PXC Compact Series for BACnet Networks

Figure 1. PXC Compact Series Controllers (PXC-24 and PXC-36 shown).

Description

The PXC Compact Series (Programmable Controller–Compact) for BACnet networks is a high-performance Direct Digital Control (DDC) supervisory equipment controller, which is an integral part of the APOGEE Automation System. The controllers are classified as either a BACnet Building Controller (B-BC) with support for BACnet/IP or BACnet MS/TP protocols.

The PXC Compact Series offers integrated I/O based on state-of-the-art TX-I/O™ Technology, which provides superior flexibility of point and signal types, and makes it an optimal solution for Air Handling Unit (AHU) control. The PXC Compact operates stand-alone or networked to perform complex control, monitoring, and energy management functions without relying on a higher-level processor.

The PXC Compact Series communicates with other field panels or workstations on a peer-to-peer Automation Level Network (ALN), or on the Field Level Network (FLN), and supports the following communication options:

- Native BACnet/IP communications over 10/100 MB Ethernet networks
- Native BACnet MS/TP on RS-485

The PXC Compact is available with 16, 24, or 36 point terminations. Selected models in the Compact Series provide the following options:

- Support for MS/TP or P1 FLN devices.
- Support for MS/TP FLN devices.
- An extended temperature range for the control of rooftop devices.
- Support for Island Bus, which uses TX-I/O modules to expand the number of point terminations for high-speed loop control. For PXC-36 only.

Features

- BACnet Testing Laboratories (BTL) certified Classified as BACnet Building Controllers (B-BC) using the BACnet/IP protocol and/or BACnet MS/TP, or BACnet Advanced Application Controllers (B-AAC) using the BACnet MS/TP protocol for specific models.
- DIN rail mounted device with removable terminal blocks simplifies installation and servicing.
- Proven program sequences to match equipment control applications.
- Built-in energy management applications and DDC programs for complete facility management.
- Comprehensive alarm management, historical data trend collection, operator control, and monitoring functions.
- Sophisticated Adaptive Control, a closed loop control algorithm that auto-adjusts to compensate for load/seasonal changes (License required with Firmware revision 3.5.1 and higher).

- Message control for terminals, printers, pagers, and workstations.
- Highly configurable I/O using Siemens state-of-the-art TX-I/O™ Technology.
- HMI RS-232 port, which provides laptop connectivity for local operation and engineering.
- Extended battery backup of Real Time Clock.
- Persistent database backup and restore within the controller.
- Optional HOA (Hand/Off/Auto) module for swappable and configurable HOA capability.
- Optional extended temperature range for rooftop installation.
- Optional support for MS/TP or P1 FLN devices.
- Optional support for P1 Wireless FLN.
- Optional operation as a MS/TP or P1 device with default applications.
- PPCL performance during an internal database backup has been significantly improved. PPCL will consistently execute during the backup cycle.
- Unused Ethernet ports are now disabled and do not require the field panel to cold start.
- The handling of COV subscriptions for large databases has been improved.
- The HMI prompt was changed from A, N, **M** (Application/flNdevice/Mstp) to A, N, **B (Application/flNdevice/Bacnet)**; allowing the configuration of routed FLN types and clarifying that any BACnet device (MS/TP or IP) can be added to the BACnet ALN.
- The Available memory report has been extended to show installed Memory (physical memory installed in hardware), in addition to the existing metrics already provided:
  - Available RAM left
  - Number of Fragments of memory
  - Largest Contiguous memory
- Auto Save allows the database to be backed up to flash memory automatically whenever the database is changed, instead of being an operator-selected function. It does not provide any safeguard or protection against power loss.
- PXM10T and PXM10S support: Optional LCD Local user interface with HOA (Hand-off-auto) capability and point commanding and monitoring features.
- MS/TP Point Pickup Module (PPM) support: Universal Inputs can be configured for analog or digital input. Input/Output type is configured by writing to BACnet object properties.
- The Simple Network Management Protocol (SNMP) Agent allows points in the field panel to communicate with an SNMP manager over Ethernet.
- The Meter Proxy allows a PXC Compact 16 or 24 field panel to act as an FTP client and send files (for example, Trend Sample Report) containing trend data directly to an FTP server. All trend data points contained in the PXC Compact 16 or 24 field panel are uploaded to an FTP server at a scheduled time interval. You can schedule the trend data file upload by configuring a trigger point that is commanded by the BACnet Scheduler or PPCL code.

The Compact Series

In addition to building and system management functions, the Compact Series includes several styles of controllers that flexibly meet application needs.

PXC-16

The PXC-16 provides control of 16 points, including 8 software-configurable universal points.

Point count includes: 3 Universal Input (UI), 5 Universal I/O (U), 2 Digital Input (DI), 3 Analog Output (AOV), and 3 Digital Output (DO).

PXC-24

The PXC-24 provides control of 24 points, including 16 software-configurable universal points.

Point count includes: 3 Universal Input (UI), 9 Universal I/O (U), 4 Super Universal I/O (X), 3 Analog Output (AOV), 5 Digital Output (DO).

PXC-16 Unitary Equipment Controller

The PXC-16 Unitary Equipment Controller provides control of 16 points, including 8 software-configurable universal points.

PXC-24 Unitary Equipment Controller

The PXC-24 Unitary Equipment Controller provides control for 24 points including 16 software configurable universal points, with point types as listed in PXC-24 above. The PXC-24 Unitary Equipment Controller is a BACnet MS/TP device that can be configured as a programmable, stand-alone FLN device when a workstation is not present. When a workstation is connected through a PXC Modular or Compact with MS/TP capability, the PXC-24 Unitary Equipment Controller can operate as either an ALN or FLN device.

Extended Temperature Operation (Rooftop)

PXC16.3-UCMR.A and PXC24.3-UCMR.A Unitary Equipment Controller models support extended temperature operation, allowing for rooftop installations.

PXC-36

The PXC-36 provides control of 36 local points, including 24 software-configurable universal points.

Point count includes: 18 Universal I/O (U), 6 Super Universal I/O (X), 4 Digital Input (DI), and 8 Digital Output (DO).

The PXC-36 offers the flexibility of expanding the total point count through a self-forming Island Bus. With the addition of a TX-I/O Power Supply, up to four TX-I/O modules can be supported. For more information, see the *TX-I/O Product Range Technical Specification Sheet* (149-476).

Available Options

The following options are available to match the application:

FLN Support

- The PXC-16 and PXC-24 “F” models with an FLN license support up to 32 P1 or MS/TP devices.
- The PXC-36 with an FLN license supports up to 96 P1 or MS/TP devices.
- A Wireless FLN may also be used to replace the traditional P1 FLN cabling with wireless communication links that form a wireless mesh network. Additional hardware is required to implement the Wireless FLN.

For more information about FLN support, contact your local Siemens Industry representative.

Launch Pad

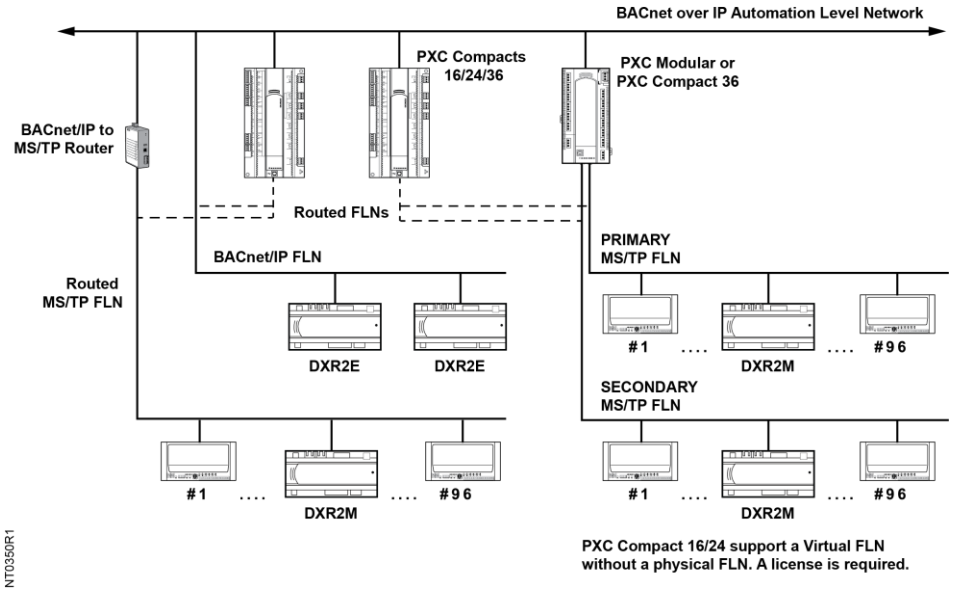
Siemens Launch Pad provides easy access to the applications required for configuring, monitoring, and controlling the Building Automation System. It allows you to deploy the Application MC tool to a field panel, load licenses, add shortcuts to other applications, and access user documentation.

The Launch Pad is an Adobe AIR-based application that allows you to do the following:

- Launch Adobe AIR-based UI that allows you to interact with Siemens Ethernet BACnet Field Panels and provides a more intuitive user interface for database interaction in comparison to line-by-line command prompts.
- Deploy browser-based Application MC to field panels.
- Deploy licenses to field panels.
- Add shortcut buttons so that other commonly-used Building Automation System applications are easily accessible and can be launched from Launch Pad.
- A shortcut button is automatically added, if WCIS has been installed along with Launch Pad.

Routed FLNs

A Routed FLN is a software configured network that allows you to group BACnet IP or MS/TP devices by network number. A network that resides in a field panel but does not have a physical connection to a piece of equipment.



Hardware

The PXC Compact Series consists of the following major components:

- Input/Output Points
- Power Supply
- Controller Processor

Input/Output Points

- The PXC Compact input/output points perform A/D or D/A conversion, signal processing, point command output, and communication with the controller processor. The terminal blocks are removable for easy termination of field wiring.
- The Universal and Super Universal points leverage TX-I/O™ Technology from Siemens Building Technologies to configure an extensive variety of point types.
- Universal Input (UI) and Universal Input/Output (U) points are software-selectable to be:
  - 0-10V input
  - 4-20 mA input
  - Digital Input
  - Pulse Accumulator inputs
  - 1K Ni RTD @ 32°F (Siemens, Johnson Controls, DIN Standard)
  - 1K Pt RTD (375 or 385 alpha) @ 32°F
  - 10K NTC Thermistor (Type 2 and Type 3) @ 77°F
  - 100K NTC Thermistor (Type 2) @ 77°F
  - 0-10V Analog Output (Universal Input/Output (U) points only)
- Super Universal (X) points (PXC-24 and PXC-36 only) are software-selectable to be:
  - 0-10V input
  - 4-20 mA input
  - Digital Input
  - Pulse Accumulator inputs
  - 1K Ni RTD @ 32°F (Siemens, Johnson Controls, DIN Standard)
  - 1K Pt RTD (375 or 385 alpha) @ 32°F
  - 10K NTC Thermistor (Type 2 and Type 3) @ 77°F
  - 100K NTC Thermistor (Type 2) @ 77°F
  - 0-10V Analog Output
  - 4-20 mA Analog Output
  - Digital Output (using external relay)
- Dedicated Digital Input (DI) points (PXC-16 only) are dry contact status sensing.
- Digital Output (DO) points are 110/220V 4 Amp (resistive) Form C relays; LEDs indicate the status of each point.
- All PXC Compact Series models support 0-10 Vdc Analog Output circuits.
- On PXC-24 and PXC-36 models, the Super Universal points may be defined as either 0-10 Vdc or 4-20 mA Analog Output circuits.

Power Supply

- The 24 volt DC power supply provides regulated power to the input/output points and active sensors. The power supply is internal to the PXC Compact housing, eliminating the need for external power supply and simplifying installation and troubleshooting.
- The power supply works with the processor to ensure smooth power up and power down sequences for the equipment controlled by the I/O points, even through brownout conditions.

Controller Processor

- The PXC Compact Series includes a microprocessor-based multi-tasking platform for program execution and communications with the I/O points and with other PXC Compacts and field panels over the ALN.
- A Human Machine Interface (HMI) port, with a quick-connect phone jack (RJ-45), uses RS-232 protocol to support operator devices (such as a local user interface or simple CRT terminal), and a phone modem for dial-in service capability.
- A USB Device port supports a generic serial interface for an HMI or Tool connection, or used for memory expansion in select models. The USB Device port does not support firmware flash upgrades.
- The program and database information stored in the PXC Compact RAM memory is battery-backed. This eliminates the need for time-consuming program and database re-entry in the event of an extended power failure.
- The firmware, which includes the operating system, is stored in non-volatile flash ROM memory; this enables firmware upgrades in the field.
- Brownout protection and power recovery circuitry protect the controller board from power fluctuations.
- LEDs provide instant visual indication of overall operation, network communication, and low battery warning.

Programmable Control with Application Flexibility

The PXC Compact Series of high performance controllers provides complete flexibility, which allows the owner to customize each controller with the exact program for the application.

The control program for each PXC Compact is customized to exactly match the application. Proven Powers Process Control Language (PPCL), a text-based programming structure like BASIC, provides direct digital control and energy management sequences to precisely control equipment and optimize energy usage.

Global Information Access

The HMI port supports operator devices, such as a local user interface or simple CRT terminal, and a phone modem for dial-in service capability. Devices connected to the operator terminal port gain global information access.

Multiple Operator Access

Multiple operators can access the network simultaneously. Multiple operator access ensures that alarms are reported to an alarm printer while an operator accesses information from a local terminal. When using the BACnet/IP ALN option, multiple operators may also access the controller through concurrent Telnet sessions and/or local operator terminal ports.

Menu Prompted, English Language Operator Interface

The PXC Compact includes a simple, yet powerful, menu-driven English Language Operator Interface that provides, among other things:

- Point monitoring and display
- Point commanding
- Historical trend collection and display for multiple points
- Event scheduling
- Program editing and modification via Powers Process Control Language (PPCL)
- Alarm reporting and acknowledgment
- Continual display of dynamic information

Built-in Direct Digital Control Routines

The PXC Compact provides stand-alone Direct Digital Control (DDC) to deliver precise HVAC control and comprehensive information about system operation. It receives information from sensors in the building, processes the information, and directly controls the equipment. The following functions are available in the PXC Compact:

- Adaptive Control, an auto-adjusting closed loop control algorithm, which provides more efficient, adaptive, robust, fast, and stable control than the traditional PID control algorithm. It is superior in terms of response time and holding steady state, and at minimizing error, oscillations, and actuator repositioning.
- Closed Loop Proportional, Integral and Derivative (PID) control.
- Logical sequencing.
- Alarm detection and reporting.
- Reset schedules.

Built-in Energy Management Applications

The following applications are programmed in the PXC Compact Series and require simple parameter input for implementation:

- Automatic Daylight Saving Time switchover
- Calendar-based scheduling
- Duty cycling
- Economizer control
- Equipment scheduling, optimization and sequencing
- Event scheduling
- Holiday scheduling
- Night setback control
- Peak Demand Limiting (PDL)
- Temperature-compensated duty cycling
- Temporary schedule override

BACnet Compact Series Specifications

Dimensions (L × W × D)	
PXC-16 and PXC-24	10.7" × 5.9" × 2.45" (272 mm × 150 mm × 62 mm)
PXC-36	11.5" × 5.9" × 3.0" (293 mm × 150 mm × 77 mm)

Processor, Battery, and Memory	
Processor and Clock Speed	PXC-16 and PXC-24: Freescale MPC852T, 100 MHz PXC-36: Freescale MPC885, 133 MHz
Memory	PXC-16 and PXC-24: 24 MB (16 MB SDRAM, 8 MB Flash ROM) PXC-16/24 “F” and “F32”: 40 MB (32 MB SDRAM, 8 MB Flash ROM) PXC-36: 80 MB (64 MB SDRAM, 16 MB Flash ROM) **NOTE:** See the Configuration and Sizing Guidelines document for supported memory size. New PXC models will now support high speed 480 Mbps communication (PXC-36 only).
Battery backup of Synchronous Dynamic (SD) RAM (field replaceable)	PXC-16 and PXC-24 Non-rooftop Models: 180 days (accumulated) AA (LR6) 1.5 Volt Alkaline (non-rechargeable) PXC-36**:** 60 days (accumulated) AA (LR6) 1.5 Volt Alkaline (non-rechargeable) Rooftop (Extended Temperature) Models: 330 days (accumulated) AA (LR6) 3.6 Volt Lithium (non-rechargeable)
Battery backup of Real Time Clock	Non-rooftop Models: 10 years Coin cell (BR2032) 3 Volt lithium Rooftop (Extended Temperature) Models: 18 months Coin cell (BR2032) 3 Volt lithium

Communication	
A/D Resolution (analog in)	16 bits
D/A Resolution (analog out)	10 bits
BACnet/IP Automation Level Network (ALN)	10Base-T or 100Base-TX compliant
BACnet MS/TP Automation Level Network (ALN)	RS-485, 9600 bps to 115.2 Kbps, 1/8 load
BACnet MS/TP Field Level Network (FLN) *on selected models, license may be required*	RS-485, 9600 bps to 115.2 Kbps, 1/8 load
Optional P1 Wired/Wireless Field Level Network (FLN) *on selected models, license may be required*	RS-485, 4800 bps to 38.4 Kbps, 1/8 load
Human-Machine Interface (HMI) Advanced User Mode	RS-232 compliant, 1200 bps to 115.2 Kbps

Communication

USB Device port (for non-smoke control applications only)	USB 1.1 (12 Mbps) and 2.0 (480 Mbps), Type B female connector. Self-powered, does not use or supply USB power.
Prior to June 2013	USB 1.0 (1.5 Mbps) and 1.1 (12 Mbps).
USB Host port *on selected models* (for ancillary smoke control applications only).	USB 1.0 (1.5 Mbps), 1.1 (12 Mbps), and 2.0 (480Mbps), Type A female connector. USB unit loads (5V, 500 mA).
Prior to June 2013	USB 1.0 (1.5 Mbps) and 1.1 (12 Mbps), Type A female connector.

Electrical

Power Requirements	24 Vac ±20% input @ 50/60 Hz
Power Consumption (Maximum)	PXC-16: 18 VA @ 24 Vac
	PXC-24: 20 VA @ 24 Vac
	PXC-36: 35 VA 24 Vac
AC Power and Digital Outputs	NEC Class 1 Power Limited
Communication and all other I/O	NEC Class 2
Digital Input	Contact Closure Sensing Dry Contact/Potential Free inputs only Does not support counter inputs
Digital Output	Class 1 Relay
External supply line fusing	Max. 8 A, slow
Non-renewable fuse circuit breakers	Max. 10 A, characteristic B, C, D as per EN 60898
Analog Output	0 to 10 Vdc
Universal Input (UI) and Universal Input/Output (U)	**Analog Input** Voltage (0-10 Vdc) Current (4-20 mA) 1K Ni RTD @ 32°F 1K Pt RTD (375 or 385 alpha) @ 32°F 10K NTC Type 2 or Type 3 Thermistor @ 77°F 100K NTC Type 2 Thermistor @ 77°F **Digital Input** Pulse Accumulator Contact Closure Sensing Dry Contact/Potential Free inputs only Supports counter inputs up to 20 Hz **Analog Output (Universal Input/Output (U) points only)** Voltage (0-10 Vdc)

Electrical

Super Universal (X)

Analog Input
Voltage (0-10 Vdc)
Current (4-20 mA)
1K Ni RTD @ 32°F
1K Pt RTD (375 or 385 alpha) @ 32°F
10K NTC Type 2 or Type 3 Thermistor @ 77°F
100K NTC Type 2 Thermistor @ 77°F
Digital Input
Pulse Accumulator
Contact Closure Sensing
Dry Contact/Potential Free inputs only
Supports counter inputs up to 20 Hz
Analog Output
Voltage (0-10 Vdc)
Current (4-20 mA)
Digital Output (requires an external relay)
0 to 24 Vdc, 22 mA max.

Operating Environment

Ambient operating environment	Operate in a dry location, which is protected from exposure to salt spray or other corrosive elements. Exposure to flammable or explosive vapors must be prevented.
Ambient operating temperature	32°F to 122°F (0°C to 50°C)
Ambient operating temperature *with rooftop (extended temperature) option*	-40°F to 158°F (-40°C to 70°C)
Shipping and storage environment	-13°F to 158°F (-25°C to 70°C)
Relative Humidity	PXC-*16 and* PXC-*24:* 5 to 95% rh non-condensing PXC-*36:* 5 to 95% rh non-condensing
Mounting Surface	PXC-*16 and* PXC-*24:* Direct equipment mount, building wall, or structural member PXC-*36:* Building wall or a secure structure

Agency Listings

UL	UL864 UUKL Smoke Control Equipment - Conforms to UL864 9th and 10th Edition. (except UEC and rooftop models) UL 864 UUKL7 Smoke Control Equipment - Conforms to UL864 9th and 10th Edition. (except UEC and rooftop models) CAN/ULC-S527-M8 (except rooftop models) UL916 PAZX - Conforms to UL916 9th and 10th Edition. (all models) UL916 PAZX7 - Conforms to UL916 9th and 10th Edition. (all models)
Agency Compliance	FCC Compliance CFR47 Part 15, Subpart B, Class B Australian EMC Framework European EMC Directive (CE) European Low Voltage Directive (LVD) RoHS Compliant UKCA - Electromagnetic Compatibility Regulations (S.I. 2016 No. 1091 / S.I. 2012 No. 3032)

Agency Listings	
OSHPD Seismic Certification	Product meets OSHPD Special Seismic Preapproval certification (OSH-0217-10) under California Building Code 2010 (CBC2010) and International Building Code 2009 (IBC2009) when installed within the following Siemens enclosure part numbers: PXA-ENC18, PXA-ENC19, or PXA-ENC34.
BTL	BACnet Testing Laboratories (BTL) Certified, Firmware Revision 3.0 and later

Ordering Information

PXC Compact Series

Part Number	Description
PXC16.2-E.A	PXC Compact, 16 point, BACnet/IP ALN
PXC16.2-EF.A	PXC Compact, 16 point, BACnet/IP ALN, P1or MS/TP FLN
PXC16.2-EF32.A	PXC Compact, 16 point, BACnet/IP ALN, FLN enabled
PXC16.3-UCMR.A	PXC Unitary Equipment Controller, 16 point, BACnet MS/TP, Rooftop Model
PXC24.2-E.A	PXC Compact, 24 point, BACnet/IP ALN
PXC24.2-EF.A	PXC Compact, 24 point, BACnet/IP ALN, P1 or MS/TP FLN
PXC24.2-EF32.A	PXC Compact, 24 point, BACnet/IP ALN, P1 or MS/TP FLN
PXC24.2-ER.A	PXC Compact, 24 point, BACnet/IP ALN, rooftop
PXC24.2-ERF.A	PXC Compact, 24 point, BACnet/IP ALN, rooftop, P1 or MS/TP FLN
PXC24.3-UCMR.A	PXC Unitary Equipment Controller, 24 point, BACnet MS/TP, Rooftop Model
PXC36-E.A	PXC Compact, 36 point, BACnet/IP or MS/TP ALN
PXC36-EF.A	PXC Compact, 36 point, BACnet/IP or MS/TP ALN, Island Bus, P1 or MS/TP FLN

Optional Licenses

Product Number	Description
LSM-FLN	License to enable FLN support on models PXC-16-EF.A or PXC-24-EF.A
LSM-FLN36.A	License to enable FLN support on models PXC36-E.A and PXC36-PE.A
LSM-IB36.A	License to enable 4 TX-I/O modules on the Island Bus on models PXC36-E.A and PXC36-PE.A
LSM-36.A	License to enable 4 TX-I/O modules on the Island Bus and FLN support on models PXC36-E.A and PXC36-PE.A
LSM-SNMP	License to enable SNMP Agent on Siemens Modular or Compact hardware with BACnet Firmware Revision 3.2.3
LSM-ADAPT	License to use the Adaptive Control added in FW 3.5.1/2.8.18 and later

*) Field Panel Web Services are no longer available for sale. Launch Pad is a free download available from X:\StdApps\APOGEE_Products_FW_SW\Integrated_Solutions.

Accessories

Product Number	Description
PXA-COMP.CON	PXC Compact Connector Kit - Fits one PXC-36, PXC-24 or PXC-16

Service Boxes and Enclosures

Product Number	Description
PXA-SB115V192VA	PX Series Service Box—115V, 24 Vac, 50/60 Hz, 192 VA
PXA-SB115V384VA	PX Series Service Box—115V, 24 Vac, 50/60 Hz, 384 VA
PXA-SB230V192VA	PX Series Service Box—230V, 24 Vac, 50/60 Hz, 192 VA
PXA-SB230V384VA	PX Series Service Box—230V, 24 Vac, 50/60 Hz, 384 VA
PXA-ENC18	18" Enclosure (Utility Cabinet) (UL Listed NEMA Type 1 Enclosure)
PXA-ENC19	19” Enclosure (UL Listed NEMA Type 1 Enclosure)
PXA-ENC34	34” Enclosure (UL Listed NEMA Type 1 Enclosure)

Documentation

Product Number	Description
553-104	PXC Compact Series Owner's Manual
125-1896	APOGEE Powers Process Control Language (PPCL) User's Manual

Disposal

The device is considered an electronic device for disposal in accordance with the European Guidelines and may not be disposed of as domestic garbage.

- Dispose of the device through channels provided for this purpose.
- Comply with all local and currently applicable laws and regulations.

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