TN-5308
Hardware Installation Guide

Moxa ToughNet Switch

Fourth Edition, May 2013

MOXA®

Overview

The ToughNet TN-5308 series M12 unmanaged Ethernet switches are designed for industrial applications in harsh environments. The TN series switches use M12 connectors to ensure tight, robust connections, and guarantee reliable operation against environmental disturbances, such as vibration and shock. The TN-5308 series Ethernet switches provide 8 Fast Ethernet M12 ports, support IEEE 802.3/802.3u/802/3x with 10/100M, full/half-duplex, MDI/MDI-X auto-sensing, and provide an economical solution for your industrial Ethernet network. Models with an extended operating temperature range of -40 to 75°C are also available. The TN-5308 series Ethernet switches are compliant with EN50155/50121-3-2/50121-4 standards for railway applications.

Package Checklist

Your TN-5308 is shipped with the following items. If any of these items is missing or damaged, please contact your customer service representative for assistance.

- Moxa ToughNet Switch
- Panel Mounting Kit
- Hardware Installation Guide
- Moxa Product Warranty Statement

Features

High Performance Network Switching Technology

- 8 10/100BaseT(X) ports
- Store and Forward switching process type
- IEEE 802.3/802.3u/802.3x
- 10/100M, Full/Half-Duplex, MDI/MDIX auto-sensing

Industrial-Specific Applications

- Support 12/24/36/48 VDC (7 to 60 VDC) power input for "-LV" models
- Support 72/96/110 VDC (50.4 to 154 VDC) power input for "-MV" models
- Active circuit protection

Rugged Design

- M12 / M23 circular connectors for vibration-resistant robust connections
- Operating temperature range of 0 to 60°C, or extended operating temperature range of -40 to 75°C for "-T" models
- IP40, rugged metal housing
- Panel mounting or DIN-rail mounting installation capability

TN-5308-LV Panel Layouts
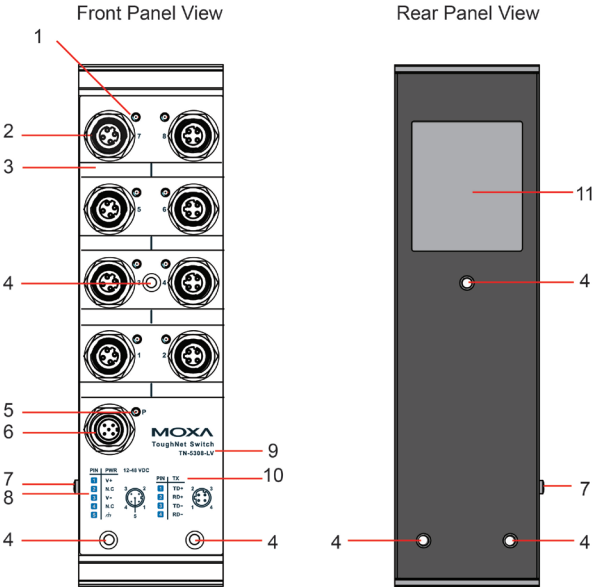
Front Panel View

Rear Panel View

1. TP port's 10/100 Mbps LED
2. 10/100BaseT(X) port
   (female 4-pin shielded M12 connector with D coding)
3. Port label
4. Screw holes for panel mounting kit or DIN rail mounting kit
   (there are 3 holes: top middle, bottom left, and bottom right)
5. Power input LED
6. Power input port
   (male 6-pin shielded M12 connector with A coding)
7. Grounding screw
8. Power input port pin assignment
9. Model name
10. TP port pin assignment
11. Model label

TN-5308-MV Panel Layouts
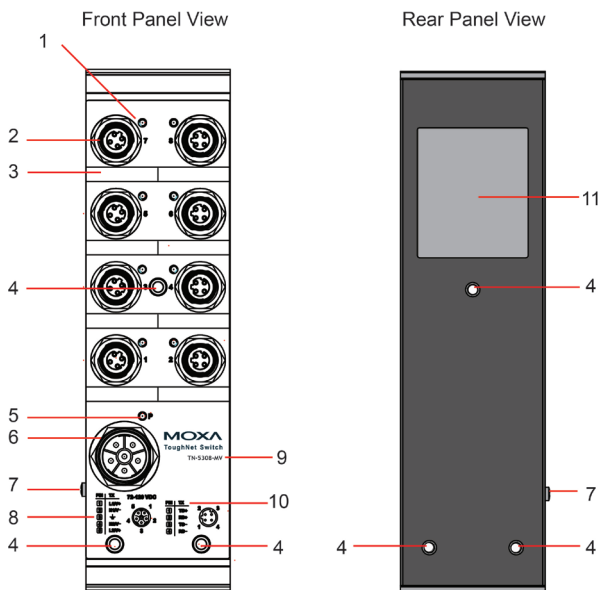
Front Panel View   Rear Panel View

1. TP port's 10/100 Mbps LED
2. 10/100BaseT(X) port
   (female 4-pin shielded M12 connector with D coding)
3. Port label
4. Screw holes for panel mounting kit or DIN rail mounting kit
   (there are 3 holes: top middle, bottom left, and bottom right)
5. Power input LED
6. Power input port
   (male 6-pin shielded M23 connector with A coding)
7. Grounding screw
8. Power input port pin assignment
9. Model name
10. TP port pin assignment
11. Model label

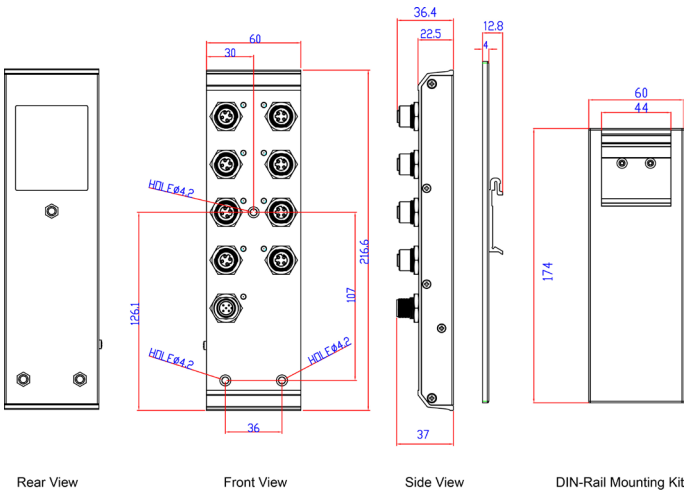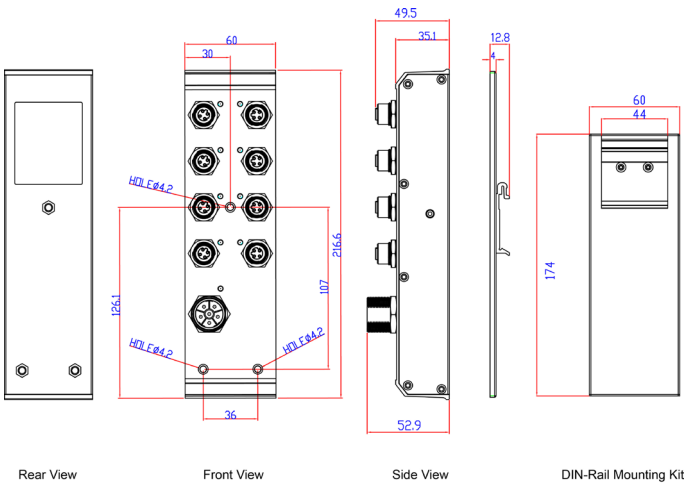## Mounting Dimensions (unit = mm)

TN-5308-LV

Rear View   Front View   Side View   DIN-Rail Mounting Kit

TN-5308-MV

Rear View   Front View   Side View   DIN-Rail Mounting Kit

Panel/Wall Mounting

Mounting the TN-5308-LV/MV on the wall requires 3 screws. Please use the 3 screws packed in the panel mounting kit.

STEP 1: Prepare the 3 screw holes on the wall according to the positions of the 3 screw holes on the switch shown on the mounting dimension diagram.

STEP 2: Use one screw to go through the top-middle screw hole on the switch and screw it into the wall.

STEP 3: Screw in the remaining 2 screws through the bottom-left and bottom-right holes on the switch to the wall.

NOTE The screw lengths of TN-5308-LV and TN-5308-MV are different. TN-5308-LV uses M3 * 30 mm screws. TN-5308-MV uses M3 * 40 mm screws. Please use the screws packed in the panel mounting kit.

DIN-Rail Mounting (optional)

With the optional DIN-Rail mounting kit DK-TN-5308 (must be purchased separately), you can mount the TN-5308-LV/MV on a 35mm DIN-Rail.
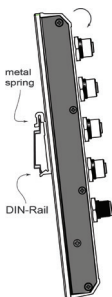
STEP 1:

Fix the DIN-Rail attachment plate onto the rear panel of the switch as shown in the figure at the right.
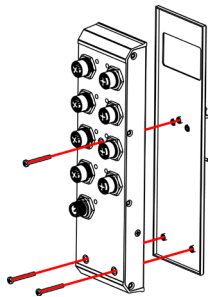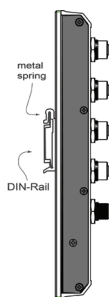

STEP 2:

Position the TN-5308-LV/MV on the DIN-Rail, tilting to hook clamps over the top edge of the rail.

STEP 3:

Swing the switch down fully onto the DIN-Rail until both clamps completely latch.

To remove the Moxa ToughNet Switch from the DIN-Rail, simply reverse Steps 2 and 3 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 switch.
> This device has UL508 approval. Use copper conductors only, 60/75°C, and tighten to 4.5 pound-inches. For use in pollution degree 2 environments.

> ⚠️ **ATTENTION**
>
> **Safety First!**
> Calculate the maximum possible current in each power wire and common wire. 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 TN-5308

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 Supply

The M12 A coded 5 pin and M23 6 pin male connector on the TN-5308-LV/MV front panel is used for the DC power input. You have to prepare a power cord with M12/M23 A-coded 5-pin female connector to connect the switch to the DC power input.

Pinouts for the power input port on the TN-5308-LV

PIN	PWR
1	V+
2	N.C.
3	V−
4	N.C.
5	⏚

N.C. : Not connected

Pinouts for the power input port on the TN-5308-MV

PIN	PWR
1	V+
2	V-
3	⏚
4	N.C.
5	N.C.

STEP 1: Plug your power cord connector to the power input port of the TN-5308 switch.

STEP 2: Screw the nut on your power cord connector to the power input connector on the switch to ensure a tight connection.

> ⚠️ **ATTENTION**
>
> Before connecting the TN-5308 to the DC power input, make sure the DC power source voltage is stable.

Connecting the Data Lines

10/100BaseT(X) Ethernet Port Connection

All TN-5308 models have 8 10/100BaseT(X) Ethernet ports (4-pin shielded M12 connectors with D coding). The 10/100TX ports located on the TN-5308's 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-type) connected to the port.

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

Pinouts for the 10/100BaseT(X) Ports on the TN-5308

PIN	TX
1	TD+
2	RD+
3	TD−
4	RD−

Housing: shield

Pinouts for the RJ45 (8-pin) Port

RJ45 (8-Pin)
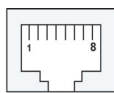
MDI Port Pinouts

Pin	Signal
1	Tx +
2	Tx -
3	Rx +
6	Rx -

MDI-X Port Pinouts

Pin	Signal
1	Rx +
2	Rx -
3	Tx +
6	Tx -

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

Cross-Over Cable Wiring

Tx+	1	1	Tx+
Rx+	2	2	Rx+
Tx-	3	3	Tx-
Rx-	4	4	Rx-
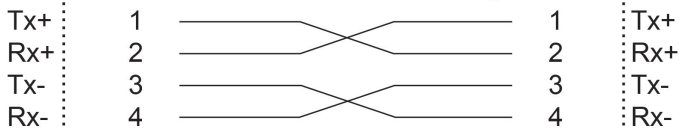
M12 (4-pin, M) to M12 (4-pin, M) Straight-Through Cable Wiring

Straight-through Cable Wiring

Tx+	1	——————————	1	Rx+
Rx+	2	——————————	2	Tx+
Tx-	3	——————————	3	Rx-
Rx-	4	——————————	4	Tx-

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

Cross-Over Cable Wiring

Tx+	1		1	Tx+
Rx+	2		2	Tx-
Tx-	3		3	Rx+
Rx-	4		6	Rx-

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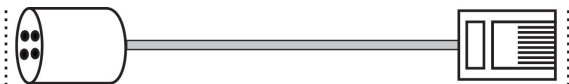
Straight-through Cable Wiring

Tx+	1	——————————	1	Rx+
Rx+	2		2	Rx-
Tx-	3		3	Tx+
Rx-	4	——————————	6	Tx-

Auto MDI/MDI-X Connection

The Auto MDI/MDI-X function allows users to connect TN-5308's 10/100BaseTX ports to any kind of Ethernet device, without needing to pay attention to the type of Ethernet cable being used for the connection. This means that you can use either a straight-through cable or cross-over cable to connect the TN-5308 to Ethernet devices.

Dual Speed Functionality & Switching

The TN-5308's 10/100 Mbps switched M12 ports auto negotiate with the connected device to use the fastest data transmission rate supported by both devices. All of Moxa's ToughNet switches are plug-and-play devices, so that software configuration is not required. The half/full duplex mode for the switched M12 ports is user dependent and changes (by auto-negotiation) to full or half duplex, depending on which transmission speed is supported by the attached device.

Switching and Address Learning

The TN-5308 has a MAC address table that can hold up to 1000 node addresses, which makes it suitable for use with large networks. The address tables are self-learning, so that as nodes are added or removed, or moved from one segment to another, the TN-5308 automatically keeps up with new node locations. An address-aging algorithm causes the least-used addresses to be deleted in favor of newer, more frequently used addresses. To reset the address buffer, power down the unit and then power it back up.

Switching, Filtering, and Forwarding

Each time a packet arrives at one of the switched ports, a decision is made to filter or forward the packet. Packets with source and destination addresses belonging to the same port segment will be filtered, constraining those packets to one port, and relieving the rest of the network from the need to process them.

A packet with destination address on another port segment will be forwarded to the appropriate port, and will not be sent to the other ports where it is not needed. Packets that are used in maintaining the operation of the network (such as the occasional multi-cast packet) are forwarded to all ports.

The TN-5308 operates in the store-and-forward switching mode, which eliminates bad packets and enables peak performance to be achieved when there is heavy traffic on the network.

LED Indicators

Several LED indicators are located on the TN-5308's front panel. The function of each LED is described in the table below.

LED	Color	State	Description
PWR	AMBER	On	Power is being supplied to the power input.
		Off	Power is not being supplied to the power input.
TP (10M)	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.
TP (100M)	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.

Auto-Negotiation and Speed Sensing

All of the TN-5308's Ethernet ports independently support auto-negotiation for speeds in the 10BaseT and 100BaseTX modes, with operation according to the IEEE 802.3u standard. This means that some nodes could be operating at 10 Mbps, while at the same time, other nodes are operating at 100 Mbps.

Auto-negotiation takes place when an M12 cable connection is made, and then each time a LINK is enabled. The TN-5308 advertises its capability for using either 10 Mbps or 100 Mbps transmission speeds, with the device at the other end of the cable expected to advertise in the same way. Depending on what type of device is connected, this will result in agreement to operate at a speed of either 10 Mbps or 100 Mbps.

If a TN-5308's Ethernet port is connected to a non-negotiating device, it will default to 10 Mbps speed and half-duplex mode, as required by the IEEE 802.3u standard.

Specifications

Technology	
Standards	IEEE 802.3 for 10BaseT
	IEEE 802.3u for 100BaseT(X)
	IEEE 802.3x for Flow Control
Processing Type	Store and Forward
Flow Control	IEEE802.3x flow control, back pressure flow control
Interface	
M12 Ports	10/100BaseT(X) auto negotiation speed, F/H duplex mode and auto MDI/MDI-X connection
LED Indicators	PWR, 10/100M
Power Requirements	
Input Voltage	TN-5308-LV: 12/24/36/48 VDC (7 to 60 VDC)
	TN-5308-MV: 72/96/110 VDC (50.4 to 154 VDC)
Input Current	TN-5308-LV: 0.19A @ 12 VDC, 0.10A @ 24 VDC, 0.054A @ 48 VDC
	TN-5308-MV: 0.033A @ 72 VDC, 0.024A @ 96 VDC, 0.021A @ 110 VDC
Connection	TN-5308-LV: M12 A-coding, 5-pin male connector
	TN-5308-MV: M23 A-coding, 5-pin male connector
Overload Current Protection	Present
Reverse Polarity Protection	Present
Physical Characteristics	
Housing	Metal, IP40 protection
Dimensions (W × H × D)	TN-5308-LV: 60 x 216.6 x 36.1 mm (2.36 x 8.53 x 1.42 in)
	TN-5308-MV: 60 x 216.6 x 53.7 mm (2.36 x 8.53 x 2.11 in)
Weight	TN-5308-LV: 485 g
	TN-5308-MV: 685 g
Installation	Panel mounting, DIN-Rail mounting (with

optional kit)

Environmental Limits

Operating Temperature	Standard Models: 0 to 60°C (32 to 140°F)
	Wide Temp. Models: -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)

Regulatory Approvals

Safety	UL508 (Pending)
Rail Traffic	EN50155 (Environmental, Pending),
	EN50121-3-2 (Pending), EN50121-4 (Pending)
Traffic Control	NEMA TS2 (Pending), e-Mark (Pending)
EMI	FCC Part 15, CISPR (EN55022) class A
EMS	EN61000-4-2 (ESD), level 3
	EN61000-4-3 (RS), level 4
	EN61000-4-4 (EFT), level 3
	EN61000-4-5 (Surge), level 3
	EN61000-4-6 (CS), level 3
	EN61000-4-8
	EN61000-4-11
	EN61000-4-12
Shock	IEC61373
Freefall	IEC60068-2-32
Vibration	IEC61373

Note: Please check Moxa's website for the most up-to-date certification status.

WARRANTY	5 years
	Details: See www.moxa.com/warranty