

# TN-5916 Series Quick Installation Guide

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**Moxa ToughNet NAT Router**

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## **Technical Support Contact Information** **[www.moxa.com/support](http://www.moxa.com/support)**

### Moxa Americas:

Toll-free: 1-888-669-2872

Tel: 1-714-528-6777

Fax: 1-714-528-6778

### Moxa China (Shanghai office):

Toll-free: 800-820-5036

Tel: +86-21-5258-9955

Fax: +86-21-5258-5505

### Moxa Europe:

Tel: +49-89-3 70 03 99-0

Fax: +49-89-3 70 03 99-99

### Moxa Asia-Pacific:

Tel: +886-2-8919-1230

Fax: +886-2-8919-1231

### Moxa India:

Tel: +91-80-4172-9088

Fax: +91-80-4132-1045

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**P/N: 1802059160010**



## Overview

The ToughNet TN-5916 is a high performance M12 Layer 3 NAT Router that supports Layer 3 routing functionality to facilitate the deployment of applications across networks. The TN-5916 NAT router uses M12 and other circular connectors to ensure tight, robust connections and guarantee reliable operation against environmental disturbances, such as vibration and shock. The TN-5916 NAT router supports isolated power in the 24 to 110 VDC power input range, allowing the same model to be used at different sites around the globe, and provides up to 16 Fast Ethernet M12 ports with 4 bypass relay ports. Furthermore, with a -40 to 75°C operating temperature and IP54-rated waterproof enclosure, the router can be deployed in harsh environments. The TN-5916 series Ethernet routers are compliant with essential sections of EN 50155, covering operating temperature, power input voltage, surge, ESD, and vibration, as well as conformal coating and power insulation, making the routers suitable for a variety of industrial applications.

## Package Checklist

Your ToughNet TN-5916 NAT router is shipped with the following items. If any of these items is missing or damaged, please contact your customer service representative for assistance.

- 1 Moxa ToughNet NAT router
- M12 to DB9 console port cable
- 2 protective caps for console and relay output ports
- Panel mounting kit
- CD-ROM with user's manual, Windows utility, and SNMP MIB file
- Hardware installation guide
- Warranty card

## Features

### ***Anti-Vibration Circular Connectors for Robust Links***

- M12 D-coding 4-pin female connectors for Fast Ethernet 10/100BaseT(X) ports.
- M12 A-coding 5-pin male connectors for console and relay output.
- M23 6-pin male connector for power input.

### ***Dual Isolated Power Inputs***

- 24 to 110 VDC (16.8 to 137.5 VDC), isolated.

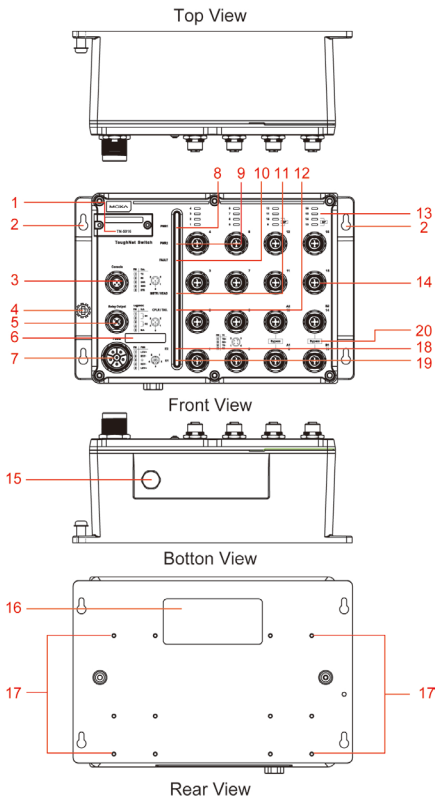
### ***Designed for Industry-specific Applications***

- Bypass relay ensures non-stop data communication in the event the router stops working due to a power failure.
- EN 50155/50121-3-2 compliant. See specs for details about compliance with specific parts of the EN 50155 specifications.
- -40 to 75°C operating temperature range.
- IP54, rugged high-strength case.
- Panel mounting or DIN-rail mounting installation capability.

## **Recommended Optional Accessories**

- CBL-M23(FF6P)Open-BK-100-IP67: 1-meter M23 to 6-pin power cable with IP67-rated female 6-pin M23 connector
- CBL-M12D(MM4P)/RJ45-100 IP67: 1-meter M12-to-RJ45 Cat-5E UTP Ethernet cable with IP67-rated male 4-pin M12 D-coded connector
- CBL-M12(FF5P)/OPEN-100 IP67: 1-meter M12-to-5-pin power cable with IP67-rated female 5-pin M12 A-coded connector
- M12D-4P-IP68: Field-installable M12 D-coded screw-in connector, male 4-pin, IP68-rated
- M12A-5P-IP68: Field-installable M12 A-coded screw-in connector, female 5-pin, IP68-rated
- CAP-M12F-M: Metal cap for M12 female connector
- DK-DC50131: DIN-rail mounting kit, 50 x 131 mm

# TN-5916 Panel Layouts



1. Model name
2. Screw holes for panel mounting kit
3. Console port
4. Grounding screw
5. Relay output port
6. Power input voltage range indicator
7. Power input port (male 6-pin shielded M23 connector)
8. PWR1 LED: for power input 1
9. PWR2 LED: for power input 2
10. FAULT LED
11. MSTR/HEAD LED: for ring master or chain head
12. CPLR/TAIL LED: for ring coupler or chain tail
13. TP port's 10/100 Mbps LED
14. 10/100BaseT(X) port (female 4-pin shielded M12 connector with D coding)
15. Waterproof vent
16. Product label
17. 12 screw holes for DIN-rail mounting kit
18. E2 LED: Not used by the TN-5916 series
19. E1 LED: Not used by the TN-5916 series
20. Ports 9-10, 13-14 with relay bypass function



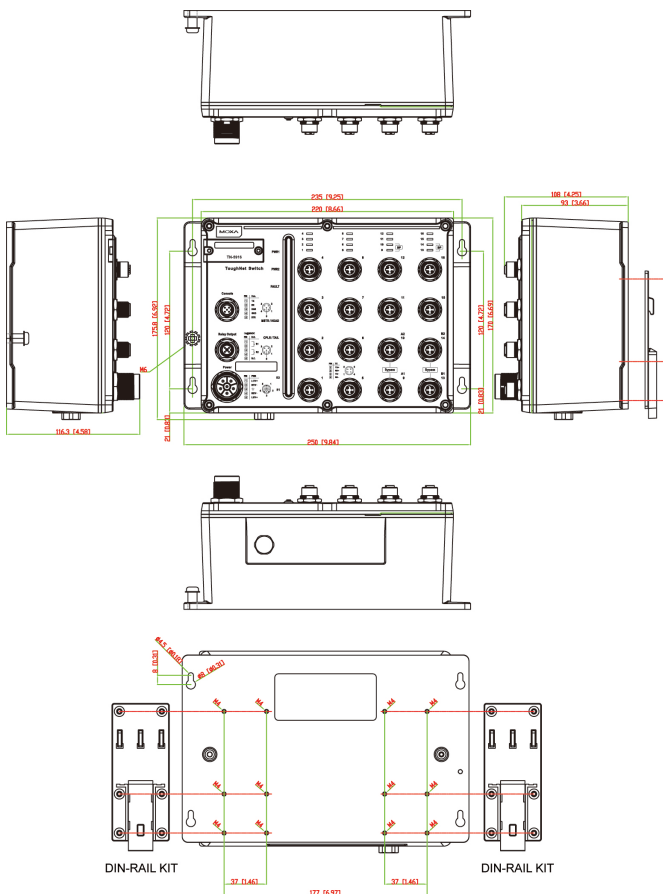
## ATTENTION

DO NOT open or remove the vent (#15). Removing the seal will invalidate the warranty.

Ports (including 3, 5, and 14) that are not in use must be tightly covered with protective caps (an optional accessory) to ensure IP54/IP67-rated protection.

## Mounting Dimensions (unit = mm)

### TN-5916 Series



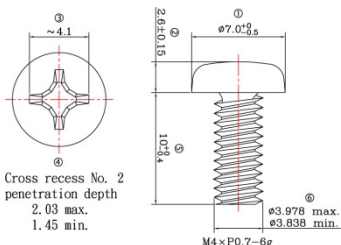
## Panel/Wall Mounting

### STEP 1:

Mounting the TN-5916 to a wall requires 4 screws. Use the ToughNet router as a guide to mark the correct positions of the 4 screws.

### STEP 2:

Use the 4 screws in the panel mounting kit. If you would like to use your own screws, make sure the screw head is **between 6.0 mm and 7.0 mm** in diameter and the shaft is less than **4.0 mm** in diameter, as shown at the right.

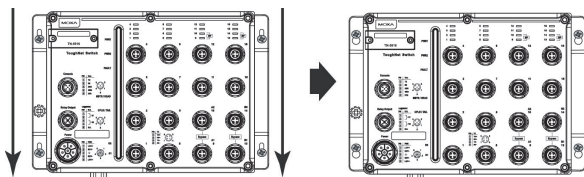


Do not screw the screws in all the way—leave a space of about 2 mm to allow room for sliding the ToughNet router between the wall and the screws.

**NOTE** Before tightening the screws into the wall, make sure the screw head and shaft size are suitable by inserting the screw through one of the keyhole-shaped apertures of the ToughNet router.

### STEP 3:

Once the screws are fixed in the wall, hang the ToughNet router on the 4 screws through the large opening of the keyhole-shaped apertures, and then slide the router downwards. Tighten the four screws for added stability.



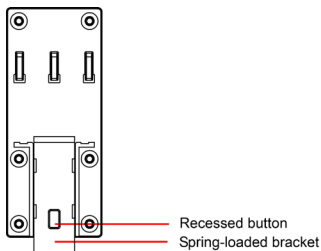
**NOTE** To provide greater protection from vibration and shock, use screws with shaft diameter between 6.0 mm and 7.0 mm, and fix the ToughNet router onto the wall directly through the large opening of the keyhole-shaped apertures.

## DIN-Rail Mounting (optional)

Use the optional DIN-rail mounting kit (DK-DC50131, must be purchased separately) to mount the TN-5916 on a 35 mm DIN-rail.

### STEP 1:

Use 12 screws (6 screws per plate) to attach the two DIN-rail attachment plates to the rear panel of the router.

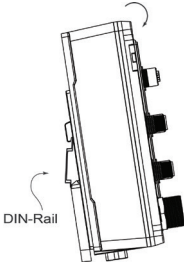


**STEP 2:**

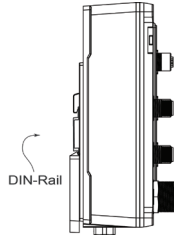
If the spring-loaded bracket is locked in place, push the recessed button to release it. Once released, you should feel some resistance from the spring as you slide the bracket up and down a few millimeters in each direction.

**STEP 3:**

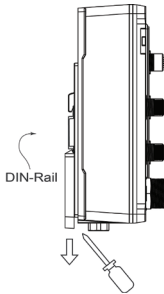
Position the ToughNet router on the DIN-rail, tilted, so the clamps hook over the top edge of the rail.

**STEP 4:**

Swing the router down fully onto the DIN-rail, until both clamps completely latch.



To remove the Moxa ToughNet Router from the DIN-rail, use a screwdriver to pull out the two spring-loaded brackets from the bottom until they are fixed in a "locked" position. Then, reverse Steps 3 and 4 above.



## Wiring Requirements



### WARNING

Turn the power off before disconnecting modules or wires. The correct power supply voltage is listed on the product label. Check the voltage of your power source to make sure you are using the correct voltage. Do NOT use a voltage greater than what is specified on the product label.

These devices must be supplied by a SELV source as defined in the Low Voltage Directive 2006/95/EC and 2004/108/EC.



## ATTENTION

### Safety First!

Be sure to disconnect the power cord before installing and/or wiring your Moxa router.

This device has UL 508 approval. Use copper conductors only, 60 to 75°C, and tighten to 4.5 inch-pounds. For use in pollution degree 2 environments.



## ATTENTION

### Safety First!

Observe all electrical codes dictating the maximum current allowable for each wire size. If the current goes above the maximum ratings, the wiring could overheat, causing serious damage to your equipment.

## Please Read and Follow These Guidelines:

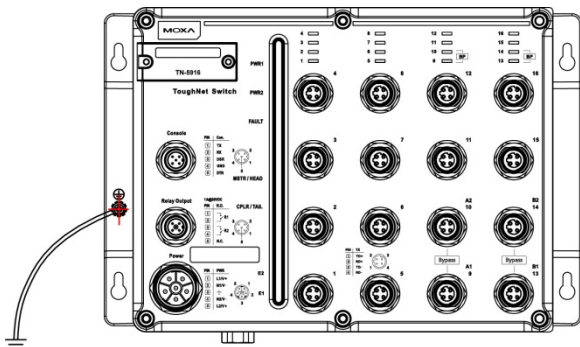
- Use separate paths to route wiring for power and devices. If power wiring and device wiring paths must cross, make sure the wires are perpendicular at the intersection point.

**NOTE:** Do not run signal or communications wiring and power wiring through the same wire conduit. To avoid interference, wires with different signal characteristics should be routed separately.

- You can use the type of signal transmitted through a wire to determine which wires should be kept separate. The rule of thumb is that wiring that shares similar electrical characteristics can be bundled together.
- Keep input wiring and output wiring separated.
- It is strongly advised that you label wiring for all devices in the system when necessary.

## Grounding the ToughNet NAT Router

Grounding and wire routing help limit the effects of noise due to electromagnetic interference (EMI). Run the ground connection from the grounding screw to the grounding surface prior to connecting devices.







## ATTENTION


This product is intended to be mounted to a well-grounded mounting surface such as a metal panel.

## Connecting the Power Supplies

The ToughNet TN-5916 series routers support two sets of power supplies—power input 1 and power input 2. The M23 6-pin male connector on the TN-5916's front panel is used for the dual power inputs.

### Pinouts for the Power Input Port on the TN-5916

PIN	PWR
1	L1/V+
2	N1/V-
3	⏏
4	N2/V-
5	L2/V+



Pin	Description	Usage
1	PWR1 Live / DC +	Connect "PWR1 Live / DC +" to the positive (+) terminal when using a DC power source.
2	PWR1 Neutral / DC -	Connect "PWR1 Neutral / DC -" to the negative (-) terminal when using a DC power source.
3	Chassis Ground	Connect the "Chassis Ground" to the safety ground terminal for DC inputs.
4	PWR2 Neutral / DC -	Connect "PWR2 Neutral / DC -" to the negative (-) terminal when using a DC power source.
5	PWR2 Live / DC +	Connect "PWR2 Live / DC +" to the positive (+) terminal when using a DC power source.

#### STEP 1:

Plug the power cord connector into the TN-5916's power input port.

#### STEP 2:

Screw in the nut on the power cord connector to the power input connector (on the router) to ensure a tight connection.



## ATTENTION

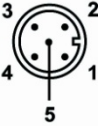
Before connecting the TN-5916 to the power input, make sure the power source voltage is stable.

## Connecting the Relay Outputs

Each TN-5916 router has two sets of relay outputs—relay output 1 and relay output 2. The M12 A-coded 5-pin male connector on the TN-5916 front panel is used for the two relay outputs. Use a power cord with an M12 A-coded 5-pin female connector to connect the relay contacts. You can purchase an M12 power cable from Moxa; the model number is CBL-M12 (FF5P)/OPEN-100 IP67.

### Pinouts for the TN-5916's Relay Output Port

PIN	R.O.
1	R1
2	
3	R2
4	
5	N.C.



The diagram shows a circular M12 A-coded 5-pin male connector with pins numbered 1 through 5. Pin 1 is at the bottom, pin 2 is at the top right, pin 3 is at the top left, pin 4 is at the bottom left, and pin 5 is at the center. The wiring diagram shows that pins 1 and 2 are connected to relay R1, pins 3 and 4 are connected to relay R2, and pin 5 is not connected (N.C.).

**N.C.:** Not connected

#### **FAULT:**

The two sets of relay contacts of the M12 A-coded 5-pin male connector are used to detect user-configured events. The two wires attached to the fault contacts form an open circuit when a user-configured event is triggered. If a user-configured event does not occur, the fault circuit remains closed.

## Connecting the Data Lines


### 10/100BaseT(X) Ethernet Port Connection

All TN-5916 models have 16 10/100BaseT(X) Ethernet ports (4-pin shielded M12 connector with D coding). The 10/100TX ports located on the TN-5916 front panel are used to connect to Ethernet-enabled devices. Most users configure these ports for Auto MDI/MDI-X mode, in which case the port's pinouts are adjusted automatically depending on the type of Ethernet cable used (straight-through or cross-over), and the type of device (NIC-type or HUB/Switch/Router-type) connected to the port.

In what follows, we give pinouts for both MDI (NIC-type) ports and MDI-X (HUB/Switch/Router-type) ports. We also give cable wiring diagrams for straight-through and cross-over Ethernet cables.

### 10/100BaseT(X) Port Pinouts

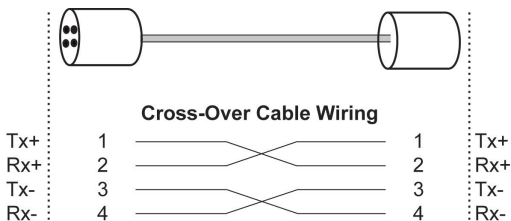
PIN	TX
1	TD+
2	RD+
3	TD-
4	RD-



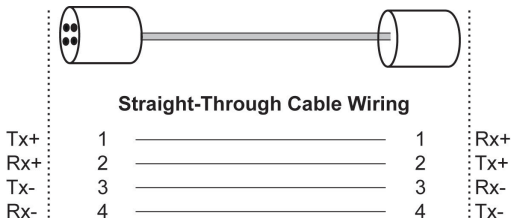
The diagram shows a circular 4-pin shielded M12 connector with pins numbered 1 through 4. Pin 1 is at the bottom left, pin 2 is at the top left, pin 3 is at the top right, and pin 4 is at the bottom right. The wiring diagram shows that pin 1 is connected to TD+, pin 2 to RD+, pin 3 to TD-, and pin 4 to RD-.

**Housing:** shield

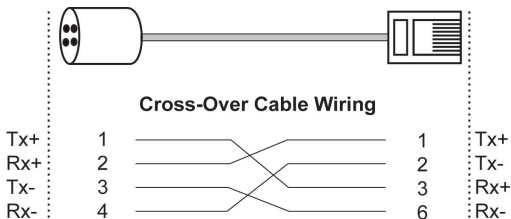
**M12 (4-pin, M) to M12 (4-pin, M) Cross-Over Cable Wiring**



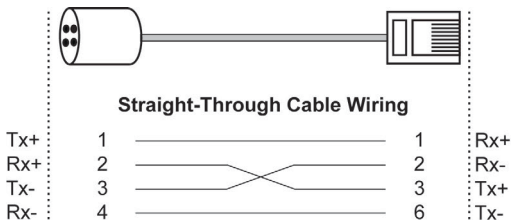
**M12 (4-pin, M) to M12 (4-pin, M) Straight-Through Cable Wiring**



**M12 (4-pin, M) to RJ45 (8-pin) Cross-Over Cable Wiring**



**M12 (4-pin, M) to RJ45 (8-pin) Straight-Through Cable Wiring**

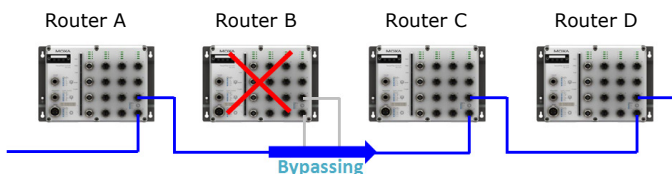


## Bypass Relay Function

The TN-5916 is equipped with a bypass relay function. When the router is operating normally, these bypass ports work in the same way as the other ports. That is, frame ingressions are processed and then forwarded. If the router stops working due to a power failure, the bypass relay function will be triggered to ensure non-stop data communication.

The figure below illustrates the bypass relay function. For example, if Router B loses power, then the two bypass functional ports will be bypassed through the relay circuit and the transmission line from Router A to B and the transmission line from Router B to C will interconnect automatically, ensuring that power continues to be supplied.

The bypass relay function helps the network recover from single-node failures in a linear topology.



Since the maximum segment length of category 5 twisted-pair cable is 100 meters, cable length must be considered when designing a network that utilizes this function. For example, the total length of the cables from Router A to B and from B to C must be no more than 100 meters. This way, if the two adjacent nodes (router B and C for example) encounter a power failure, there will be no stoppage, provided that the total length of the cables A-to-B, B-to-C, and C-to-D are no more than 100 meters.

The bypass relay function works best for networks with linear topologies. ToughNet™ routers with bypass relay function are not recommended to be used in networks that employ ring topologies because network loops may occur when redundancy protocols such as RSTP or TurboRing™ are applied.

## LED Indicators

Several LED indicators are located on the ToughNet router's front panel. The function of each LED is described in the table below.

LED	Color	State	Description
<b>System LEDs</b>			
PWR1	AMBER	ON	Power is being supplied to power input PWR1.
		OFF	Power is not being supplied to power input PWR1
PWR2	AMBER	ON	Power is being supplied to power input PWR2.
		OFF	Power is not being supplied to power input PWR2.
FAULT	RED	ON	When the corresponding PORT alarm is enabled, and a user-configured event is triggered.
		OFF	When the corresponding PORT alarm is enabled and a user-configured event is not triggered, or when the corresponding PORT alarm is disabled.
MSTR/ HEAD	GREEN	ON	When the TN router is either the Master of this Turbo Ring, or the Head of this Turbo Chain.
		Blinking	When the TN router is Ring Master of this Turbo Ring and the Turbo Ring is broken, or it is Chain Head of this Turbo Chain and the Turbo Chain is broken.
		OFF	When the TN router is neither the Master of this Turbo Ring, nor the Head of this Turbo Chain.
CPLR/ TAIL	GREEN	ON	When the TN router enables the coupling function to form a back-up path in this Turbo Ring, or it is the Tail of this Turbo Chain.
		Blinking	When Turbo Chain is down.
		OFF	When the TN router disables the coupling function of the Turbo Ring, or it is not the Tail of the Turbo Chain.
<b>Port LEDs</b>			
TP (10/100M)	AMBER	ON	TP port's 10 Mbps link is active.
		Blinking	Data is being transmitted at 10 Mbps.
		Off	TP port's 10 Mbps link is inactive.
	GREEN	On	TP port's 100 Mbps link is active.
		Blinking	Data is being transmitted at 100 Mbps.
		off	TP port's 100 Mbps link is inactive.

## Specifications

<b>Technology</b>	
Standards	IEEE 802.3 for 10BaseT IEEE 802.3u for 100BaseT(X) IEEE 802.3x for Flow Control IEEE 802.1D for Spanning Tree Protocol IEEE 802.1w for Rapid STP IEEE 802.1Q for VLAN Tagging IEEE 802.1p for Class of Service IEEE 802.3ad for static Port Trunk
Protocols	IGMPv1/v2, SNMPv1/v2c/v3, DHCP Server, TFTP, SNTP, SMTP, RMON, HTTP, HTTPS, Telnet, Syslog, SSH, SNMP Inform, LLDP, RIP V1/V2, VRRP
MIB	MIB-II, Ethernet-like MIB, P-BRIDGE MIB, Q-BRIDGE MIB, Bridge MIB, RSTP MIB, RMON MIB Group 1, 2, 3, 9
Flow Control	IEEE802.3x flow control, back pressure flow control
<b>Router Properties</b>	
Priority Queues	4
Max. Number of Available VLANs	16
VLAN ID Range	VID 1 to 4094
IGMP Groups	256
<b>Interface</b>	
Fast Ethernet	Front cabling, M12 connector, 10/100BaseT(X) auto negotiation speed, F/H duplex mode, and auto MDI/MDI-X connection
Console Port	M12 A-coding 5-pin male connector
System LED Indicators	PWR1, PWR2, FAULT, MSTR/HEAD, CPLR/TAIL
Port LED Indicators	10/100M (fast Ethernet port)
Alarm Contact	Two relay outputs in one M12 A-coding 5-pin male connector with current carrying capacity of 1 A @ 30 VDC
<b>Power Requirements</b>	
Input Voltage	WV: 24 to 110 VDC (16.8 to 137.5 VDC)
Input Current	0.85 A @ 24 VDC, 0.17 A @ 110 VDC
Connection	M23 6-pin male connector
Overload Current Protection	Present
Reverse Polarity Protection	Present
<b>Physical Characteristics</b>	
Housing	Metal, IP54 protection (with protective caps on unused ports)
Dimensions (W × H × D)	250 × 175.8 × 116.3 mm (9.84 × 6.92 × 4.58 in)
Weight	4030 g
Installation	Panel mounting, DIN-Rail mounting (with optional kit)

<b>Environmental Limits</b>	
Operating Temperature	-40 to 75°C (-40 to 167°F)
Storage Temperature	-40 to 85°C (-40 to 185°F)
Operating Humidity	5 to 95% (non-condensing)
<b>Regulatory Approvals</b>	
Safety	UL/cUL 508, EN 60950-1 (LVD)
Rail Traffic	EN 50155, EN 50121-3-2
EMI	FCC Part 15, CISPR (EN 55022) class A
EMS	EN 61000-4-2 (ESD), level 3 EN 61000-4-3 (RS), level 3 EN 61000-4-4 (EFT), level 3 EN 61000-4-5 (Surge), level 3 EN 61000-4-6 (CS), level 3 EN 61000-4-8
Shock	IEC 61373
Freefall	IEC 60068-2-32
Vibration	IEC 61373
<b>Note: Please check Moxa's website for the most up-to-date certification status.</b>	
<b>Warranty</b>	
Warranty Period	5 years
Details	<a href="http://www.moxa.com/warranty">www.moxa.com/warranty</a>