-2330 system; it is always enabled. This port is also used to access the SMP IO-2330 system's web interface to monitor and control I/Os for commissioning.
16	ENET1A, ENET1B	Built-in Ethernet connectors (switch) The following connector types are available for theses built-in ports: • Shielded metallic RJ45 (standard) • Fiber-optic LC (option) **Note:** Both connectors of the built-in ports are of the same type.
17	PWR Power supply terminal block	Wiring terminals for the power supply The power supply can accept an input range of 19.2—60 Vdc. Eaton recommends the use of a shielded cable with 18 to 12 AWG wires for the SMP IO-2330-K power supply terminal block. **Note:** If the SMP IO-2330-K is intended for use at ambient temperatures greater than 140 °F (60 °C), use a cable with a suitable temperature rating.
18	OUT1, OUT2	Two (2) NO/NC (normally open / normally closed) Form C relays: OUT1 relay's NC contact is pre-configured for system health monitoring (application). Both relays are available for system applications and can be activated through a system data output point, if configured. When configured for system health monitoring, the OUT1 relay's NC contact operates as follows: The relay's NC contact remains closed until the SMP IO-2330 system is started. Thereafter, the contact is opened if the SMP IO-2330 system is working properly. In case of failure, the NC contact closes.

Specifications (physical characteristics)

Table 3: General specifications

General specifications		
Dimensions	Height: 5.23 in. (132.8 mm) Width: 19 in. (482 mm) Depth: 2.8 in. (71 mm) 10 lb max (4.5 kg)	No connectors on the rear panel
Installation	Back to back on panel (rack-mount) or wall-mount	
Warranty	10-year limited	
Operating temperature	-40 °F to +185 °F * (-40 °C to 85 °C)	* : cTUVus safety marking is based on the temperature table.
Storage temperature	-40 °F to +185 °F (-40 °C to 85 °C)	
Humidity	5 to 95 %, non-condensing	

Table 3: General specifications

General specifications		
Degrees of protection provided by enclosure	IP00 (design to meet IP30)	IEC60529: 2013
MTBF	Real MTBF (practical): > 100 years	The MTBF value is obtained from the ratio of the number of devices in operation over the actual number of failures observed on devices of the same SMP family.
Maximum altitude	Up to 6561.7 feet (2000 meters)	
Status LED display	Power Watchdog Clock synchronization (SYNC) Build-in serial port (RS-485) Build-in Ethernet ports (ENET1A, ENET1B) Status (ST1) Local/Remote status LED for Control outputs (L/R) Relay status (OUT1, OUT2) Test Breaker Close Test Breaker Trip Master Close Master Trip BI 1 CURRENT LIMIT Output Status (1 to 32)	
Internal Battery	Rechargeable lithium battery Lifetime: > 20 years	Not serviceable Battery autonomy > 20 days Battery charging time < 24 hrs

Table 4: Power supply specifications

Power supply specifications			
Note: The power cable is not shipped with the device. The cable must be ordered separately or supplied by the customer. Refer to section Accessories and Cables options for details about the power cable.			
Specifications			
	Nominal voltages	24, 48 Vdc	
	Input voltage range	19.2 – 60 Vdc	
	Inrush current	24 Vdc: 17 A < 0.5 ms 48 Vdc: 50 A < 0.5 ms	
	Short interruption	24 Vdc: 10 ms 48 Vdc: 50 ms	Typical load @ 25 °C

Table 4: Power supply specifications

Power supply specifications			
Power consumption		14 W max for K and 10 W max for KR	
Protection		65 Vdc, 8.4 J Differential MOV Protection 3.15 A TL fuses on + and - 1000 Vdc dielectric Reverse polarity protection	Fuses are not user-serviceable.
Terminal block power		3-pin connector	Located on the bottom left side
	Wire size	12 – 30 AWG solid wire 12 – 30 AWG stranded wire	
	Wire screw max torque	5.3 lb-in (0.6 N-m)	

Table 5: Communication ports Ethernet

Ethernet communication ports		
Note: Both connectors of the built-in Ethernet ports are of the same type.		
Ports	Two (2) ports, no LED indicators	Located on the front bottom left side
Metallic connectors (standard)	2 x 10/100/BASE-T/TX	RJ-45 connectors
Fiber-optic (option)	2 x 100BASE-FX, up to 2 km	LC connectors Multimode 1300 nm

Table 6: Communication port serial

Serial communication port		
Feature	2-wire RS-485 support (multidrop) protection Up to 1200 m (4000 ft.) 32 devices and 115200 b/s Common mode TVS	
Protection	12 Vdc Common mode TVS	40 A 8.3 ms
Wire size	16 – 28 AWG	
Wire screw max torque	2.2 lb-in (0.25 N-m)	

Table 7: Auxiliary port

Auxiliary port		
USB		
USB 2.0 client (CONSOLE)	Type B connector (front panel)	Located on the bottom left side

Table 8: Time synchronization

Time synchronization			
Demodulated IRIG-B			
	Input	Via terminal block	Isolated
		2 V high-level detection	Current sink at 5 V IRIG-B 5 mA Current sink at 10 V IRIG-B; 11 mA
		Vin max up to 12 Vdc, Opto-isolated IEEE 1344, C37.118, B002, B003, B004, B006, B007	Input impedance = 1000 Ω ±10 %
	Protection	Accuracy: ± 100 µs	
		Differential mode TVS	
Terminal block IRIG-B		7-pin connector	
	Wire size	16 - 28 AWG	
	Wire screw max torque	2.2 lb-in (0.25 N-m)	
Real-time clock (with battery backup)		Drift: ± 10 sec/day on normal operating temperature range and ± 20 sec/day outside the operating temperature range, when unit is powered off. Drift: < 3 sec/day on all temperature ranges when unit is running.	

Table 9: Auxiliary relays (alarm relays)

Auxiliary relays (alarm relays)		
2 Form C relays (OUT1, OUT2)	Normally open and normally closed relays contacts (NO/NC). 1st relay is pre-configured for system health monitoring. Both relays are available for system applications and can be activated through a system data point.	Located on the bottom left side 60 W / 125 VA (max power) 125 Vdc / 120 Vac[1] (max voltage) 2 A (max interruption current) 3 A (max carrying current) [1]: The use of output relays with voltage over 48 Vdc is out of the scope of cTUVus certification.
Protection	630 Vac / 810 Vdc, 9.5 J Common MOV protection 260 Vac / 340 Vdc, 9.5 J MOV Protection across contacts	

Table 9: Auxiliary relays (alarm relays)

Auxiliary relays (alarm relays)			
Terminal block Auxiliary relays		6-pin connector	2 Form-C contacts
	Wire size	12 – 30 AWG solid wire 12 – 30 AWG stranded wire	
	Wire screw max torque	5.3 lb-in (0.6 N-m)	

Table 10: CPU

CPU	
Processor architecture	ARM
Operating system	LINUX
Processor	ARM® Cortex® - A8 600 MHz
Memory	2 Gbit NAND Flash, 256 MB DDR3 RAM

Important: cTUVus certification applies for the SMP IO-2330-K with wetting voltages that are isolated from the primary power supply.

Table 11: Status and alarm input (Universal Binary input)

Status and alarm input (Universal Binary input)			
Voltage range (selectable by software)			
	24—48 (± 19.2 to ± 60) Vdc		ON: > ± 19.2—60 Vdc; OFF: ± 7 Vdc
	24—48 (± 19.2 to ± 60) VAC 50/60 Hz ± 5 Hz		ON: > 15—60 Vac; OFF: 5 Vac
Current draw at nominal			
	24—48 Vdc 2.5—5.4 mA, 0.26 W max		
	24—48 Vac 2.6—5.5 mA, 0.26 W max		
Sampling rate		500 µs	
Debouncer delay		Software configurable up to 127 ms	No hardware filter on activation
Protection		Common protection: 680 Vac / 915 Vdc, 9.5J MOV and 0.011 µF capacitor	

Table 11: Status and alarm input (Universal Binary input)

Status and alarm input (Universal Binary input)			
Terminal block binary input			
	Wire size	12—30 AWG	
	Wire screw maximum torque	5.3 lb-in (0.6 N-m)	

Table 12: Control outputs (relays)

Control outputs (relays) **Important:** All control outputs must be activated by the same voltage type and level. For example, if 125 Vdc is selected, it must be 125 Vdc for all control outputs of the SMP IO-2330-K. For the model KR, the maximum voltage for control operation is limited to 48 V.		
Output relays	Form C relays	
Protection	2 A TL fuses for wetting supply. 1000 Vdc dielectric Protection across contacts: 260 Vac/ 340 Vdc, 9.5 J MOV and 0.011 µF capacitor Common protection: 640 Vac / 915 Vdc, 9.5 J MOV and 0.011 µF capacitor	Fuses are user-serviceable, by qualified personnel only.
Operating time	Pickup 10 ms maximum Dropout 6 ms maximum	at 20 °C, excluding bouncing
Relay rating Form C		
Nominal switching capacity	2 A / 30 Vdc (resistive load)	
Max switching power	60 W / 125 VA	
Maximum switching current	2 A	
Maximum voltage	125 Vdc / 120 Vac	
Continuous carry	3 A	
Minimum load	10 mA, 10 Vdc	

Table 12: Control outputs (relays)

Control outputs (relays) **Important:** All control outputs must be activated by the same voltage type and level. For example, if 125 Vdc is selected, it must be 125 Vdc for all control outputs of the SMP IO-2330-K. For the model KR, the maximum voltage for control operation is limited to 48 V.			
Relay rating Trip/Close and Raise-Lower/Latch			
	Nominal switching capacity	2 A / 30 Vdc (resistive load)	
	Max switching power	60 W / 125 VA	
	Maximum wetting voltage	125 Vdc / 120 VAC	
	Maximum switching current	2 A	
Terminal Block Binary Output			
	Wire size	12—30 AWG solid wire	
	Wire screw maximum torque	5.3 lb-in (0.6 N-m)	

Certifications and compliancy notes

The SMP IO-2330-K was developed under rigorous design requirements and meets or exceeds the standards that were required for the legacy RTU that will be replaced.

Table 13: Platform certification and standard compliancy

Certification and standard compliancy		
Certification	**Details**	**Notes**
cTUVus Marking	IEC 61010-1:2010/AMD1:2016	
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	

Table 14: Firmware certification and standard compliancy

Certification	**Notes**
UL-2900-1 for firmware version 2.0	UL 2900 is a series of standards published by UL (formerly Underwriters Laboratories), a global safety consulting and certification company. UL 2900-1 applies to Software Cybersecurity for Network-Connectable Products. The UL 2900-1 standard says it “applies to network-connectable products that shall be evaluated and tested for vulnerabilities, software weaknesses and malware” and that it describes these requirements and methods: • Requirements regarding the software developer (vendor or other supply chain member) risk management process for their product. • Methods by which a product shall be evaluated and tested for the presence of vulnerabilities, software weaknesses, and malware. • Requirements regarding the presence of security risk controls in the architecture and design of a product. This standard does not contain requirements regarding functional testing of a product. This means this standard contains no requirements to verify that the product functions as designed. This standard does not contain requirements regarding the hardware contained in a product.

Type test details

Table 15: Type test details: Electromagnetic Compatibility (EMC)

Type test details		
Electromagnetic Compatibility (EMC)		
Conducted emissions	FCC part 15 subpart B (2019) ICES-003 (2016) CISPR32 (2015)	Class A
Radio Disturbance Characteristics	FCC part 15 subpart B (2019) ICES-003 (2016) CISPR32 (2015)	Class A
RF immunity	IEC 61000-4-3 (2006) A1 (2007) A2 (2010)	80 MHz — 2.7 GHz: • 10 V/m + 1 kHz • 80 % AM (18 V/m Peak) • Dwell time: 0.5 s Spot frequencies: 80 MHz, 160 MHz, 380 MHz, 450 MHz, 900 MHz, 1850 MHz, 2150 MHz: • 10 V/m + 1 kHz 80 % AM (18 V/m Peak) • Dwell time: 10 s
Electrostatic Discharge	IEC 61000-4-2 (2008)	DC Power (48 Vdc and 24 Vdc): • L-PE : ±0.5 kV,±1 kV, ±2 kV, ±4 kV • L-L : ±0.5 kV,±1 kV, ±2 kV Communication (Shielded at both ends) - method with 10m cable: • L-PE : ±0.5 kV,±1 kV, ±2 kV, ±4 kV I/O: • L-PE : ±0.5 kV,±1 kV, ±2 kV, ±4 kV • L-L : ±0.5 kV,±1 kV, ±2 kV
Surge Immunity	EN 61000-4-5 (2006)	Level 4
Conducted Immunity	IEC 61000-4-6 (2013)	150 kHz-80 MHz: • 10 Vrms + 1 kHz • 80 % AM • Dwell time: 0.5 s Spot frequencies: 27 MHz, 68 MHz,150 kHz-80 MHz: • 10 Vrms + 1 kHz • 80 %AM • Dwell time: 10 s On DC power (48 Vdc & 24 Vdc) with CDN On PE with CDN On communication with EM clamp On I/O with EM clamp

Table 15: Type test details: Electromagnetic Compatibility (EMC)

Type test details		
Power Frequency Magnetic Field	EN 61000-4-6 (2007)	Continuous field: • 100 A/m / 50 Hz & 60 Hz Short duration field: • 1000 A/m / 50 Hz & 60 Hz Criteria / Class: A
Damped Oscillatory Wave	IEC 61000-4-18 (2006) A1 (2010)	DC Power (48 Vdc & 24 Vdc): • ±2.5 kV CM /1 kV DM with direct coupling, 1 MHz Communication (Shielded at both ends) - method with 10 m cable: • ±2.5 kV CM with direct coupling, 1 MHz I/O: • ±2.5 kV CM /1 kV DM on I/O with direct coupling, 1 MHz Test duration 2 s / polarity
Conducted Disturbances	IEC 61000-4-16 (2006)	
Ripple on DC Input power port immunity test	IEC 61000-4-17 (1999) A1 (2001) A2 (2009)	Test level: 15 % dc value (100 Hz/120 Hz) Test performed @ lowest & highest voltage range Duration: 1 min
DC Voltage Variations*	IEC 61000-4-29 (2000)	DC Power (48 Vdc & 24 Vdc): • 70 % Un during 0.5 s • 40 % Un during 0.2 s • 0 % Un during 5 s • 0 % Un during 50 ms *: Not compliant at 24 Vdc
Impulse Voltage	IEC 60255-5 (2000)	IO: 5 kV Relay CPU: 5 kV Power supply: 5 kV IRIG-B: 2.5 kV Enet: 2.5 kV
Dielectric	IEC 60255-5 (2000)	Power: 1000 Vdc IO: 1000 Vdc Enet: 1500 Vrms IRIG-B: 1500 Vrms Relays: 0.8 Vdc

Table 16: Type test details: Climatic environment conditions

Type test details		
Climatic environment conditions		
Cold Test	IEC 60068-2-1	-40 °C, 16 hours, test Ad

Table 16: Type test details: Climatic environment conditions

Type test details		
Dry Heat	IEC 60068-2-2	+85 °C, 16 hours, test Bd
Damped heat humidity	IEC 60068-2-30	Variant 2, 55 °C, 6 cycles, test dB

Table 17: Type test details: Mechanical environmental conditions

Type test details		
Mechanical environmental conditions		
Sinusoidal Vibration	IEC 60068-2-6 IEC 60255-21-1 (1988) Class 1	Frequency: 10 — 150 Hz Acceleration: 1 g Sweep speed: 1.0 oct/min Cycles per axes: 20 Axes: X, Y, Z
Drop test	CEI 60068-2-31 (2008) ISO 4180 (2009) ISO 2206 (1987)	Package: 1 m

Temperature derating

To be compliant with the IEC 61010-1 certification, the SMP IO-2330-K can be used within the temperature range that is function of the total power dissipated in the unit, as described below. According to the standard, the SMP IO-2330-K can support operating temperatures between -40 °F to +185 °F * (-40 °C to 85 °C).

Table 18: Temperature derating table for the SMP IO-2330-K system with momentary ON BO

Features	Maximum operating temperature
Maximum operation temperature - Copper	70 °C
Maximum operation temperature - Optical	60 °C

Table 19: Temperature derating table for the SMP IO-2330-K system with steady ON BO

	Total Watt *	Copper communication	Optical communication
Maximum operation temperature	< 2 W	70 °C	60 °C
	2 W to 3 W	65 °C	55 °C
	3 W to 5.5 W	60 °C	50 °C
	5.6 W to 7.9 W	55 °C	45 °C

* : where:

```
Watt total=(A X 0.2) + (A X (B X B X 0.45))
```

- A: steady binary output
- B: average current per output (maximum 2 A per entry)
- 0.2: power of relay when ON (ETRM), in Watt
- 0.45: output resistance (PCB + relay contact), in Ohms

Example for 8 steady ON outputs with 0.5 A average current: 2.5 W = (8 x 0.2) + (8 x (0.5 x 0.5 x 0.45))

Dimension drawings

Following are the front,side and bottom views for the SMP IO-2330-K.

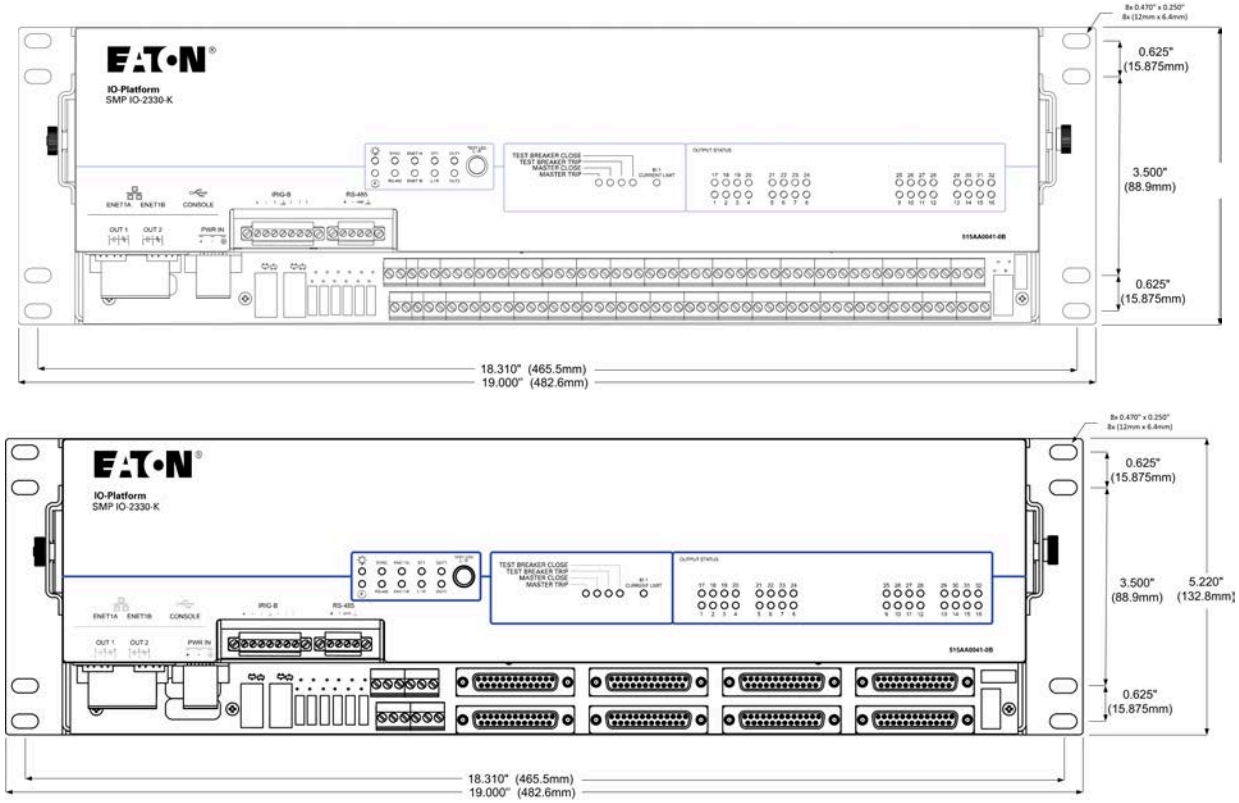


Figure 4: SMP IO-2330-K- Front view (K and KR)

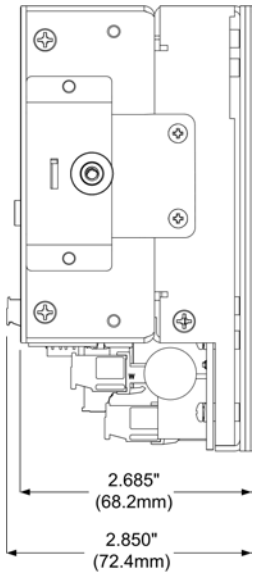


Figure 5: SMP IO-2330-K- Side view

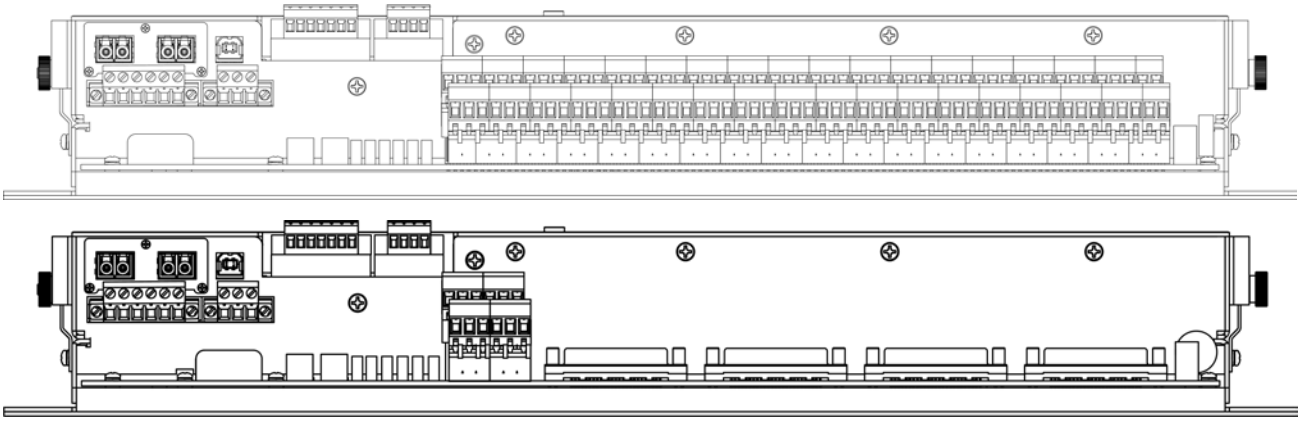


Figure 6: SMP IO-2330-K- Bottom view (K and KR)

Ordering information

The packing slip refers to an SMP IO-2330-K system number which is based on the configuration charts.

We provide the configuration chart for the SMP IO-2330-K and separated configuration charts for the open frame panels (EDAC and ETRM), if you choose one of these options.

The tables display information to verify that the received product corresponds to the system requirements; they can also be used to order an SMP IO-2330-K with the options needed. The tables detail all characteristics to match the expected features of the SMP IO-2330-K or open frame options.

Note: The SMP IO-2330 system consists of a logic panel (EDAC) and a termination panel (ETRM) assembled together. The ETRM panel, as an open frame option, can only be used with and EDAC panel. The main use case for this panel is to replace a defective GE D20 WESTERM panel that is connected to an Eaton EDAC panel.

The following table covers the complete SMP IO-2330-K system.

Table 20: SMP IO-2330-K configuration chart

Description	123	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Family																
[IO2] Substation IO	IO2															
Format																
[3] IO-2330 Wall-mount/slim-rack-mount 3U (EDAC & ETRM)		3														
Model / Application																
[3] Basic - I/O Acquisition (Monitoring & Control)			3													
I/O Type																
[K] K - Control Output Module				K												
Connector Type																
[G] Compression disconnect termination (with plug)					G											

Table 20: SMP IO-2330-K configuration chart

Description	123	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
[H] Compression disconnect termination (without plug)					H											
[R] DB-25 termination (LV Only)					R											
Internal Flash Memory																
[A] 2 Gb NAND Flash						A										
Basic Ethernet Option																
[C] 2 Ethernet 10/100 Base-T							C									
[L] 2 Ethernet 100 Optical, LC connectors							L									
Power Supply																
[L] 24 - 48 VDC								L								
Internal 1																
[0] None									0							
Internal 2																
[0] None										0						
Internal 3																
[0] None											0					
Internal 4																
[0] None												0				
Internal - SAP 15 Analog Input Mode																
[0] None													0			
Internal SAP 16 - Wetting																
[0] None / External Wetting Only														0		
Internal SAP 17 - Default BI configuration																
[0] None															0	

Table 20: SMP IO-2330-K configuration chart

Description	123	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
I/O Software package option																
[0] SMP IO-2200 Basic profile / NONE This profiles includes: • DNP3 Server • IEC 61850 GOOSE • Basic SoftPLC capabilities																0
[A] SMP IO-2200 61850 profile This profiles includes: • DNP3 Server • IEC 61850 Server • IEC 61850 GOOSE • Basic SoftPLC capabilities																A

The following table covers the logic panel (EDAC) associated to the SMP IO-2330-K system.

Table 21: EDAC logic panel configuration chart (SMP IO-2830-K)

Description (SMP-)	123	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Family																
[IO2] Substation IO	IO2															
Format																
[8] SMP IO-2330 Wall-mount - Header (EDAC Only)		8														
Model / Application																
[3] Basic - I/O Acquisition (Monitoring & Control)			3													
I/O Type																
[K] K - Control Output Module				K												
Connector Type																
[0] None					0											
Internal Flash Memory																
[A] 2 Gb NAND Flash						A										
Basic Ethernet Option																
[C] 2 Ethernet 10/100 Base-T							C									
[L] 2 Ethernet 100 Optical, LC connectors							L									

Table 21: EDAC logic panel configuration chart (SMP IO-2830-K)

Description (SMP-)	123	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Power Supply																
[L] 24 - 48 VDC								L								
Internal 1																
[0] None									0							
Internal 2																
[0] None										0						
Internal 3																
[0] None											0					
Internal 4																
[0] None												0				
Internal - SAP 15 Analog Input Mode																
[0] None													0			
Internal SAP 16 - Wetting																
[0] None														0		
Internal SAP 17 - Default BI configuration																
[0] None															0	
I/O Software package option																
[0] SMP IO-2200 Basic profile / NONE This profiles includes: • DNP3 Server • IEC 61850 GOOSE • Basic SoftPLC capabilities																0
[A] SMP IO-2200 61850 profile This profiles includes: • DNP3 Server • IEC 61850 Server • IEC 61850 GOOSE • Basic SoftPLC capabilities																A

The following table covers the terminations panel (ETRM) associated to the SMP IO-2330-K system.

Table 22: ETRM termination panel configuration chart (SMP IO-2730-K)

Description (SMP-)	123	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Family																
[IO2] Substation IO	IO2															
Format																
[7] IO-2330 Wall-mount - Terminal (ETRM Only)		7														
Model / Application																
[3] Basic - I/O Acquisition (Monitoring & Control)			3													
I/O Type																
[K] K - Control Output Module				K												
Connector Type																
[G] Compression disconnect termination (with plug)					G											
[H] Compression disconnect termination (without plug)					H											
[R] DB-25 termination (LV Only)					R											
Internal Flash Memory																
[0] None						0										
Basic Ethernet Option																
[0] None							0									
Power Supply																
[0] None								0								
Internal 1																
[0] None									0							
Internal 2																
[0] None										0						
Internal 3																
[0] None											0					
Internal 4																
[0] None												0				

Table 22: ETRM termination panel configuration chart (SMP IO-2730-K)

Description (SMP-)	123	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Internal - SAP 15 Analog Input Mode																
[0] None													0			
Internal SAP 16 - Wetting																
[0] None														0		
Internal SAP 17 - Default BI configuration																
[0] None															0	
I/O Software package option																
[0] SMP IO-2200 Basic profile / NONE																0

Accessories and cables

Table 23: Accessories

Part number	Description
SMP-PSU-2001	External Wetting Power supply: IN: 48 Vdc; OUT: 24 Vdc
SMP-PSU-2002	External Wetting Power supply: IN: Univ. 125 V; OUT: 24 Vdc
SMP-CON-IO2xxx-K	IO-2xxx-K replacement connectors kit - IO section (Terminal Bloc Model)

Table 24: Cables

Part number	Description
Shielded Power Cable	
P-CABC-0303-00	AC Power Cable Shielded Nema 5-15-Wire **Important:** 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

Table 24: Cables

Part number	Description
Ethernet Multimode Fiber	
-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
-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-0310-03	Copper Ethernet Cable RJ45 CAT6 3 m
P-CABC-0310-01	Copper Ethernet Cable RJ45 CAT6 1 m
P-CABC-0310-xxx	Copper Ethernet Cable RJ45 CAT6 x m
DB9 Serial Shielded Cable	
RS-485 2-wires + IRIG-B, shielded cable, DB9 to Wires	
P-CABC-0309-0010	RS485 2-wires Serial Cable DB9M to Wire 10 m
P-CABC-0309-0003	RS485 2-wires Serial Cable DB9M to Wire 3 m
P-CABC-0309-0001	RS485 2-wires Serial Cable DB9M to Wire 1 m
P-CABC-0309-xxxx	RS485 2-wires Serial Cable DB9M to Wire x m
Time Synchronization Shielded Cable	
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

Table 24: Cables

Part number	Description
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 be provided with custom lengths, according to customer request. For a custom length-cable, use the required length to create your own cable code.

Contact your Eaton representative to validate the maximum length 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 Eaton for other cable requirements.

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