

Introduction to Modbus Gateways

Seamless communication between Modbus Ethernet and Modbus serial devices

Modbus is the standard used for communication between a wide range of industrial devices, including PLCs, DCSs, HMIs, instruments, meters, motors, and drives. Although Modbus can be used for both serial (RS-232, RS-422, and RS-485) devices and newer Ethernet devices, the serial and Ethernet protocols are so different that a specialized gateway is required for one protocol to communicate with the other. Moxa's MGate™ products are specially designed to integrate Modbus TCP and Modbus RTU/ASCII networks. MGate™ MB3000 products support one or two Ethernet connections, and up to four serial ports.

The MGate(TM) line of Modbus gateways includes products that support these advanced features:

- Multiple masters
- Priority control
- Smart routing
- Serial redirector
- Powerful Windows Utility



Powerful options for master/slave configuration between Modbus networks

Devices connected to a Modbus network must be clearly defined as either “master” or “slave.” Unlike other Modbus gateways, the MGate™ MB3000 allows protocol conversion in two directions, from Ethernet master to serial slave and from serial master to Ethernet slave. To

ensure maximum compliance with all Modbus networks, extra address mapping and exception parameters can be adjusted to handle almost any situation.

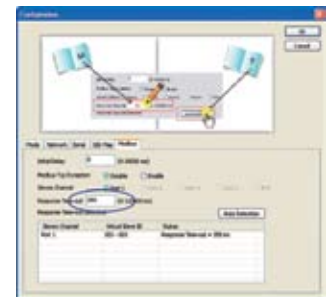
Easier integration with automatic calibration of response timeout (patent pending)

Every Modbus device should be assigned a response timeout value, as provided by the device manufacturer based on the computation required for a request. However, manually obtaining and setting these values for every device is difficult and time-consuming, especially

on complex networks with a large number of devices. The MGate™ MB3000 eliminates this difficulty with a patent-pending feature that automatically determines and sets each device's response timeout value.

(1) Automatic calibration of the timeout value provides maximum compatibility with minimum effort.

(2) Automatic calibration eliminates the need to either guess or calculate timeout values

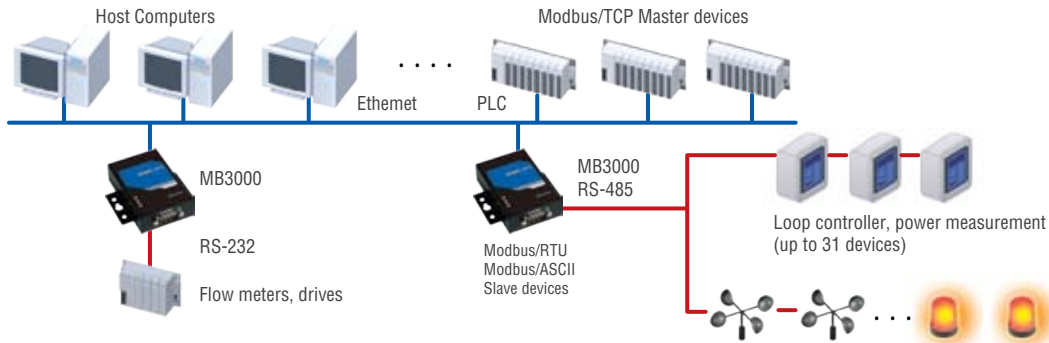


Multiple masters across different Modbus networks, with fully compliant operation

The MGate™ MB3000 supports 16 simultaneous TCP masters with up to 32 simultaneous requests per master. Serial masters are able to access up to 32 different IP addresses as TCP slaves. MGate™

MB3000 gateways have been designed so that even with multiple masters across different Modbus networks, communication remains compliant with each Modbus protocol.

Supports 16 TCP masters with up to 32 requests per master



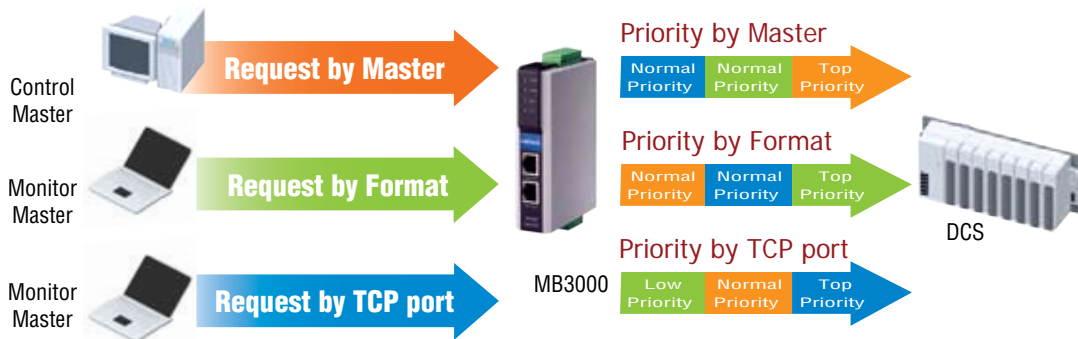
Built-in optical isolation for industrial device protection

The MGate™ MB3000 series two advanced models—the MB3170 and MB3270—that offer built-in optical isolation of the serial signals as

an option. Optical isolation helps prevent dangerous ground loops, spikes, and surges.

Priority control for critical commands (patent pending)

Flag urgent commands for immediate response



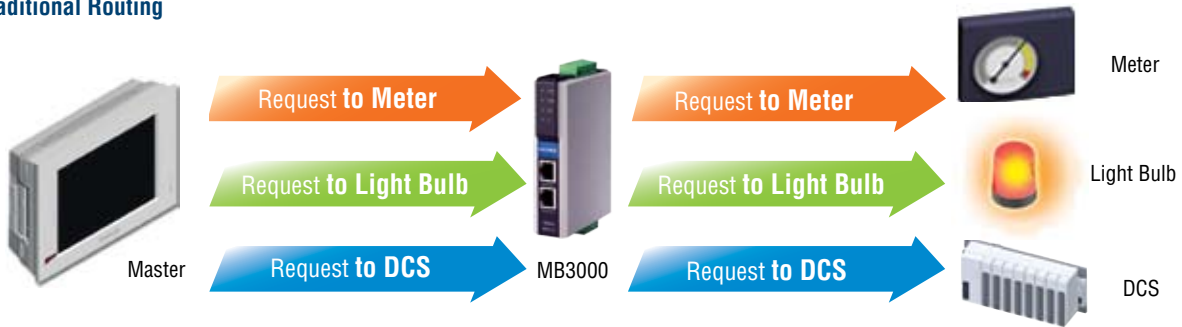
Other Modbus gateways simply transfer all requests between Modbus networks on a FIFO (first in first out) basis, with no accommodation for urgent commands that require immediate attention. The advanced models of the MGate™ MB3000 (the MB3170 and MB3270) include a patent-pending priority control feature that allows urgent commands to be flagged for immediate response based on IP address, command

type, or TCP port. The priority control feature allows the advanced models of the MB3000 series to get around the latency experienced by other Modbus gateways. With the priority control feature, the advanced MB3000 models are an ideal component of real-time control systems.

: Zero change to existing architecture with smart routing and serial redirector

Automatic Routing

Traditional Routing



Smart Routing



The MGate™ MB3270, MB3280, and MB3480 include smart routing for enhanced compatibility with existing Modbus networks. Other Modbus gateways require a separate socket connection for each serial port, making them useless for TCP masters that can only open one connection. With smart routing on the MB3000 Modbus gateway, a TCP master can use just one socket connection to command serial slaves on every serial port.

The MGate™ MB3270 has a serial redirector function that allows additional options for Modbus network integration. The serial redirector function allows the commands of a serial master to be redirected to serial slaves on another port. In addition, a serial master can operate simultaneously with TCP masters or other serial masters, without altering the Modbus architecture or software. Using the serial redirector function, advanced MB3000 gateways can establish redundant backup control or Ethernet monitoring of Modbus networks that were originally designed for a single serial master.

Create a backup system



: Powerful, easy-to-use Windows configuration utility

MGate™ Manager is a Windows utility that enables you to do the following:

- Search for all MB3000 gateways on a LAN
- Remotely configure MB3000 gateways
- Monitor devices attached to MB3000 gateways
- Remotely upgrade the firmware on MB3000 gateways

Multi-language support

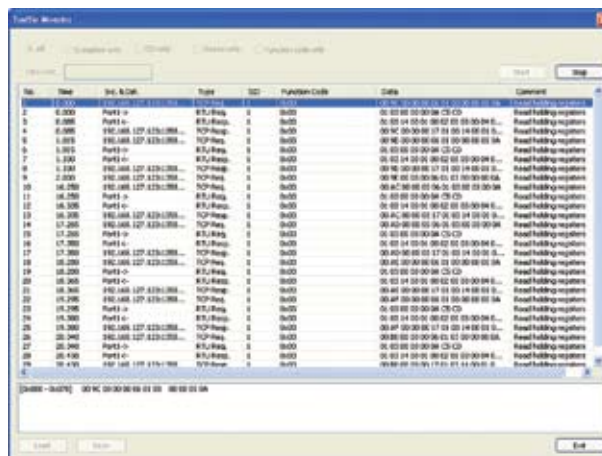
MGate™ Manager is designed for configuration and monitoring of MB3000 gateways. The HMI of this utility is easily customized to display commands in the language of your choice.



Protocol analysis tool for all Modbus communication

The monitor function can be used to log all Modbus commands and responses that pass through the MB3000 gateway. All data is presented in a clear, easy-to-understand format, and logs can

be filtered for easier analysis. With a single click, users can view exceptions, specific slave IDs, traffic to/from specific sources (serial ports, IPs), or all traffic.



MGate™ MB3180/3280/3480

1, 2, and 4-port standard Modbus gateways



- > Convert between Modbus TCP and Modbus RTU/ASCII
- > 1 Ethernet port and 1, 2, or 4 RS-232/422/485 ports
- > Supports 16 simultaneous TCP masters with up to 32 simultaneous requests per master
- > Easy hardware setup and configuration



The certification logos shown here apply to some or all of the products in this section. Please see the **Specifications** section or Moxa's website for details.

Overview

The MB3180, MB3280, and MB3480 are standard Modbus gateways that convert between Modbus TCP and Modbus RTU/ASCII protocols. Up to 16 simultaneous Modbus TCP masters are supported, with up to

31 RTU/ASCII slaves per serial port. For RTU/ASCII masters, up to 32 TCP slaves are supported.

Standard Modbus network integration

The three standard MGate™ models (MB3180, MB3280, and MB3480) are designed for easy integration of Modbus TCP and RTU/ASCII networks. With these models, Modbus serial slave devices can be seamlessly incorporated into an existing Modbus TCP network, and

Modbus TCP slaves can be made accessible to serial masters. The MB3180, MB3280, and MB3480 offer features that make network integration easy, customizable, and compatible with almost any Modbus network.

High density, cost-effective gateway

The MGate™ MB3000 gateways can effectively connect a high density of Modbus nodes to the same network. The MB3280 can manage up to 62 serial slave nodes, and the MB3480 can manage up to 124 serial slave nodes. Each RS-232/422/485 serial port can be configured

individually for Modbus RTU or Modbus ASCII operation and for different baudrates, allowing both types of networks to be integrated with Modbus TCP through one Modbus gateway.

Specifications

Ethernet Interface

- Number of Ports:** 1
- Speed:** 10/100 Mbps, Auto MDI/MDIX
- Connector:** 8-pin RJ45
- Magnetic Isolation Protection:** 1.5 KV built-in

Serial Interface

- Number of Ports:**
 - MB3180: 1
 - MB3280: 2
 - MB3480: 4
- Serial Standards:** RS-232/422/485, software selectable
- Connectors:** DB9 male
- ESD Protection:** 15 KV for all signals
- RS-485 Data Direction Control:** ADDC® (automatic data direction control)

Serial Communication Parameters

- Data Bits:** 7, 8
- Stop Bits:** 1, 2
- Parity:** None, Even, Odd, Space, Mark
- Flow Control:** RTS/CTS, XON/XOFF

Baudrate: 50 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

Software

- Operation Modes:** RTU Slave, RTU Master, ASCII Slave, ASCII Master
- Utilities:** MGate™ Manager Suite for Windows 98, ME, NT, 2000, XP, 2003, Vista
- Multi-master and Multi-drop:**
 - Master mode: 32 TCP slaves
 - Slave mode: 16 TCP masters (request queue 32-deep for each master)
- Bonus Feature:** Smart Routing

Physical Characteristics

Housing:

MB3180/3280: Aluminum (1 mm)
 MB3480: SECC sheet metal (0.8 mm), IP30 protection

Dimensions:

Without ears
 MB3180: 22 x 52 x 80 mm (0.87 x 2.05 x 3.15 in)
 MB3280: 22 x 77 x 111 mm (0.87 x 3.03 x 4.37 in)
 MB3480: 35.5 x 103 x 158 mm (1.40 x 4.06 x 6.22 in)
 With ears
 MB3180: 22 x 75.2 x 80 mm (0.87 x 2.96 x 3.15 in)
 MB3280: 22 x 100 x 111 mm (0.87 x 3.94 x 4.37 in)
 MB3480: 35.5 x 103 x 181 mm (1.40 x 4.06 x 7.14 in)

Environmental Limits

Operating Temperature: 0 to 55°C (32 to 131°F)
Operating Humidity: 5 to 95% RH
Storage Temperature: -20 to 85°C (-4 to 185°F)

Power Requirements

Input Voltage: 12 to 48 VDC
Power Connector:
 MGate™ MB3180: Power jack
 MGate™ MB3280/3480: Power jack and terminal block

Power Line Protection: 1 KV burst (EN61000-4-4: EFT/B), 0.5 KV surge (EN61000-4-5)

Regulatory Approvals

EMC: CE (EN55022 Class A and EN55024), FCC Part 15 Subpart B Class A

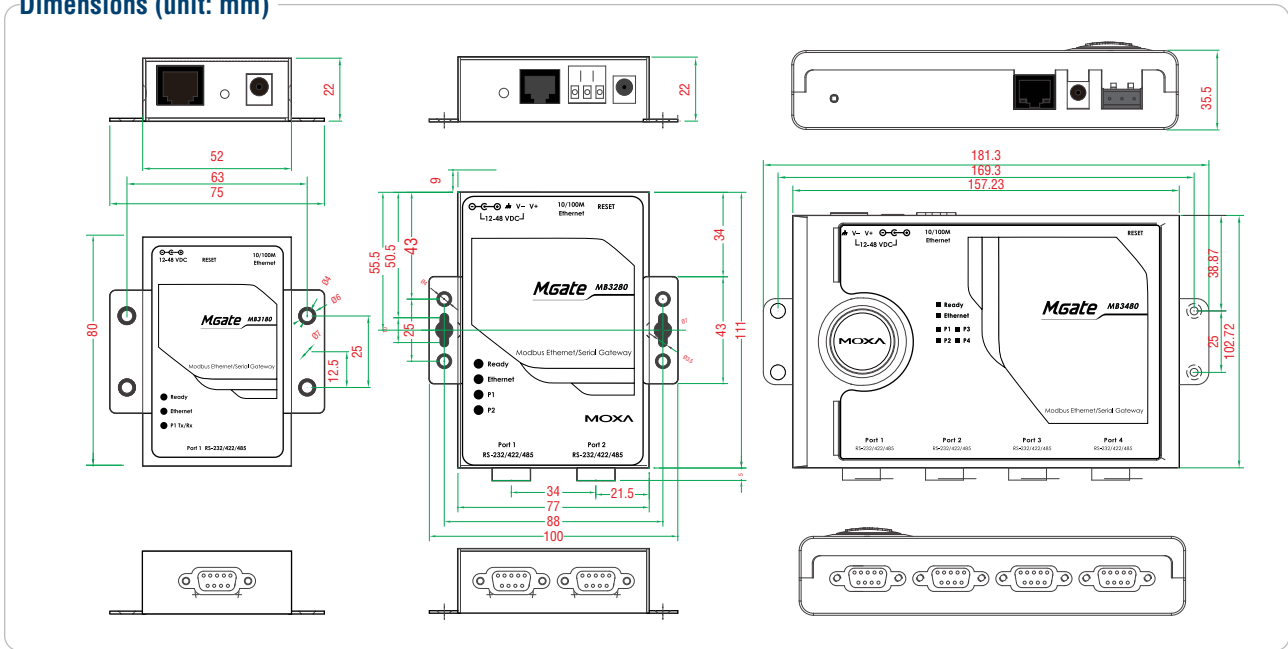
Safety: UL (UL60950-1), TÜV (EN60950-1)

- EN61000-4-2 (ESD):** Level 2
- EN61000-4-3 (RS):** Level 2
- EN61000-4-4 (EFT):** Level 2
- EN61000-4-5 (Surge):** Level 2
- EN61000-4-6 (CS):** Level 2
- EN61000-4-8:** Passed
- EN61000-4-11:** Passed
- EN61000-4-12:** Passed

Warranty

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

Dimensions (unit: mm)



Ordering Information

Available Models

- MGate™ MB3180:** 1-port standard Modbus gateway
- MGate™ MB3280:** 2-port standard Modbus gateway
- MGate™ MB3480:** 4-port standard Modbus gateway

Optional Accessories (can be purchased separately)

DK-35A: Mounting kit for 35-mm DIN-rail



Package Checklist

- MGate™ MB3180 or MB3280 or MB3480 Modbus Gateway
- Power Adaptor
- Document and Software CD
- Quick Installation Guide (printed)
- Warranty Card

MGate™ MB3170/3270

1 and 2-port advanced serial-to-Ethernet Modbus gateways



- > Configuration is exceptionally easy
- > Slave mode supports 16 TCP masters and up to 62 serial slaves at the same time
- > Master mode supports 32 TCP slaves at the same time
- > Emergency request tunnels ensure QoS control
- > Serial redirector function provided
- > Embedded Modbus protocol analyzer
- > Redundant dual DC power inputs
- > Built-in Ethernet cascading for easy wiring

The certification logos shown here apply to some or all of the products in this section. Please see the **Specifications** section or Moxa's website for details.



Overview

The MB3170 and MB3270 are advanced Modbus gateways that provide maximum flexibility for integrating industrial Modbus networks of all types and sizes. They are designed to integrate Modbus TCP, ASCII, and RTU devices in almost any master and slave combination, including serial master to serial slave, or simultaneous serial and

Ethernet masters. A special priority control feature allows urgent commands to obtain immediate response. All models are ruggedly constructed, are DIN-rail mountable, and offer built-in optical isolation for serial signals as an option.

Integration of TCP masters without alteration to Modbus RTU/ASCII network or software

The MB3270 can integrate Modbus TCP with Modbus RTU/ASCII, without modifying the existing Modbus RTU/ASCII architecture or software. With the serial redirector function, a serial master can

maintain direct access to serial slave devices through a specially mapped serial port. This allows the serial and TCP masters to access serial slaves simultaneously.

Cascading Ethernet ports for easy wiring

Advanced models of the MGate™ MB3000 series have two Ethernet ports to make network wiring easier. Dual Ethernet ports allow users to string multiple Modbus gateways together using standard RJ45 Ethernet cables, eliminating the need for a separate Ethernet switch.



Redundant power inputs

Advanced models of the MB3000 series have dual power inputs for greater reliability. The power inputs allow simultaneous connections to two live DC power sources, so that continuous operation is provided

even if one power source fails. The higher level of reliability makes these advanced Modbus gateways ideal for demanding industrial applications.

Warning by relay output

A relay output is provided for the Ethernet link and power input status. The relay output gives maintenance engineers an additional tool for

troubleshooting and maintenance.

Priority control for urgent commands (patent pending)

As Modbus networks increase in size and complexity, the lag time between commands and responses becomes a major concern. Advanced models of the MB3000 series provide a priority control function for urgent commands, allowing users to force certain

commands to get an immediate response. Depending on your system's requirements, different methods are available to define which commands receive priority.

Specifications

Ethernet Interface

Number of Ports: 2 (1 IP)

Speed: 10/100 Mbps, Auto MDI/MDIX

Connector: 8-pin RJ45

Magnetic Isolation Protection: 1.5 KV built-in

Serial Interface

Number of Ports:

MB3170/3170I: 1

MB3270/3270I: 2

Serial Standards: RS-232/422/485, software selectable

Connectors:

MB3170/3170I: DB9 male for RS-232, Terminal block for RS-422/485

MB3270/3270I: DB9 male x 2

ESD Protection: 15 KV for all signals

RS-485 Data Direction Control: ADDC® (automatic data direction control)

Serial Communication Parameters

Data Bits: 7, 8

Stop Bits: 1, 2

Parity: None, Even, Odd, Space, Mark

Flow Control: RTS/CTS, XON/XOFF

Baudrate: 50 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

Software

Operation Modes: RTU Slave, RTU Master, ASCII Slave, ASCII Master

Utilities: MGate™ Manager Suite for Windows 98, ME, NT, 2000, XP, 2003, Vista

Multi-master and Multi-drop:

Master mode: 32 TCP slaves

Slave mode: 16 TCP masters (request queue 32-deep for each master)

Bonus Features: Smart Routing, Serial Redirectory, Priority Control

Physical Characteristics

Housing: Polycarbonate (2 mm)

Dimensions:

Without ears

29 x 89.2 x 118.5 mm (1.14 x 3.51 x 4.67 in)

With ears extended

29 x 89.2 x 124.5 mm (1.14 x 3.51 x 4.90 in)

Environmental Limits

Operating Temperature:

Standard Models: 0 to 55°C (32 to 131°F)

Wide Temp. Models: -40 to 75°C (-40 to 167°F)

Operating Humidity: 5 to 95% RH

Storage Temperature: -20 to 85°C (-4 to 185°F)

Power Requirements

Input Voltage: 12 to 48 VDC

Power Connector: Terminal block

Power Line Protection: 1 KV burst (EN61000-4-4: EFT/B), 0.5 KV surge (EN61000-4-5)

Regulatory Approvals

EMC: CE (EN55022 Class A and EN55024), FCC Part 15 Subpart B Class A

Safety: UL (UL60950-1), TÜV (EN60950-1)

Hazardous Location: UL/cUL Class 1 Division 2 Groups A, B, C, D; ATEX Class 1 Zone 2 (pending)

Shock: IEC60068-2-27

Freefall: IEC60068-2-23

Vibration: IEC60068-2-6

EN61000-4-2 (ESD): Level 3

EN61000-4-3 (RS): Level 3

EN61000-4-4 (EFT): Level 4

EN61000-4-5 (Surge): Level 3

EN61000-4-6 (CS): Level 3

EN61000-4-8: Passed

EN61000-4-11: Passed

EN61000-4-12: Passed

Marine: DNV (pending)

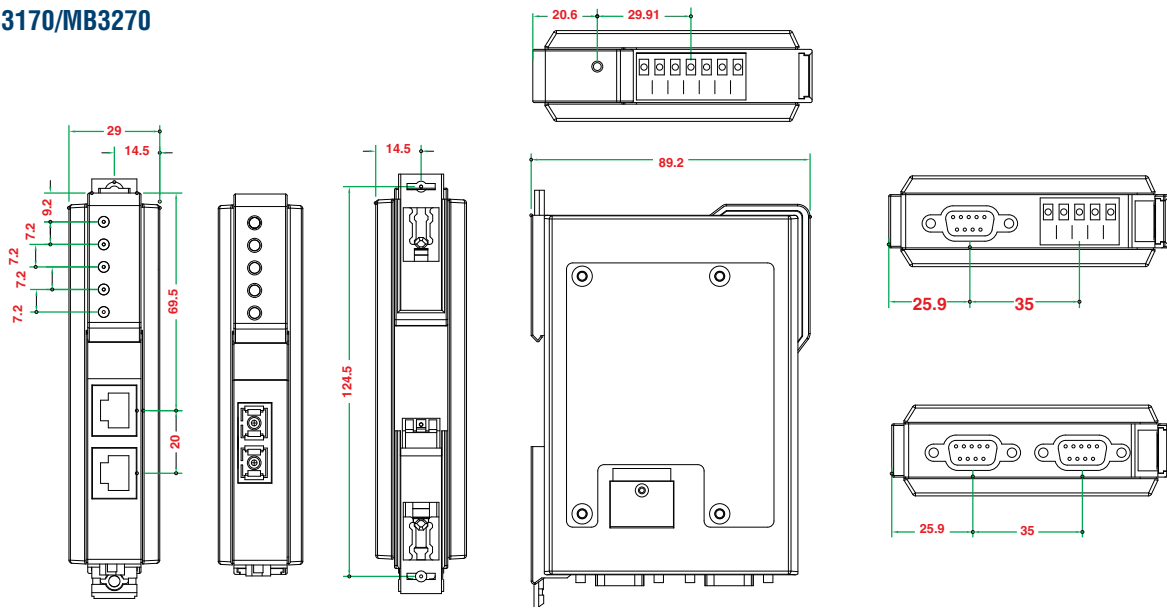
Warranty

Warranty Period: 5 years

Details: See www.moxa.com/warranty

Dimensions (unit: mm)

MB3170/MB3270



Ordering Information

Available Models

- MGate™ MB3170: 1-port advanced Modbus gateway
- MGate™ MB3170I: 1-port advanced Modbus gateway with 2 KV isolation
- MGate™ MB3270: 2-port advanced Modbus gateway
- MGate™ MB3270I: 2-port advanced Modbus gateway with 2 KV isolation
- MGate™ MB3170-T: 1-port advanced Modbus gateway with wide temperature support
- MGate™ MB3170I-T: 1-port advanced Modbus gateway with 2 KV isolation with wide temperature support
- MGate™ MB3270-T: 2-port advanced Modbus gateway with wide temperature support
- MGate™ MB3270I-T: 2-port advanced Modbus gateway with 2 KV isolation with wide temperature support

Package Checklist

- MGate™ MB3170 or MB3170I or MB3270 or MB3270I Modbus Gateway
- Document and Software CD
- Quick Installation Guide (printed)
- Warranty Card

Optional Accessories (can be purchased separately)

- DR-45-24: 24 VDC DIN-rail power supply (2A@45W) with universal 85 to 264 VAC input
- DR-75-24: 24 VDC DIN-rail power supply (32A@75W) with universal 85 to 264 VAC input
- DR-120-24: 24 VDC DIN-rail power supply (5A@120W) with switch for choosing 88 to 132 VAC, or 176 to 264 VAC input

