ioPAC 8500 Series

Award-winning Product

TAIWAN EXCELLENCE 2014

Rugged modular RTU controllers



- Dedicated ARM (RISC) CPUs for the main system and each I/O module
- Millisecond timestamp granularity for digital input and analog input
- Supports 5 kHz sampling rate on every channel
- Pre-recording for analog input data logging
- Supports C/C++ and IEC 61131-3 programming languages
- Compliant with EN 50121-3-2, EN 50121-4, and a portion of EN 50155 specifications
- Robust and compact design for harsh environments
- Modular I/O for versatility, flexibility, and scalability

RoHS EN 50121 CE FC

Overview

The ioPAC 8500 modular RTU controllers use an ARM9 industrial grade CPU for the system, and ARM Cortex™ M4 CPUs for the modules. The controllers have 2, 5, or 9 I/O slots for 85M series modules. The USB bus between the controller CPU and module CPUs transmits data at up to 200 Mbps, and the dual CPU architecture supports a 5 kHz (per channel) analog input sampling rate, pre-recording of analog input data, and timestamping with millisecond granularity. Moreover, the ioPAC 8500 supports C/C++, rail-level surge and ESD protection, a -40 to 75°C operating temperature range, vibration protection, hot-swappable modules, two 10/100 Mbps Ethernet ports with two MACs (with port trunking capabilities), and two 3-in-1 serial ports. Accompanied by Moxa's Active OPC Server and DA-Center data integration software, the ioPAC 8500 series provides a comprehensive solution for data acquisition and control applications in harsh environments.

High Sampling Rate



High sampling rate AI

Moxa's ioPAC 8500 RTUs use an ARM9 industrial-grade CPU, and the dual CPU architecture supports up to a 5 kHz (per channel) analog input sampling rate, giving engineers the analog data precision they need to correctly analyze events after they have occurred.

Analog Input Prerecord Feature



Pre-recording

The ioPAC 8500 RTU's prerecord feature allows the RTU controller to continuously record analog input data before an event is triggered. The prerecord feature is a major improvement over products that only start logging data after an event has occurred, because these conventional approaches can often lead to the loss of critical data due to network latency during the event.

Millisecond Timestamp Granularity



Timestamp

Millisecond timestamp granularity is a powerful aid in post-event analysis and troubleshooting. For example, if an emergency triggers 10 separate I/O events within a 10-millisecond time interval, you will still be able to clearly identify the sequence in which the events occurred, even if the I/O events are recorded by different modules.

I/O Module Hot-Swapping


Hot-swap

The ioPAC 8500 RTU controller lets you hot-swap I/O modules, allowing engineers to quickly and easily install and replace modules in the field, reducing maintenance costs and streamlining maintenance procedures.

Specifications

Computer
Main CPU: 32-bit ARM9 192 MHz CPU
I/O CPU: 32-bit ARM Cortex M4 80 MHz CPU
OS: Linux
Clock: Real-time clock with battery backup
Memory:
• SDRAM: 64 MB
• Flash: 32 MB
• SRAM: 256 KB (battery backup lasts for 1 week)
• microSD™ Slot: Up to 32 GB (SD 2.0 compatible)
Note: For units operating in extreme temperatures, industrial grade, wide-temperature microSD cards are required.
Backplane Bus Speed: Up to 200 Mbps for all slots

Ethernet Interface
LAN: 2 x 10/100 Mbps, 2 MACs (IPs), RJ45 or M12
Protection: 1.5 kV magnetic isolation

Serial Communication
Interface:
• 2 RS-232/422/485 ports, software selectable (DB9 male)
• 1 RS-232 debug port (4-pin connector)
Serial Line Protection: 8 kV ESD for all signals

Serial Communication Parameters
Parity: None, Even, Odd
Data Bits: 7, 8
Stop Bits: 1, 2
Flow Control: RTS/CTS, XON/XOFF
Baudrate: 300 bps to 921.6 kbps

Serial Signals
RS-232: TxD, RxD, DTR, DSR, RTS, CTS, DCD, GND, RI
RS-422: Tx+, Tx-, Rx+, Rx-, GND
RS-485-4w: Tx+, Tx-, Rx+, Rx-, GND
RS-485-2w: Data+, Data-, GND

Software Characteristics
Automation Languages: C/C++, IEC 61131-3
Protocols: Modbus/TCP, Modbus/RTU Master

Power Requirements
Power Input: 24 VDC nominal, 9 to 48 VDC
Note: Compliant with EN 50155 at 24 VDC
Current for I/O Modules: 5 A @ 3.3 VDC (max.)
Power Consumption: 3.65 W @ 24 VDC

Physical Characteristics
Housing: Aluminum
Dimensions:
• 2-slot version: 114.7 x 135 x 100 mm (4.52 x 5.31 x 3.94 in)
• 5-slot version: 190.9 x 135 x 100 mm (7.52 x 5.31 x 3.94 in)
• 9-slot version: 292.5 x 135 x 100 mm (11.52 x 5.31 x 3.94 in)
Weight:
• 2-slot version: 1300 g
• 5-slot version: 2000 g
• 9-slot version: 2575 g
Mounting: DIN rail mounting (standard), wall mounting (optional)
Connector: Spring-type terminal block

Environmental Limits
Operating Temperature: -40 to 75°C (-40 to 176°F)
Storage Temperature: -40 to 85°C (-40 to 185°F)
Ambient Relative Humidity: 5 to 95% (non-condensing)
Altitude: Up to 2000 m
Note: Please contact Moxa if you require products guaranteed to function properly at higher altitudes.

Standards and Certifications
Safety: UL 508
EMI: EN 55022, EN 61000-3-2; EN 61000-3-3; FCC Part 15 Subpart B Class A
EMS: EN 55024, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-8, EN 61000-4-11
Shock: IEC 60068-2-27
Freefall: IEC 60068-2-32
Vibration: IEC 60068-2-6
Rail Traffic: EN 50155*, EN 50121-3-2, EN 50121-4
*Complies with a portion of EN 50155 specifications. Please contact Moxa or a Moxa distributor for details.
Note: Please check Moxa's website for the most up-to-date certification status.

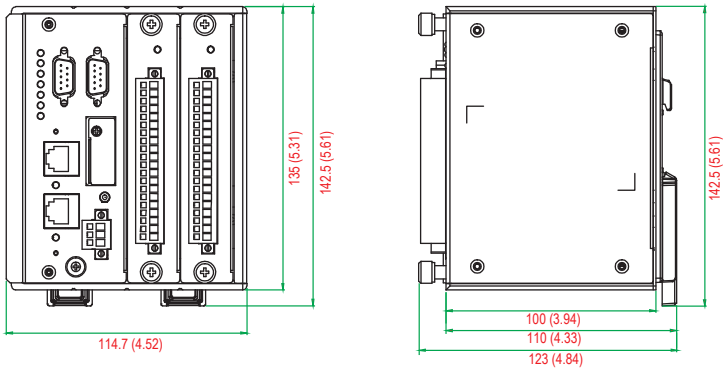
MTBF (mean time between failures)
Time: 859,979 hrs
Database: Telcordia (Bellcore)

Warranty
Warranty Period: 5 years
Details: See www.moxa.com/warranty

Dimensions

Unit: mm (inch)

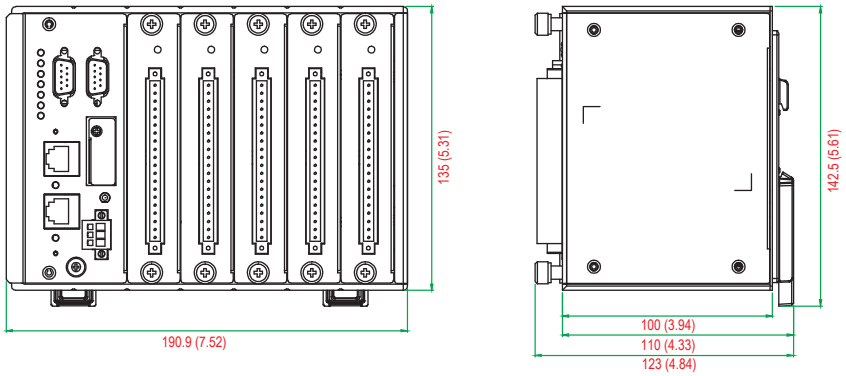
ioPAC 8500-2



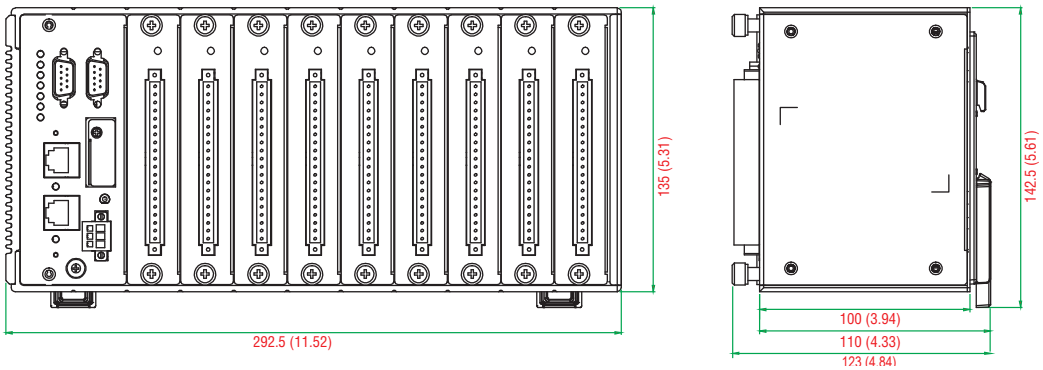
Dimensions

Unit: mm (inch)

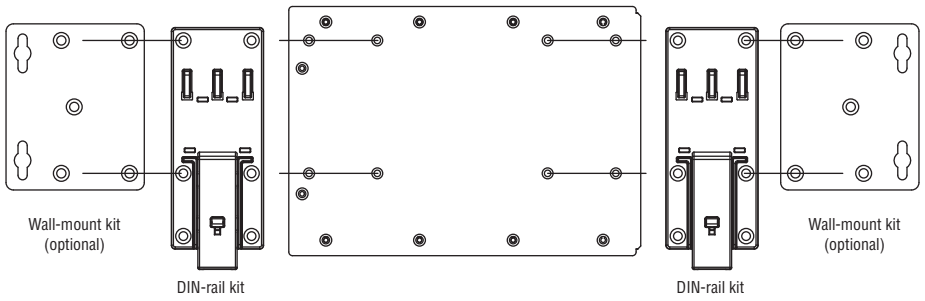
ioPAC 8500-5



ioPAC 8500-9



Mounting Kits



Ordering Information

Available Models

ioPAC 8500-2-RJ45-C-T: Modular RTU controller with RJ45 connectors, 2 I/O slots, C/C++, -40 to 75°C operating temperature
ioPAC 8500-2-M12-C-T: Modular RTU controller with M12 connectors, 2 I/O slots, C/C++, -40 to 75°C operating temperature
ioPAC 8500-2-RJ45-IEC-T: Modular RTU controller with RJ45 connectors, 2 I/O slots, IEC 61131-3, -40 to 75°C operating temperature
ioPAC 8500-2-M12-IEC-T: Modular RTU controller with M12 connectors, 2 I/O slots, IEC 61131-3, -40 to 75°C operating temperature
ioPAC 8500-5-RJ45-C-T: Modular RTU controller with RJ45 connectors, 5 I/O slots, C/C++, -40 to 75°C operating temperature
ioPAC 8500-5-M12-C-T: Modular RTU controller with M12 connectors, 5 I/O slots, C/C++, -40 to 75°C operating temperature
ioPAC 8500-5-RJ45-IEC-T: Modular RTU controller with RJ45 connectors, 5 I/O slots, IEC 61131-3, -40 to 75°C operating temperature
ioPAC 8500-5-M12-IEC-T: Modular RTU controller with M12 connectors, 5 I/O slots, IEC 61131-3, -40 to 75°C operating temperature
ioPAC 8500-9-RJ45-C-T: Modular RTU controller with RJ45 connectors, 9 I/O slots, C/C++, -40 to 75°C operating temperature
ioPAC 8500-9-M12-C-T: Modular RTU controller with M12 connectors, 9 I/O slots, C/C++, -40 to 75°C operating temperature
ioPAC 8500-9-RJ45-IEC-T: Modular RTU controller with RJ45 connectors, 9 I/O slots, IEC 61131-3, -40 to 75°C operating temperature
ioPAC 8500-9-M12-IEC-T: Modular RTU controller with M12 connectors, 9 I/O slots, IEC 61131-3, -40 to 75°C operating temperature

Package Checklist (ioPAC 8500)

- ioPAC 8500 controller
- Serial console cable
- Documentation and software CD

Optional Accessories (can be purchased separately)

WK-75: Wallmount kit
CBL-M12D(MM4P)/RJ45-100 IP67: M12 to RJ45 cable
85M-BKTES: Empty slot cover for ioPAC 85xx modules (3 pcs per package)

Package Checklist (85M modules)

- 85M module
- DB44 to 4-port DB9 cable included in 85M-5401-T package

I/O Modules (can be purchased separately)

85M-1602-T: ioPAC 85xx I/O module with 16 DIs, 24 VDC sink/source type, -40 to 75°C operating temperature
85M-2600-T: ioPAC 85xx I/O module with 16 DOs, 24 VDC sink type, -40 to 75°C operating temperature
85M-3800-T: ioPAC 85xx I/O module with 8 AIs, 4 to 20 mA, -40 to 75°C operating temperature
85M-3810-T: ioPAC 85xx I/O module with 8 AIs, 0 to 10 V, -40 to 75°C operating temperature
85M-3801-T: ioPAC 85xx I/O module with 8 AIs, 4 to 20 mA, 40 kHz, -40 to 75°C operating temperature
85M-3811-T: ioPAC 85xx I/O module with 8 AIs, 0 to 10 V, 40 kHz, -40 to 75°C operating temperature
85M-6600-T: ioPAC 85xx I/O module with 6 RTDs, -40 to 75°C operating temperature
85M-6810-T: ioPAC 85xx I/O module with 8 TCs, -40 to 75°C operating temperature
85M-5401-T: ioPAC 85xx communication module with 4-port Serial, DB44 connectors, -40 to 75°C operating temperature
Note: Conformal coating available on request



ioPAC 8500 Series I/O Modules

16 digital inputs, 24 VDC, sink/source, dry contact type



85M-1602-T: 16 digital inputs, 24 VDC, sink/source, dry contact type

Inputs and Outputs
Digital Inputs: 16 channels
Isolation: 3k VDC or 2k Vrms

Digital Inputs
Sensor Type: Wet contact (NPN or PNP), dry contact
I/O Mode: DI or event counter
Dry Contact:
• On: short to GND
• Off: open
Wet Contact (DI to GND):
NPN (DI to GND):
• On: 0 to 3 VDC
• Off: 10 to 30 VDC
PNP (DI to GND):
• Off: 0 to 3 VDC
• On: 10 to 30 VDC
Common Type: 8 points per COM
Counter Frequency: 5 kHz
Digital Filtering Time Interval: Software selectable (by 0.1 ms)

Physical Characteristics
Wiring: I/O cable, max. 16 AWG
Connector: Spring type terminal block

Environmental Limits
Operating Temperature: -40 to 75°C

Power Requirements
Power Consumption: 1.2 W @ 3.3 VDC

MTBF (mean time between failures)
Time: 1,132,561 hrs
Database: Telcordia (Bellcore)

16 digital outputs, 24 VDC, sink type



85M-2600-T: 16 digital outputs, 24 VDC, sink type

Inputs and Outputs
Digital Outputs: 16 channels
Isolation: 3k VDC or 2k Vrms

Digital Outputs
Type: Sink
I/O Mode: DO or pulse output
Pulse Output Frequency: 5 kHz
Over-voltage Protection: 45 VDC
Over-current Protection: 2.6 A (4 channels @ 650 mA)
Over-temperature Shutdown: 175°C (typical), 150°C (min.)
Current Rating: 200 mA per channel

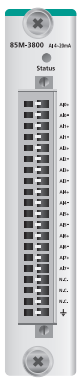
Physical Characteristics
Wiring: I/O cable, max. 16 AWG
Connector: Spring type terminal block

Environmental Limits
Operating Temperature: -40 to 75°C

Power Requirements
Power Consumption: 0.85 W @ 3.3 VDC

MTBF (mean time between failures)
Time: 792,571 hrs
Database: Telcordia (Bellcore)

8 analog inputs, 4 to 20 mA



85M-3800-T: 8 analog inputs, 4 to 20 mA

Inputs and Outputs
Analog Inputs: 8 channels
Isolation: 3k VDC or 2k Vrms

Analog Inputs
Type: Differential
Resolution: 16 bits
I/O Mode: 4 to 20 mA (wire off)
Accuracy:
±0.1% FSR @ 25°C
±0.3% FSR @ -40 and 75°C
Sampling Rate:
• All channels: 100 samples/sec
• Per channel: 12.5 samples/sec
Input Impedance: 125 ohms (min.)

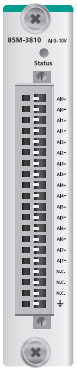
Physical Characteristics
Wiring: I/O cable, max. 16 AWG
Connector: Spring type terminal block

Environmental Limits
Operating Temperature: -40 to 75°C

Power Requirements
Power Consumption: 1.05 W @ 3.3 VDC

MTBF (mean time between failures)
Time: 1,512,906 hrs
Database: Telcordia (Bellcore)

8 analog inputs, 0 to 10 VDC



85M-3810-T: 8 analog inputs, 0 to 10 VDC

Inputs and Outputs
Analog Inputs: 8 channels
Isolation: 3k VDC or 2k Vrms

Analog Inputs
Type: Differential
Resolution: 16 bits
I/O Mode: 0 to 10 VDC
Accuracy:
±0.1% FSR @ 25°C
±0.3% FSR @ -40 and 75°C
Sampling Rate:
• All channels: 100 samples/sec
• Per channel: 12.5 samples/sec
Input Impedance: 200 k-ohms (min.)

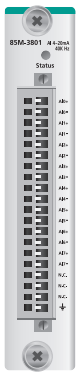
Physical Characteristics
Wiring: I/O cable, max. 16 AWG
Connector: Spring type terminal block

Environmental Limits
Operating Temperature: -40 to 75°C

Power Requirements
Power Consumption: 1.04 W @ 3.3 VDC

MTBF (mean time between failures)
Time: 1,530,690 hrs
Database: Telcordia (Bellcore)

8 analog inputs, 4 to 20 mA, 40 kHz



85M-3801-T: 8 analog inputs, 4 to 20 mA, 40 kHz

Inputs and Outputs
Analog Inputs: 8 channels
Isolation: 3k VDC or 2k Vrms

Analog Inputs
Type: Differential
Resolution: 16 bits
I/O Mode: 4 to 20 mA (wire off)
Historical Data Buffering: 60KB per channel, 6 seconds data buffer at 5KHz
Accuracy:
±0.1% FSR @ 25°C
±0.3% FSR @ -40 and 75°C
Sampling Rate:
• All channels: 40k samples/sec
• Per channel: 5k samples/sec
Input Impedance: 125 ohms (min.)

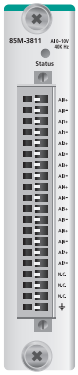
Physical Characteristics
Wiring: I/O cable, max. 16 AWG
Connector: Spring type terminal block

Environmental Limits
Operating Temperature: -40 to 75°C

Power Requirements
Power Consumption: 1.25 W @ 3.3 VDC

MTBF (mean time between failures)
Time: 1,410,655 hrs
Database: Telcordia (Bellcore)

8 analog inputs, 0 to 10 VDC, 40 kHz



85M-3811-T: 8 analog inputs, 0 to 10 VDC, 40 kHz

Inputs and Outputs
Analog Inputs: 8 channels
Isolation: 3k VDC or 2k Vrms

Analog Inputs
Type: Differential
Resolution: 16 bits
I/O Mode: 0 to 10 VDC
Historical Data Buffering: 60 KB per channel, 6 seconds data buffer at 5 kHz
Accuracy:
±0.1% FSR @ 25°C
±0.3% FSR @ -40 and 75°C
Sampling Rate:
• All channels: 40k samples/sec
• Per channel: 5k samples/sec
Input Impedance: 20 M-ohms (min.)

Physical Characteristics
Wiring: I/O cable, max. 16 AWG
Connector: Spring type terminal block

Environmental Limits
Operating Temperature: -40 to 75°C

Power Requirements
Power Consumption: 1.25 W @ 3.3 VDC

MTBF (mean time between failures)
Time: 1,426,112 hrs
Database: Telcordia (Bellcore)

6 RTD inputs



85M-6600-T: 6 RTD inputs

Inputs and Outputs

RTD Inputs: 6 channels
Isolation: 3K VDC or 2K Vrms

RTD Inputs

Input Type:
- PT50, PT100, PT200, PT500 (-200 to 850°C)
- PT1000 (-200 to 350°C)
- JPT100, JPT200, JPT500 (-200 to 640°C)
- JPT1000 (-200 to 350°C)
- NI100, NI200, NI500 (-60 to 250°C)
- NI1000 (-60 to 150°C)
- NI120 (-80 to 260°C)
- Resistance of 310, 620, 1250, and 2200

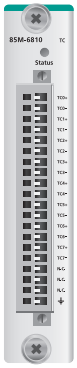
Sampling Rate (single channel):
- All channels: 12 samples/sec
- Per channel: 2 samples/sec

Resolution: 0.1°C or 0.1 ohm
Accuracy: ±0.1% FSR @ 25°C
±0.3% FSR @ -40 and 75°C
Input Impedance: 625 kohms (min.)
Physical Characteristics
Wiring: I/O cable, max. 16 AWG
Connector: Spring type terminal block

Environmental Limits

Operating Temperature: -40 to 75°C

8 thermocouple inputs



85M-6810-T: 8 thermocouple inputs

Inputs and Outputs

Analog Inputs: 8 channels
Isolation: 3K VDC or 2K Vrms

Thermocouple Inputs

Sensor Type: J (0 to 750°C), K (-200 to 1250°C), T (-200 to 350°C), E (-200 to 900°C), R (-50 to 1600°C), S (-50 to 1760°C), B (600 to 1700°C), N (-200 to 1300°C)
Millivolt Type:
- Mode: ±78.126 mV, ±39.062 mV, ±19.532 mV
- Fault and over-voltage protection: -35 to +35 VDC (power off); -25 to +30 VDC (power on)

Sampling Rate (single channel):
- All channels: 12 samples/sec
- Per channel: 1.5 samples/sec

Resolution: 16 bits

Accuracy: ±0.1% FSR @ 25°C
±0.3% FSR @ -40 and 75°C
Input Impedance: 1 Mohms (min.)
Physical Characteristics
Wiring: I/O cable, max. 16 AWG
Connector: Spring type terminal block

Environmental Limits

Operating Temperature: -40 to 75°C

4 serial ports



85M-5401-T: 4 serial ports

Serial Communication
Interface: 4 RS-232/422/485 ports, software selectable (DB44 male)
Isolation: 3K VDC or 2K Vrms
Note: DB44 to 4-port DB9 cable included in the package.

Serial Communication Parameters
Parity: None, Even, Odd
Data Bits: 7, 8
Stop Bits: 1, 2
Flow Control: RTS/CTS, XON/XOFF
Baudrate: 300 bps to 921.6 kbps

Serial Signals
RS-232: TxD, RxD, RTS, CTS, DTR, DSR, DCD, GND
RS-422: Tx+, Tx-, Rx+, Rx-, GND
RS-485-4w: Tx+, Tx-, Rx+, Rx-, GND
RS-485-2w: Data+, Data-, GND

Physical Characteristics
Connector: DB44 male

Environmental Limits
Operating Temperature: -40 to 75°C

Power Requirements
Power Consumption: 1.24 W @ 3.3 VDC

MTBF (mean time between failures)
Time: 596,611 hrs
Database: Telcordia (Bellcore)

Common Specifications

Environmental Limits
Storage Temperature: -40 to 85°C (-40 to 185°F)
Ambient Relative Humidity: 5 to 95% (non-condensing)

Standards and Certifications
Safety: UL 508
EMI: EN 55022, EN 61000-3-2, EN 61000-3-3, FCC Part 15 Subpart B Class A
EMS: EN 55024, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-8, EN 61000-4-11
Shock: IEC 60068-2-27
Freefall: IEC 60068-2-32
Vibration: IEC 60068-2-6
Rail Traffic: EN 50155*, EN 50121-3-2, EN 50121-4
*Complies with a portion of EN 50155 specifications. Please contact Moxa or a Moxa distributor for details.
Note: Please check Moxa's website for the most up-to-date certification status.

Warranty
Warranty Period: 5 years
Details: See www.moxa.com/warranty

© Moxa Inc. All Rights Reserved. Updated Aug. 29, 2014. Specifications subject to change without notice. Please visit our website for the most up-to-date product information.