TSM34Q/C

Hardware Manual

Applied Motion Products

TXM34Q/C/IP Hardware Manual

Contents

TXM34Q/C/IP Hardware Manual

TXM34 Models Available

Model	Communications			
	RS-232	RS-485	Ethernet	CANopen
TXM34Q-1AG	X			
TXM34Q-1RG		X		
TXM34Q-1DG			X	
TXM34IP-1DG			X	
TXM34Q-3AG	X			
TXM34Q-3RG		X		
TXM34Q-3DG			X	
TXM34IP-3DG			X	
TXM34Q-5AG	X			
TXM34Q-5RG		X		
TXM34Q-5DG			X	
TXM34IP-5DG			X	
TXM34Q-6AG	X			
TXM34Q-6RG		X		
TXM34Q-6DG			X	
TXM34IP-6DG			X	
TXM34C-1CG*	X			X
TXM34C-3CG*	X			X
TXM34C-5CG*	X			X
TXM34C-6CG*	X			X

*RS-232 for motor configuration only

1 Introduction

Thank you for selecting Applied Motion Products TXM34Q/C/IP Integrated Motor. The TXM line of integrated StepSERVO motors combines servo technology with an integrated motor to create a product with exceptional feature and broad capability. We hope our commitment to performance, quality and economy will result in a successful motion control project.

1.1 Features

- Programmable, digital servo driver and motor in an integrated package
- Operates from a 24 to 70 volt DC power supply, auxiliary power for keep alive function from 12 to 48 volt DC
- Control modes:

Torque control
  Analog input
  SCL commanded

Velocity control
  Digital input control velocity
  Analog velocity
  SCL commanded velocity (jogging)

Position control
  Digital signal type Step & Direction, CW & CCW pulse, A/B Quadrature
  Analog position
  Serial commanded position

Q Programming
  Stand alone operation

CANopen mode (CiA 301, CiA402 standard)
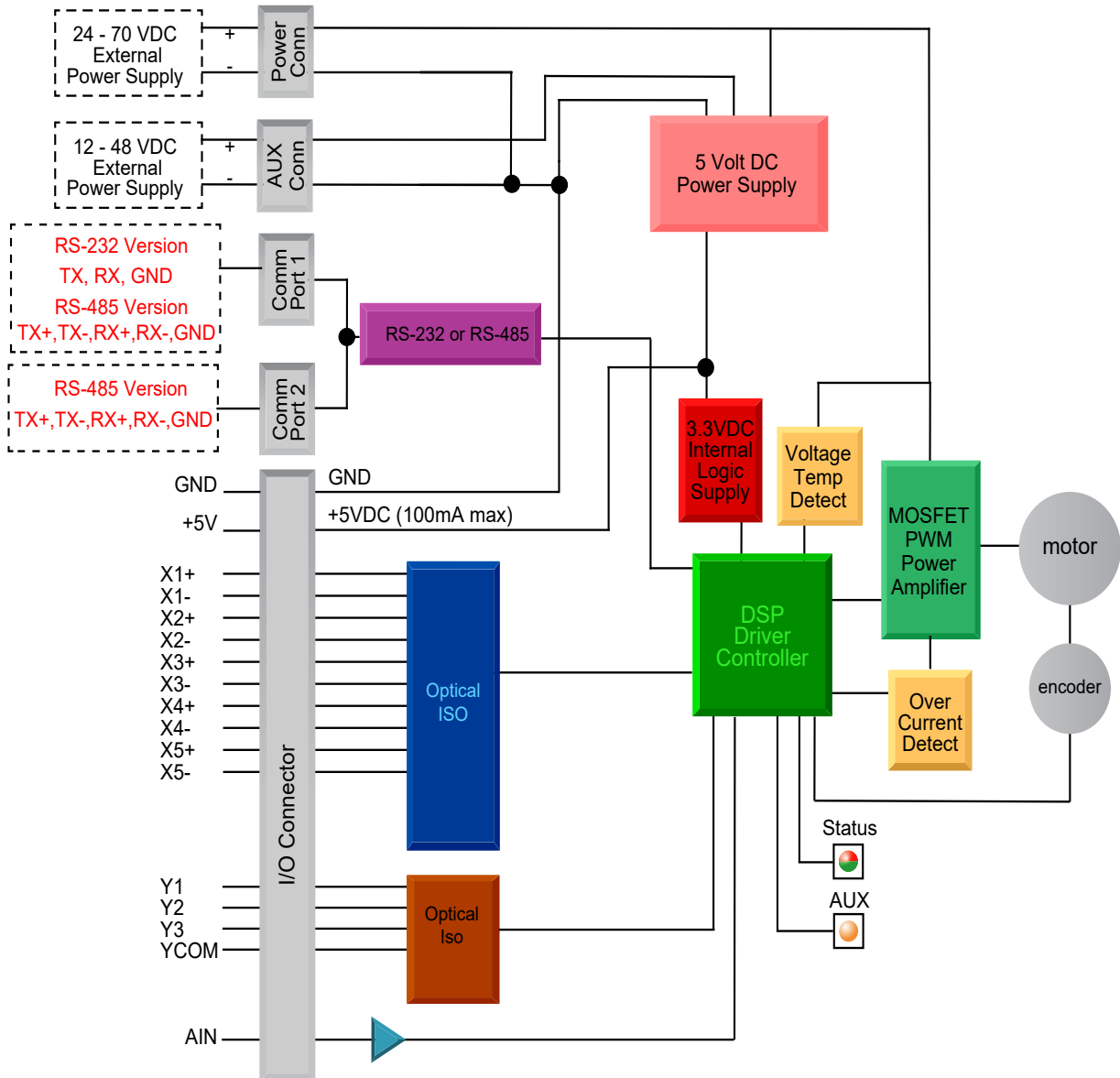 Torque mode
  Velocity mode
  Position mode

Modbus/RTU and Modbus/TCP bus control

- Communications:
      RS-232 , RS-485, CANopen or Dual Port Ethernet
- 5000 line (20,000 counts/rev) encoder feedback
- Available torque:
    TXM34x-1xG: Up to 2.9 N-m continuous
    TXM34x-3xG: Up to 5.6 N-m continuous
    TXM34x-5xG: Up to 7.2 N-m continuous
    TXM34x-6xG: Up to 9.5 N-m continuous
- I/O:
    5 optically isolated digital inputs, with adjustable bandwidth digital noise rejection filter, 5 to 24 volts
    3 optically isolated digital outputs, 30V/100 mA max.
    1 analog input for speed and position control, 0 to 5 volts
- Technological advances:
    Full servo control, Closed loop
    Efficient, Accurate, Fast, Smooth
    Intelligent, Compact
    IP65 protected with three or four M12 connectors

1.2 Block Diagrams

TXM34 RS-232 or RS-485 Block Diagram

24 - 70 VDC External Power Supply | +
| -

Power Conn

12 - 48 VDC External Power Supply | +
| -

AUX Conn

RS-232 Version TX, RX, GND
RS-485 Version TX+,TX-,RX+,RX-,GND

Comm Port 1

RS-485 Version TX+,TX-,RX+,RX-,GND

Comm Port 2

RS-232 or RS-485

5 Volt DC Power Supply

3.3VDC Internal Logic Supply

Voltage Temp Detect

MOSFET PWM Power Amplifier

DSP Driver Controller

Over Current Detect

motor

encoder

GND | GND
+5V | +5VDC (100mA max)

I/O Connector

X1+
X1-
X2+
X2-
X3+
X3-
X4+
X4-
X5+
X5-

Optical ISO

Y1
Y2
Y3
YCOM

Optical Iso

AIN

Status

AUX
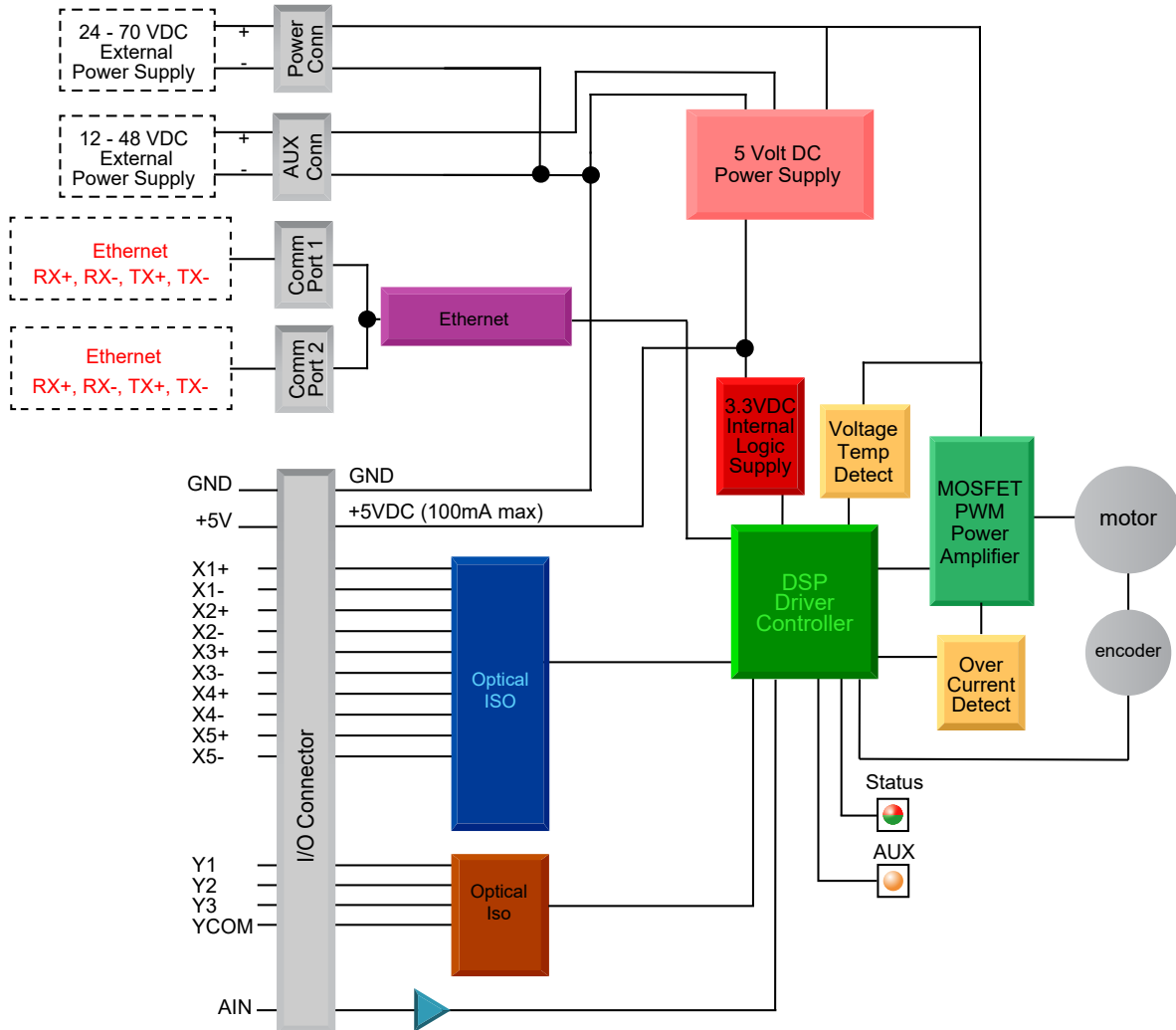
5

TXM34 CANopen Block Diagram
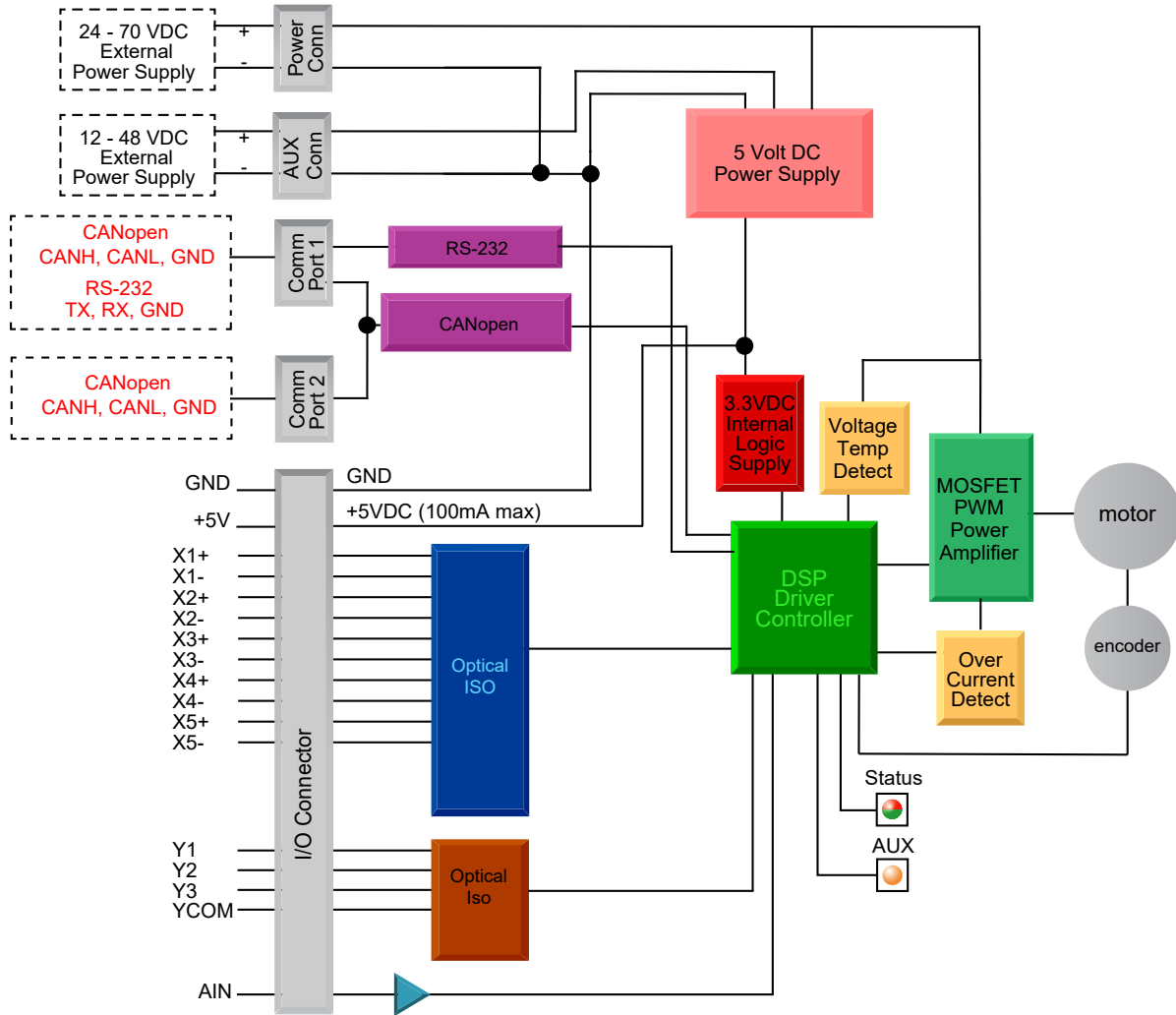
TXM34 Ethernet Block Diagram

1.3 Safety Instructions

Only qualified personnel should transport, assemble, install, operate, or maintain this equipment. Properly qualified personnel are persons who are familiar with the transport, assembly, installation, operation, and maintenance of motors, and who meet the appropriate qualifications for their jobs.

To minimize the risk of potential safety problems, all applicable local and national codes regulating the installation and operation of equipment should be followed. These codes may vary from area to area and it is the responsibility of the operating personnel to determine which codes should be followed, and to verify that the equipment, installation, and operation are in compliance with the latest revision of these codes.

Equipment damage or serious injury to personnel can result from the failure to follow all applicable codes and standards. Applied Motion Products does not guarantee the products described in this publication are suitable for a particular application, nor do they assume any responsibility for product design, installation, or operation.

- Read all available documentation before assembly and operation. Incorrect handling of the products referenced in this manual can result in injury and damage to persons and machinery. All technical information concerning the installation requirements must be strictly adhered to.
- It is vital to ensure that all system components are connected to earth ground. Electrical safety is impossible without a low-resistance earth connection.
- This product contains electrostatically sensitive components that can be damaged by incorrect handling. Follow qualified anti-static procedures before touching the product.
- During operation keep all covers and cabinet doors shut to avoid any hazards that could possibly cause severe damage to the product or personal health.
- During operation, the product may have components that are live or have hot surfaces.
- Never plug in or unplug the Integrated Motor while the system is live. The possibility of electric arcing can cause damage.

Be alert to the potential for personal injury. Follow recommended precautions and safe operating practices emphasized with alert symbols. Safety notices in this manual provide important information. Read and be familiar with these instructions before attempting installation, operation, or maintenance. The purpose of this section is to alert users to the possible safety hazards associated with this equipment and the precautions necessary to reduce the risk of personal injury and damage to equipment. Failure to observe these precautions could result in serious bodily injury, damage to the equipment, or operational difficulty.

TXM34Q/C/IP Hardware Manual

2 Getting Started

The following items are needed:
- a 24 - 70 Volt DC power supply, see the section below "Choosing a Power Supply" for help in choosing the right one
- If the keep alive function is required, an external 12 - 48 volt DC power supply will be needed for auxiliary power
- a small flat blade screwdriver for tightening the connectors (included)
- a PC running Microsoft Windows XP (SP3), or Windows 7, 8, or 10
- A 3004-331-XX (right angle), 3004-332-XX (straight) power cable, 3004-333-XX (right angle), 3004-334-XX (straight) I/O cable.
- For RS-232 models: 3004-278-5M for RS-232 programming cable. If your PC does not have an RS-232 serial port, you'll need a USB-serial adapter. We recommend the Applied Motion 3004- 235 or 8500-003.
- For RS-485 and CANopen models: 3004-288-5M for RS-485 and CANopen programming cable. You will also need an Applied Motion 8500-003 USB-serial adapter with screw terminal connector in order to connect your TXM34 to your PC for configuration, tuning and programming.
- For Ethernet Drive: 3004-280-5M Ethernet programming cable, and 3004-335-XX (straight) or 3004-345-XX (right angle) for daisy chain network.

2.1 Installing Software
Before utilizing the TXM34Q/C/IP Integrated StepSERVO Motor and Step-Servo Quick Tuner Software in an application, the following steps are necessary:
- Install the Step-Servo Quick Tuner Software from Applied Motion Products website, version 3.0.16.0725 or later
- Connect the drive to the PC using the programming cable. When using RS-485, it is best to be setup in a 4-Wire configuration (see Section 3.2.2 "Connecting to a host using RS-485".) When using Ethernet, see Section 3.2.5 "Connecting to a PC using Ethernet".
- Connect the drive to the power supply. See instructions below.
- Launch the software by clicking Start...Programs... Applied Motion Products.

2.2 Mounting the Hardware
As with any step motor, the TXM34 must be mounted so as to provide maximum heat sinking and airflow. Keep enough space around the Integrated Motor to allow for the airflow.

Never use the drive where there is no airflow or where other devices cause the surrounding air to be more than 40°C (104°F).
Never use the drive where metal or other electrically conductive particles can infiltrate the drive.
Always provide airflow around the drive.

2.3 Choosing a Power Supply
The main considerations when choosing a power supply are the voltage and current requirements for the application.

2.3.1 Supply Voltage
The TXM34 is designed to give optimum performance at 48 Volts DC. Choosing the voltage depends on the performance needed and motor/drive heating that is acceptable and/or does not cause a drive over-temperature. Higher voltages will give higher speed performance but will cause the TXM34 to produce higher temperatures. Using power supplies with voltage outputs that are near the drive's maximum may significantly reduce the operational duty-cycle.

The extended range of operation can be as low as 18VDC minimum to as high as 75VDC maximum. When operating below 18VDC, the power supply input may require larger capacitance to prevent under-voltage and internal-supply alarms. Current spikes may make supply readings erratic. The supply input cannot go below 18VDC for reliable operation. Absolute minimum power supply input is 18VDC. If the input supply drops below 18VDC the low voltage alarm will be triggered. This will not fault the drive.

Absolute maximum power supply input is 75VDC at which point an over-voltage alarm and fault will occur. When using a power supply that is regulated and is near the drive maximum voltage of 75VDC, a regen clamp may be required to prevent over-voltage when regeneration occurs. When using an unregulated power supply, make sure the no-load voltage of the supply does not exceed the drive's maximum input voltage of 75VDC.

2.3.2 Auxiliary Supply Voltage (Keep Alive Function)

Apart from the main power supply, TXM34 also has an auxiliary power input (AUX power) for keep alive function of the drive. When the main power supply is off, the AUX power will keep the logic power on, allowing the drive to remember its state data (motor position, etc.). This allows the motor to resume operation from its previous position without a homing routine when the main power is switched back on.

When the main power is removed while the auxiliary power is still on, the drive will show a fault. If the AUX power supply range is 12-15VDC, the status LED will flash a 3 red, 2 green pattern indicating the internal voltage is out of range. If the AUX power supply is 15-48VDC, the status LED will flash a 4 red, 2 green pattern indicating a power supply undervoltage. When the main power supply is restored the drive will not automatically clear the fault. It will need to be cleared by the I/O function or SCL commands.

2.3.2.1 Power Sequence

For best motor performance, the main power must always be applied before the auxiliary power. When main power is applied to the motor first, there is a brief self-test procedure that automatically measures internal motor parameters. This self-test procedure ensures optimal performance of the motor. However, if auxiliary power is already applied when main power is applied, the self-test procedure does not execute. For this reason, when powering the motor on from a completely powered off state (both main and auxiliary power removed), the sequence must always be main power first, auxiliary power second.

Once the self-test procedure is successfully executed, the internal motor parameters are stored by the drive until both main and auxiliary power supplies are removed. Therefore, the main power can be repeatedly removed without the motor parameters being lost, as long as auxiliary power is maintained at all times. Only when both the main and auxiliary power are removed does the sequence above apply.

2.3.2.2 Keep Alive Recovery with I/O Function

1. After the main power is removed and the logic remains powered, an undervoltage or internal voltage out of range fault is generated. This alarm will display as a flashing LED pattern which can be checked by the codes listed in Section 4.1 "Status (STAT) LED Error Codes".

2. After the main power supply has been restored, the fault must be cleared. Use the alarm reset function through input 4 (X4) which can be set in the Step-Servo Quick Tuner Software. If an internal voltage out of range alarm occurred, the motor will remain disabled. Use the servo on function through input 3 (X3), also set by the software. If an undervoltage occurred, the motor will re-enable after using the alarm reset function.

3. Resume motion and normal program operation.

2.3.2.3 Keep Alive Recovery with SCL

1. After the main power is removed and the logic remains powered, an undervoltage or internal voltage out of range fault is generated. This alarm displays as a flashing LED pattern and a bit in the alarm code which can be read by the host using the AL command.

2. Monitor the main power supply using the IU command. the IU command reads in units of 0.1V. For example, at 24 volts the response to the IU command will be IU=240. See Section 5.3 "Technical Specifications" for acceptable operational voltage limits.

3. After the main power supply has been restored, the fault must be cleared. To clear the fault, send the AR command. The alarm word will become 0. If the fault that occurred was internal voltage out of range, the motor will remain disabled. Send the ME command to enable the motor. If the fault was undervoltage, the motor will be enabled after the AR command is sent.

4. As the motor may have moved while the main power was lost, the EP command may be used to verify the motor's current position.

5. Resume motion and normal program operation.

2.3.3 Regeneration Clamp

If a regulated power supply is being used, there may be a problem with regeneration. When a load decelerates rapidly from a high speed, some of the kinetic energy of the load is transferred back to the power supply, possibly tripping the over-voltage protection of a regulated power supply, causing it to shut down. This problem can be solved with the use of a Applied Motion Products RC880 Regeneration Clamp. It is recommended that an RC880 initially be installed in an application. If the "regen" LED on the RC880 never flashes, the clamp is not necessary.

LEDs
Green - Power
Red - Regen on

RC880 Regen Clamp

2.3.4 Supply Current

The maximum supply currents required by the TXM34 are shown in the charts below at different power supply voltage inputs. The TXM34 power supply current is lower than the winding currents because it uses switching amplifiers to convert a high voltage and low current into lower voltage and higher current. The more the power supply voltage exceeds the motor voltage, the less current will be required from the power supply.

It is important to note that the current draw is significantly different at higher speeds depending on the torque load to the motor. Estimating how much current is necessary may require a good analysis of the load the motor will encounter.

3 Connections

3.1 Connecting the Power Supply

A 3004-331-XX (right angle), 3004-332-XX (straight) power cable is recommended for all TXM34 drives. If a user serviceable external fuse is desired, install a 10 amp fast acting fuse in line with the "+" power supply lead.
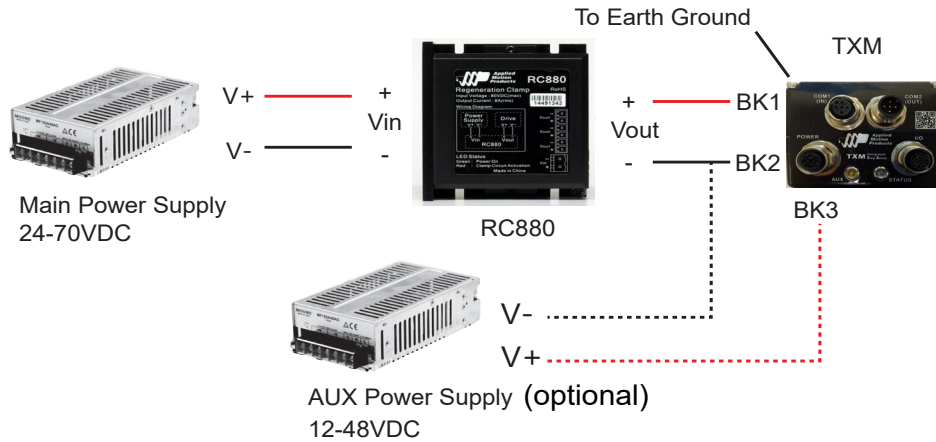
3.1.1 Connect Main Power Supply

Connect main power supply "+" to power cable's "BK1" wire.
Connect power supply "-" to power cable's "BK2" wire.
TXM34 needs 24 to 70VDC for the main power supply

⚠️ **Be careful not to reverse the "+" and "-" wires. Reversing the connection may open the internal fuse on the drive and void the warranty.**

3.1.2 Connect Auxiliary Power Supply (Optional)

If use of the Keep Alive function is needed, an extra power supply is required.
Connect the auxiliary power supply "+" terminal to the power cable's "BK3" wire
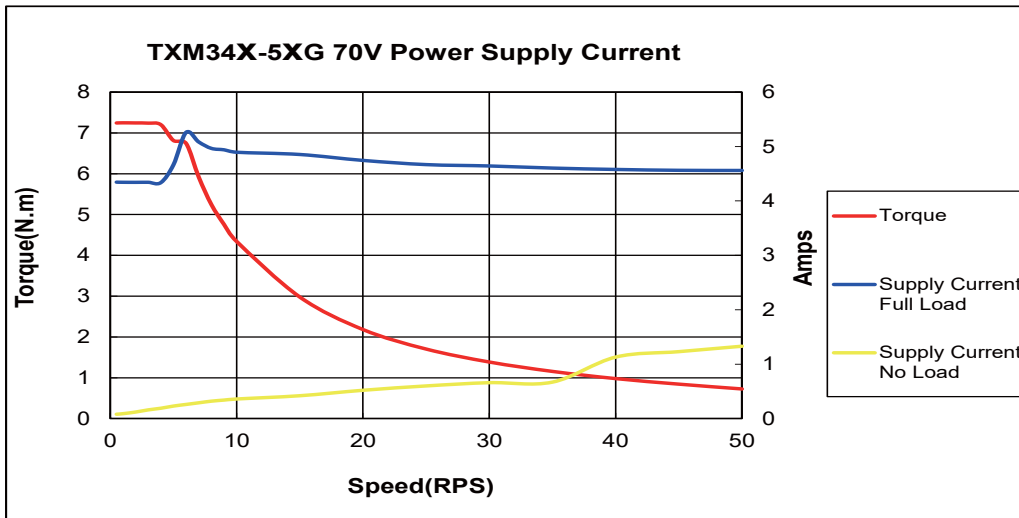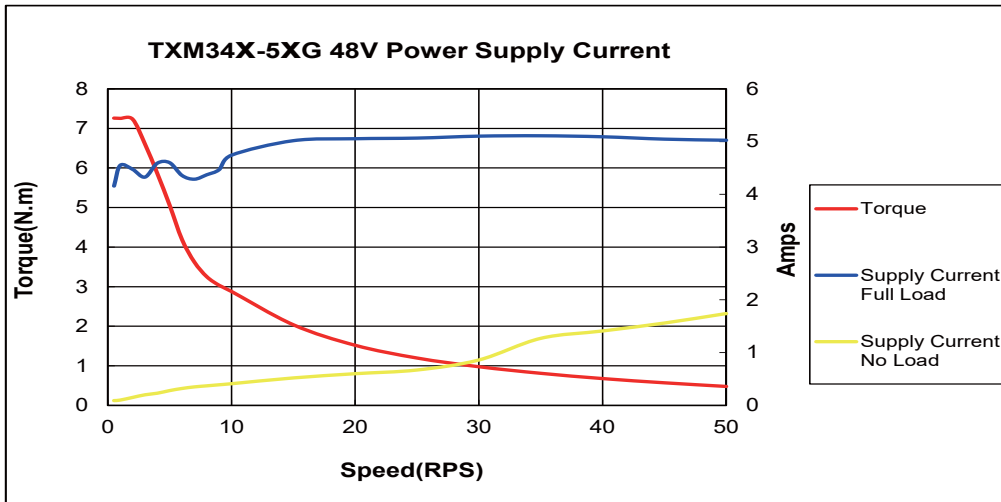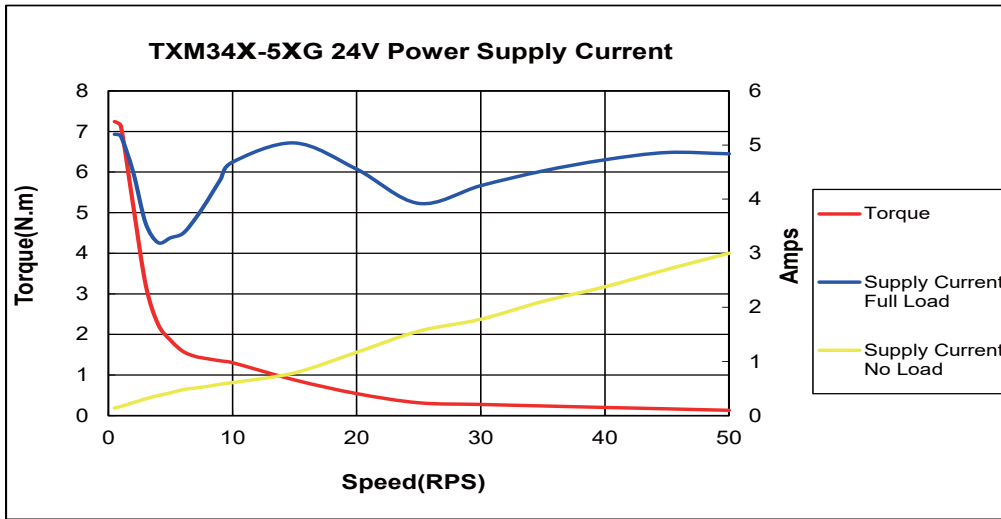The auxiliary power supply "-" terminal to the power cable's BK2
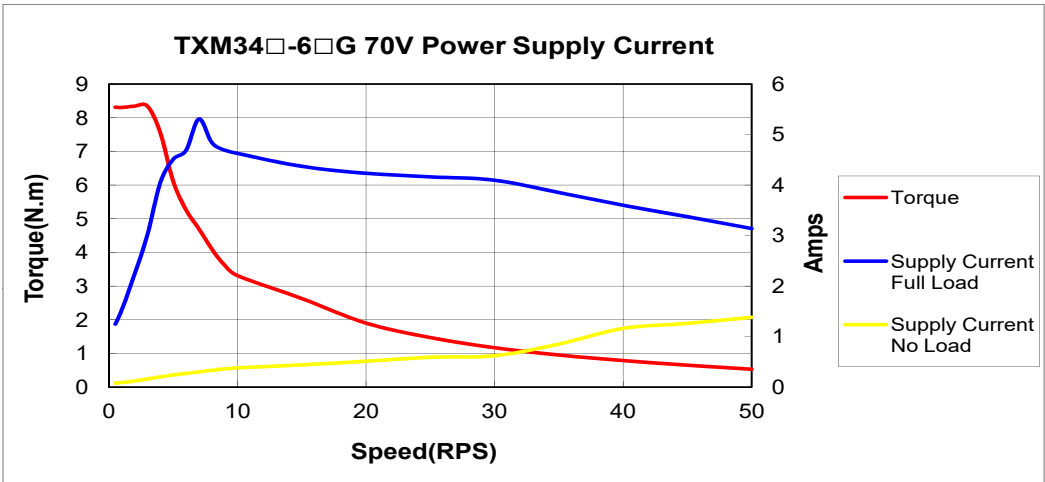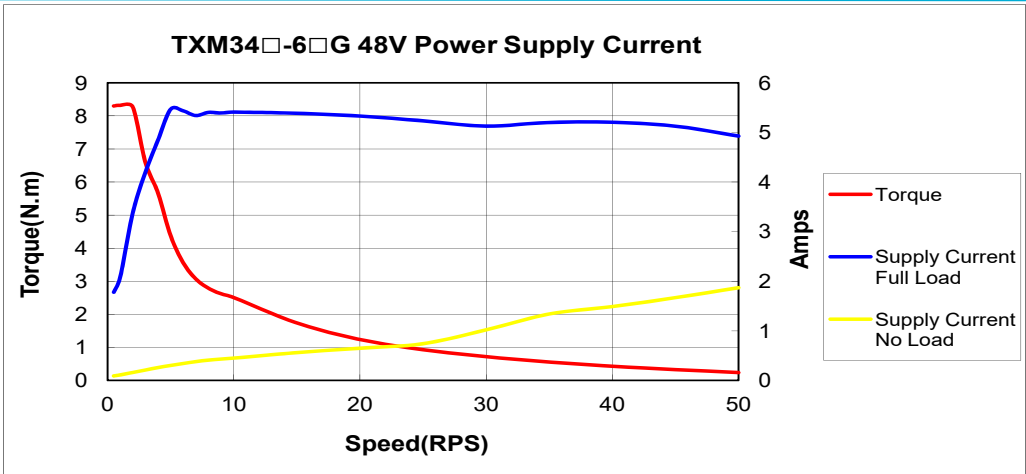TXM34 needs 12 to 48VDC for the auxiliary power supply

⚠️ **When using the optional auxiliary power supply, the main power must be applied prior to the auxiliary power. See Section 2.3.2.1 above.**

TXM34X-1XG 24V Power Supply Current

TXM34X-1XG 48V Power Supply Current

TXM34X-1XG 70V Power Supply Current

13

TXM34X-3XG 24V Power Supply Current

TXM34X-3XG 48V Power Supply Current

TXM34X-3XG 70V Power Supply Current

TXM34X-5XG 24V Power Supply Current

- Torque
- Supply Current Full Load
- Supply Current No Load

TXM34X-5XG 48V Power Supply Current

- Torque
- Supply Current Full Load
- Supply Current No Load

TXM34X-5XG 70V Power Supply Current

- Torque
- Supply Current Full Load
- Supply Current No Load

TXM34☐-6☐G 48V Power Supply Current

TXM34☐-6☐G 70V Power Supply Current

3.2 Connecting the TXM34Q/C/IP Communications

The TXM34Q/C/IP is available with different communications types, RS-232 (TXM34x -xAG), RS- 485 (TXM34Q -xRG), CANopen (TXM34C-xCG) or Ethernet (TXM34x -xDG). Each type requires a different hardware connection for interface to a PC or other Host system.

Note: Cables are not included, and must be purchased separately.

3.2.1 Connecting to a PC using RS-232

For RS-232 models please use 3004-278-XX RS-232 programming cable.

Note: If the PC does not have an RS-232 serial port, a USB to RS-232 Serial Converter will be needed. You can contact Applied Motion Products to buy a USB to RS-232 converter.

PIN	Signal	Color
1	RX	Brown
2	N/C	White
3	TX	Blue
4	GND	Black
5	N/C	Gray

⚠️ **Warning: The RS-232 circuitry does not have any extra electrical "hardening" and care should be taken when connecting to the RS-232 port as hot plugging could result in circuit failure. If this is a concern the RS-485 version which has "hardening" built into the port input and output should be used.**

3.2.2 Connecting to a Host using RS-485

RS-485 communication allows connection of more than one drive to a single host PC, PLC, HMI or other computer. It also allows the communication cable to be long (more than 300 meters or 1000 feet). Applied Motion 3004-288-XX programming cable is recommended.

The TXM34 can be used with either Two-Wire or Four-Wire RS-485 implementation. The connection can be point-to-point (i.e. one drive and one host) or a multi-drop network (one host and up to 32 drives).

NOTE: To use the TXM34Q RS-485 version with the Step-Servo Quick Tuner Software, it is better to be connected in the Four-Wire configuration (see below).
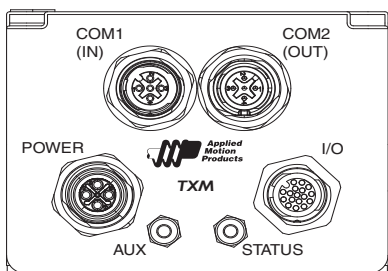

2 Wire Connection			4 Wire Connection			Color
PIN	Converter Output	Drive	PIN	Converter Output	Drive	
1	T/R+	RX+	1	TX+	RX+	Brown
2	T/R-	RX-	2	TX-	RX-	White
1	T/R+	TX+	3	RX+	TX+	Blue
2	T/R-	TX-	4	RX-	TX-	Black
5	GND	GND	5	GND	GND	Gray

Four-Wire Configuration

Four-Wire Systems utilize separate transmit and receive wires. One pair of wires must connect the host's transmit signals to each drive's RX+ and RX- terminals. The other pair connects the drive's TX+ and TX- terminals to the host's receive signals. A logic ground terminal is provided on each drive and can be used to keep all drives at the same ground potential. This terminal connects internally to the DC power supply return (V-), so if all the drives on the RS-485 network are powered from the same supply, only one drive's GND terminal should be connected to the host computer ground; the other drives' GND terminals must not connect the logic grounds.

Because the host in a four-wire system never needs to disable its transmitter, software is simplified. Some converters make this process very difficult to implement and can delay communications

NOTE: If the PC does not have an RS-485 serial port, a converter is required. You can contact Applied Motion Products to buy a USB to RS-485 converter.
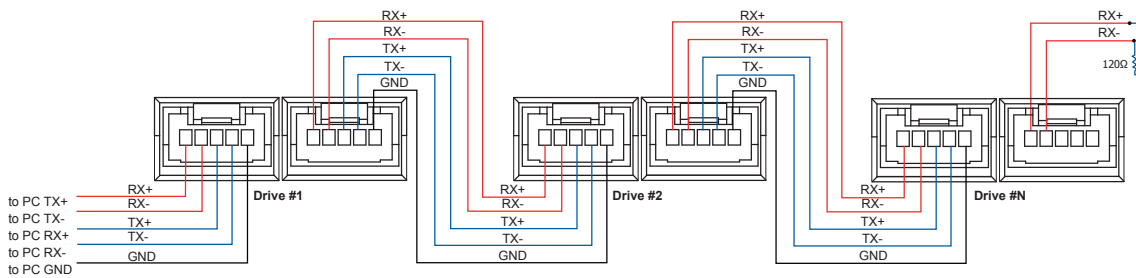
Two-Wire Configuration

In a 2-wire system, the host must disable its transmitter before it can receive data. This must be done quickly before a drive begins to answer a query. The TXM34 includes a transmit delay parameter that can be adjusted to compensate for a host that is slow to disable its transmitter. This adjustment can be made over the network using the TD command, or it can be set using the Step-Servo Quick Tuner software. It is not necessary to set the transmit delay in a four wire system.
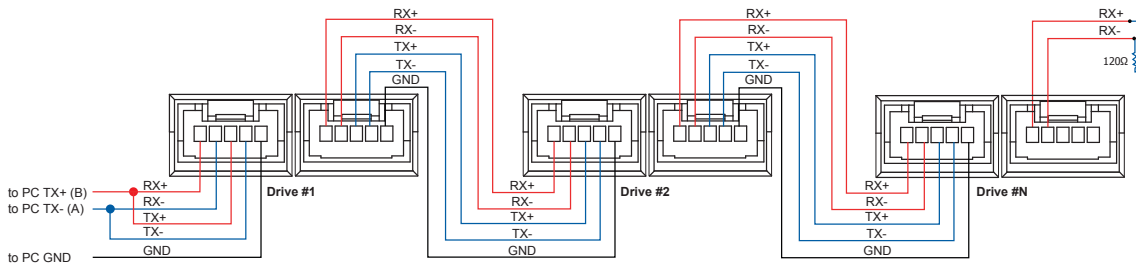
NOTE: If the PC does not have an RS-485 serial port, a converter is required. You can contact Applied Motion Products to buy a USB to RS-485 converter.

Assigning Addresses

Before the entire system is wired, each drive will need to connect individually to the host computer so that it can be assigned a unique address.

Once the drive has been connected to the PC as described above, launch the Step-Servo Quick Tuner software. Apply power to the drive. If a drive has already been configured, click the Upload button so that the Step-Servo Quick Tuner settings match

those of the drive. When operating the drive in SCL mode it will need to be assigned an address. This is done on the Drive Configuration tab where a list of address options can be seen. The numerals 0..9 or the special characters ! " # $ % & ' ( ) * + , - . / : ; < = > ? @ may be used as addresses. Make sure each drive on the network has a unique address. On a 2-wire network, the Transmit Delay may also need to be set. Most adapters work well with 10 milliseconds. Once the address has been assigned, click Download to save the settings to the drive.

3.2.3 Connecting to a Host using CANopen

Two 5-pin M12connectors are used for the communications interface of a TXM34C. Only COM1 can be used for RS-232 serial interface and CANopen daisy-chain by the other cable included with TXM34C. So only COM1 can be used to configure the TXM34 drive by RS-232 serial interface.
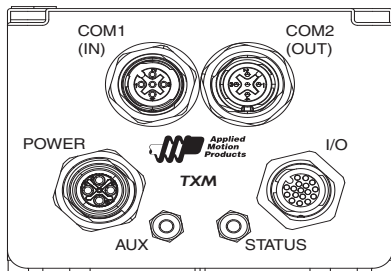
PIN	COM1 Signals	COM2 Signals	Color
1	RS-232 TX	N/C	Brown
2	RS-232 RX	N/C	White
3	CAN H	CAN H	Blue
4	CAN L	CAN L	Black
5	GND	GND	Gray

The TXM34C is configured using a combination of rotary switches and an RS-232 serial link, and then may be deployed on a distributed CANopen network. The RS-232 interface is used for configuration, tuning, node ID setting and Q program downloading. The CANopen network should be connected in a daisy-chain fashion, with a 120 ohm terminating resistor at each end of the network.
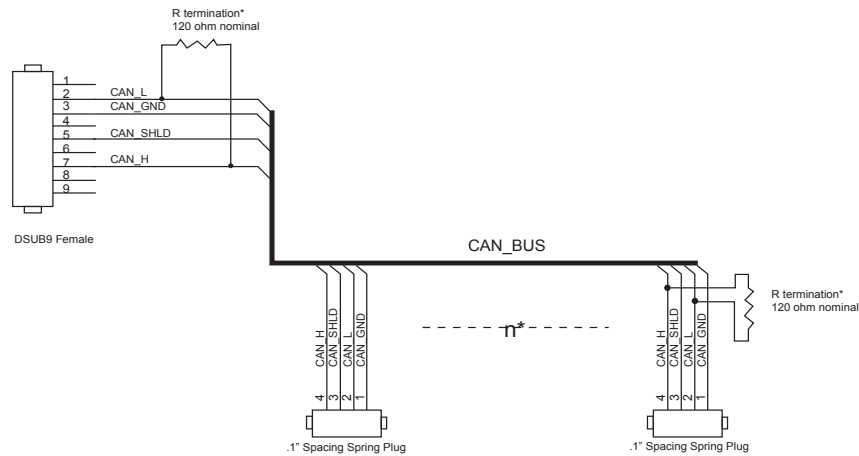
R termination:
Network must be terminated at each end with a 120 ohm resistor.

n:
Cable may be made with up to 127 drive connectors. Termination is only required at each end.

Note: If the PC does not have an RS-232 serial port, a USB to RS-232 Serial Converter will be needed. You can contact Applied Motion Products to buy a USB to RS-232 converter.

⚠️ **Warning: The RS-232 circuitry does not have any extra electrical "hardening" and care should be taken when connecting to the RS-232 port as hot plugging could result in circuit failure. If this is a concern the RS-485 version which has "hardening" built into the port input and output should be used.**

3.2.3.1 Node ID

Each node on a CANopen network must have a unique Node ID. The Node ID is configured by using Step-Servo Quick Tuner. CANopen Node IDs are seven bits long, with a range of 1 - 127.
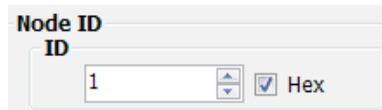
3.2.3.2 Setting the Bitrate

The CANopen network bitrate is set by using Step-Servo Quick Tuner software. The bit rate must be the same for all nodes on the CANopen network. Any changes to the bit rate require either a power cycle or a CANopen reset command to take effect.
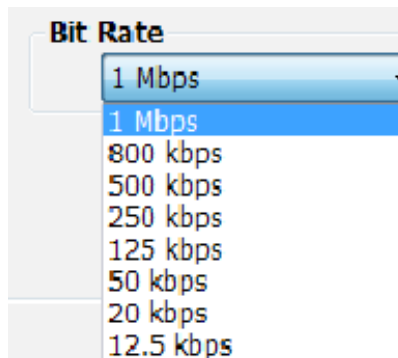
3.2.4 Choosing the Right COM Port

- Open the "Device Manager" on the PC. If the PC has an built-in RS-232 serial port, "Ports (COM & LPT)" (1) will be displayed. Connect the PC and drive with the included RS-232 communication cable. Choose the connected COM(n) port in the Step-Servo Quick Tuner software.
- If the PC does not have an RS-232 serial port, or has one but using a USB port is preferred, a USB to RS-232 serial port adapter will be needed. Open the "Device Manager" on the PC. There may or may not be a "Ports" selection. (2) Connect the adapter to the PC, this USB adapter COM port should then be displayed. (3) Choose this new COM(n) port in the Step-Servo Quick Tuner software.
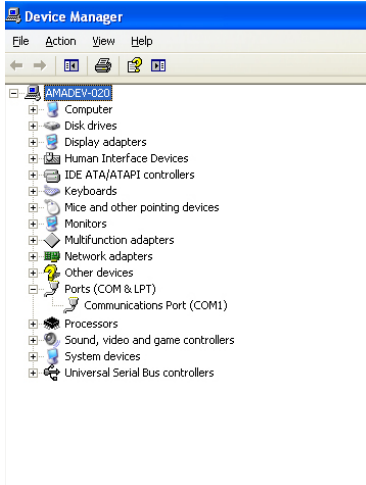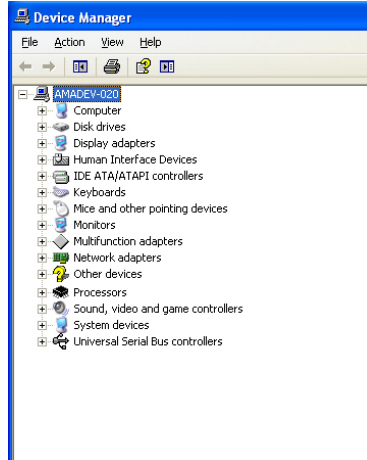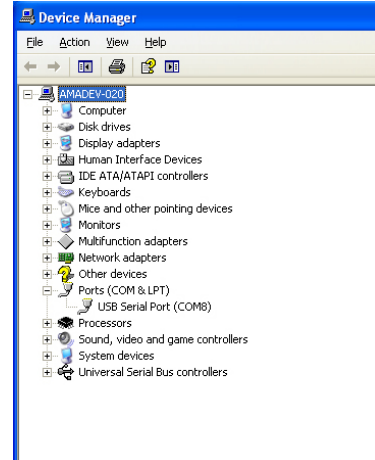
| 1 | 2 | 3 |

3.2.5 Connecting to a PC using Ethernet

This process requires three steps:

 Physically connect the motor to the network (or directly to the PC). There are 2 Ethernet connectors on the motor labeled COM1 and COM2.

    - For Ethernet Motor configuration and programming, Please use port "COM1 " on the motor only.

    - If the Ethernet network is connected in a daisy-chain fashion, the connection should be from motor#1 COM2 to motor#2 COM1, motor#2 COM2 to motor#3 COM1 and so on.

    - If using a router or hub on the network, the connection should be from the router or hub to the motor. Only COM1 port on the drive can be used, but take care to not connect to both COM ports as this may cause the communication to work incorrectly.

• Set the motor's IP address
• Set the appropriate networking properties on the PC

Daisy Chain

Router
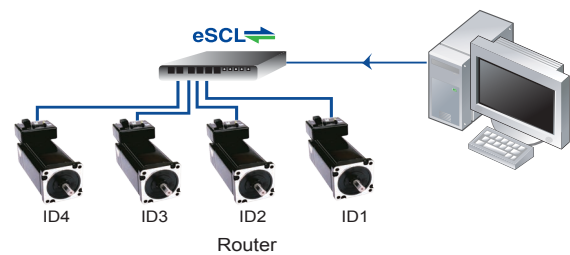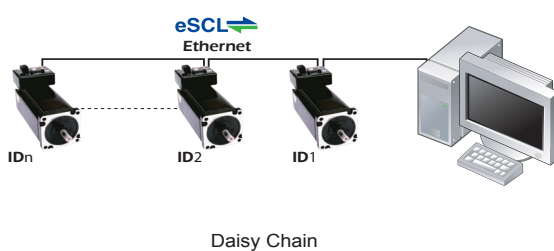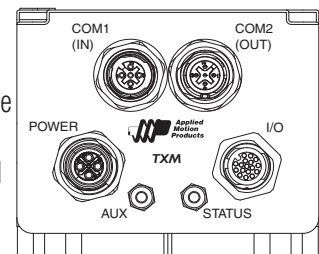
Note: The following sections are taken from the "Host Command Reference - Appendix G: eSCL (SCL over Ethernet) Reference". For more information, please read the rest of the guide. It can be downloaded from Applied Motion Products website.

Setting the IP Address

Your TXM34 stores two IP addresses: the "normal"address" and the "recovery" address. Once you've connected your TXM34 to a PC, you can set the "normal" address to a value that is best for your network. If you don't know the IP address of your TXM34, you must connect using the "recovery" address. To do this, power up the TXM34 with the network cable unplugged. Wait five seconds, then plug in the network cable. The TXM34 will then communicate using the "recovery" address, which is always 10.10.10.10. Once you are connected to a PC that' running the Step Servo Quick Tuner software, you can click "IP Table" on the top menu bar and set the normal IP address.

If you later connect the TXM34 to your network and it doesn't communicate, it might be do to a slow network component that is fooling the TXM34 into using the recovery address. In that case, you should change the recovery delay to a long time period. That is also done by clicking "IP Table" in Step Servo Quick Tuner.

Addresses, Subnets, and Ports

Every device on an Ethernet network must have a unique IP address. In order for two devices to communicate with each other, they must both be connected to the network and they must have IP addresses that are on the same subnet. A subnet is a logical division of a larger network. Members of one subnet are generally not able to communicate with members of another unless they are connected through special network equipment (e.g. router). Subnets are defined by the choices of IP addresses and subnet masks.

If you want to know the IP address and subnet mask of your PC, select Start…All Programs… Accessories…Command Prompt. Then type "ipconfig" and press Enter. You should see something like this:

```
Windows IP Configuration

Ethernet adapter Local Area Connection:

        Connection-specific DNS Suffix  . :
        IP Address. . . . . . . . . . . . : 192.168.0.22
        Subnet Mask . . . . . . . . . . . : 255.255.255.0
```

If your PC's subnet mask is set to 255.255.255.0, a common setting known as a Class C subnet mask, then your machine can only talk to another network device whose IP address matches yours in the first three octets. (The numbers between the dots in an IP address are called octets.) For example, if your PC is on a Class C subnet and has an IP address of 192.168.0.20, it can talk to a device at 192.168.0.40, but not one at 192.168.1.40. If you change your subnet mask to 255.255.0.0 (Class B) you can talk to any device whose first two octets match yours. Be sure to ask your system administrator before doing this. Your network may be segmented for a reason.

Your drive IP address can be set by using Step-Servo Quick Tuner Software. The default or "recovery" address is "10.10.10.10".

Your TXM34 stores two IP addresses: the "normal"address" and the "recovery" address.

Once you've connected your TXM34 to a PC, you can set the "normal" address to a value that is best for your network. If you don't know the IP address of your TXM34, you must connect using the "recovery" address. To do this, power up the TXM34 with the network cable unplugged. Wait five seconds, then plug in the network cable. The TXM34 will then communicate using the "recovery" address, which is always 10.10.10.10. Once you are connected to a PC that' running the Step Servo Quick Tuner software, you can click "IP Table" on the top menu bar and set the normal IP address.

TXM34Q/C/IP Hardware Manual

If you later connect the TXM34 to your network and it doesn't communicate, it might be do to a slow network component that is fooling the TXM34 into using the recovery address. In that case, you should change the recovery delay to a long time period. That is also done by clicking "IP Table" in Step Servo Quick Tuner.

If someone were to change the other settings and not write it down or tell anyone then you will not be able to communicate with your drive. The only way to "recover" it is to use the recovery address.

Setting the address to "0.0.0.0", means using the "DHCP" function. It commands the drive to get an IP address from a DHCP server on the network. The IP address automatically assigned by the DHCP server may be "dynamic" or "static" depending on how the administrator has configured DHCP. The DHCP setting is reserved for advanced users.

Your PC, or any other device that you use to communicate with the drive, will also have a unique address.

One of the great features of Ethernet is the ability for many applications to share the network at the same time. Ports are used to direct traffic to the right application once it gets to the right IP address. The UDP eSCL port in our drives is 7775. To send and receive commands using TCP, use port number 7776. You'll need to know this when you begin to write your own application. You will also need to choose an open (unused) port number for your application. Our drive doesn't care what that is; when the first command is sent to the drive, the drive will make note of the IP address and port number from which it originated and direct any responses there. The drive will also refuse traffic from other IP addresses that is headed for the eSCL port. The first application to talk to a drive "owns" the drive. This lock is only reset when the drive powers down.

If you need help choosing a port number for your application, you can find a list of commonly used port numbers at http://www.iana.org/assignments/port-numbers.

One final note: Ethernet communication can use one or both of two "transport protocols": UDP and TCP. eSCL commands can be sent and received using either protocol. UDP is simpler and more efficient than TCP, but TCP is more reliable on large or very busy networks where UDP packets might occasionally be dropped.

Option 1: Connect a Drive to Your Local Area Network

If you have a spare port on a switch or router and if you are able to set your drive to an IP address that is compatible with your network, and not used by anything else, this is a simple way to get connected. This technique also allows you to connect multiple drives to your PC. If you are on a corporate network, check with the system administrator before connecting anything new to the network. They should be able assign a suitable address and help you get going.

If you are not sure which addresses are already used on your network, you can find out using "Angry IP scanner", which can be downloaded free from http://www.angryip.org/w/Download. But be careful: an address might appear to be unused because a computer or other device is currently turned off. And many networks use dynamic addressing where a DHCP server assigns addresses "on demand". The address you choose for your drive might get assigned to something else by the DHCP server at another time.

If the PC's address is not in one of the configured drive subnets, you will have to change your subnet mask to 255.255.0.0 in
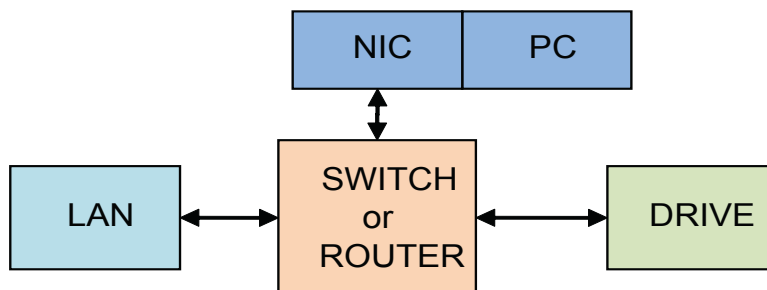
order to talk to your drive. To change your subnet mask:
1. On Windows XP, right click on "My Network Places" and select properties. On Windows 7, click Computer.

Scroll down the left pane until you see "Network". Right click and select properties. Select "Change adapter settings"

2. You should see an icon for your network interface card (NIC). Right click and select properties
3. Scroll down until you see "Internet Properties (TCP/IP)". Select this item and click the Properties button. On Windows 7/8/ Vista, look for "(TCP/IPv4)"

4. If the option "Obtain an IP address automatically" is selected, your PC is getting an IP address and a subnet mask from the DHCP server. Please cancel this dialog and proceed to the next section of this manual: "Using DHCP".

5. If the option "Use the following IP address" is selected, life is good. Change the subnet mask to "255.255.0.0" and click OK.
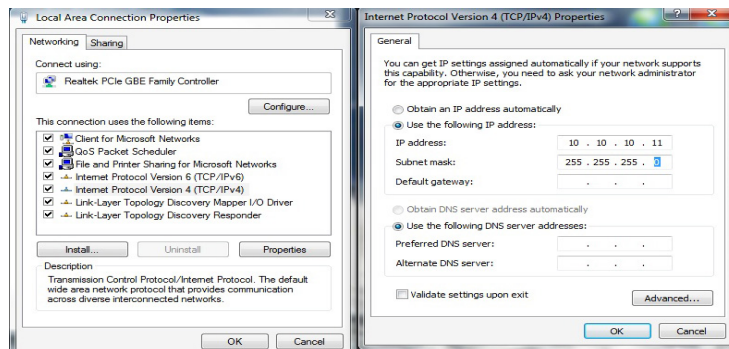
Using DHCP (not recommended)
If you want to use your drive on a network where all or most of the devices use dynamic IP addresses supplied by a DHCP server, set the IP address to "0.0.0.0". When the drive is connected to the network and powered on, it will obtain an IP address and a subnet mask from the server that is compatible with your PC. The only catch is that you won't know what address the server assigns to your drive. As it may be difficult to resolve addresses with DHCP, this method is not recommended.

Option 2: Connect a Drive Directly to Your PC
1. Connect one end of a CAT5e STP cable into the LAN card (NIC) on your PC and the other to the drive.

You don't need a special "crossover cable"; the drive will automatically detect the direct connection and make the necessary physical layer changes.

2. The default IP address is "10.10.10.10".

3. To set the IP address of your PC:
     a. On Windows XP, right click on "My Network Places" and select properties.
     b. On Windows 7, click Computer. Scroll down the left pane until you see "Network". Right click and select properties.
     Select "Change adapter settings"

4. You should see an icon for your network interface card (NIC). Right click and select properties.
     a. Scroll down until you see "Internet Properties (TCP/IP)". Select this item and click the Properties button.
     b. On Windows 7 and Vista, look for "(TCP/IPv4)"

5. Select the option "Use the following IP address". Then enter the address "10.10.10.10". This will give your PC an IP address that is on the same subnet as the drive. Windows will know to direct any traffic intended for the drive's IP address to this interface card.

6. Next, enter the subnet mask as "255.255.255.0".

7. Be sure to leave "Default gateway" blank. This will prevent your PC from looking for a router on this subnet.

8. Because you are connected directly to the drive, anytime the drive is not powered on, your PC will annoy you with a small message bubble in the corner of your screen saying "The network cable is unplugged."

Option 3: Use Two Network Interface Cards (NICs)

This technique allows you to keep your PC connected to your LAN, but keeps the drive off the LAN, preventing possible IP conflicts or excessive traffic.

1. If you use a desktop PC and have a spare card slot, install a second NIC and connect it directly to the drive using a CAT5e cable. You don't need a special "crossover cable"; the drive will automatically detect the direct connection and make the necessary physical layer changes.

2. If you use a laptop and only connect to your LAN using wireless networking, you can use the built-in RJ45 Ethernet connection as your second NIC.

3. The default IP address is "10.10.10.10".

4. To set the IP address of the second NIC:
      a. On Windows XP, right click on "My Network Places" and select properties.
      b. On Windows 7, click Computer. Scroll down the left pane until you see "Network". Right click and select properties. Select "Change adapter settings"

5. You should see an icon for your newly instated NIC. Right click again and select properties.
      a. Scroll down until you see "Internet Properties (TCP/IP)". Select this item and click the Properties button.
      b. On Windows 7 and Vista, look for "(TCP/IPv4)"

6. Select the option "Use the following IP address". Then enter the address "10.10.10.10". This will give your PC an IP address that is on the same subnet as the drive. Windows will know to direct any traffic intended for the drive's IP address to this interface card.

7. Next, enter the subnet mask as "255.255.255.0". Be sure to leave "Default gateway" blank. This will prevent your PC from looking for a router on this subnet.

8. Because you are connected directly to the drive, anytime the drive is not powered on your PC will annoy you with a small message bubble in the corner of your screen saying "The network cable is unplugged."

3.3 Inputs and Outputs

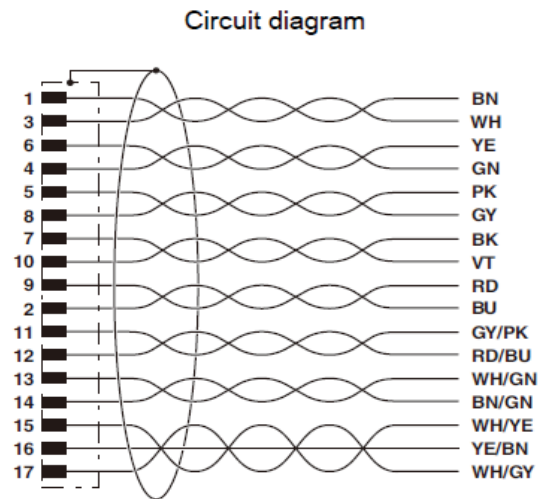The TXM34Q/C/IP has three types of inputs:
- High speed digital inputs for step & direction commands or encoder following, 5 to 24 volt logic
- Low speed digital input for other signals, 5 to 24 volt logic
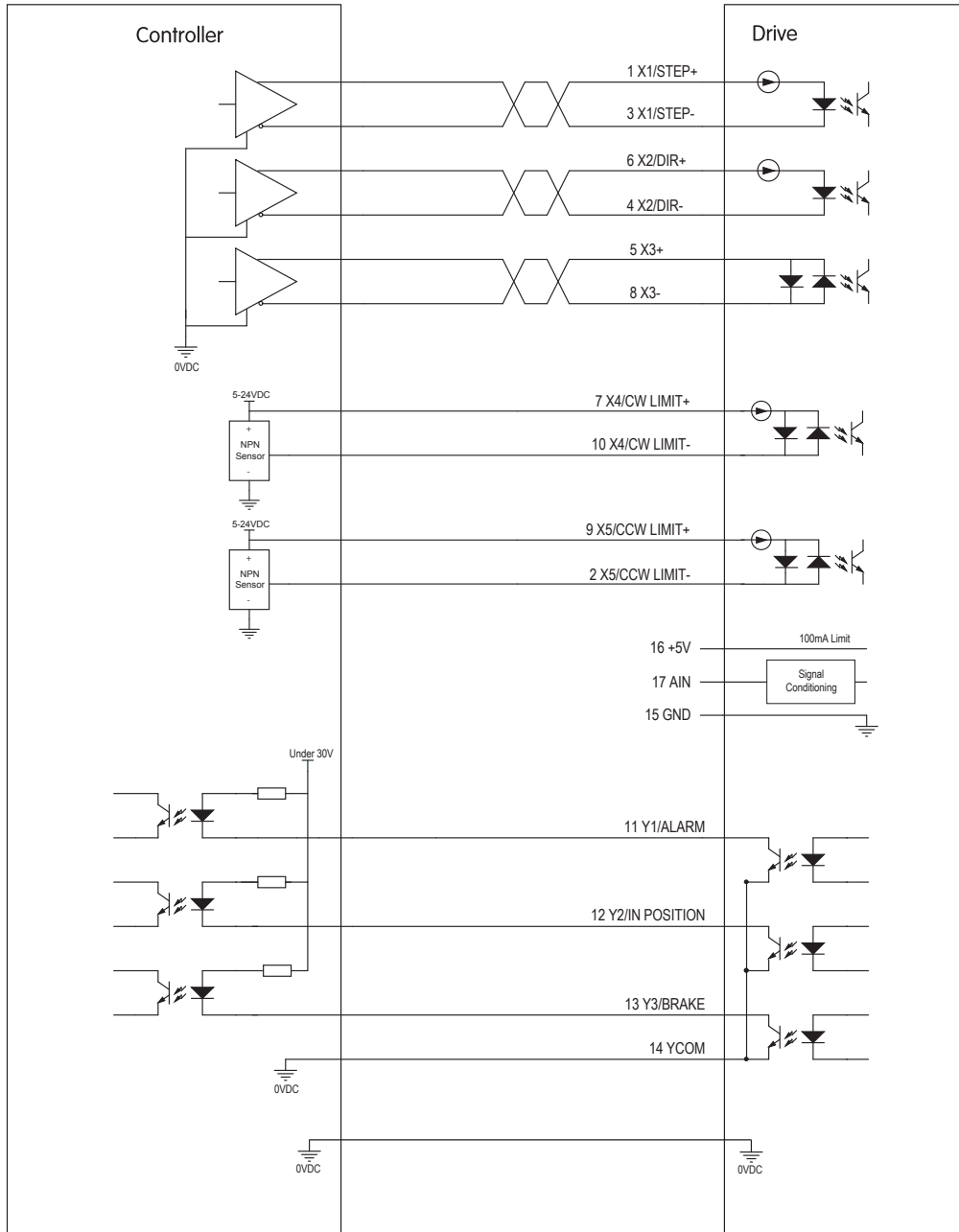- Analog input for analog speed and positioning modes

All drives include 5 digital inputs and 1 analog input:
- X1/STEP & X2/DIR are high-speed digital inputs for commanding position. Quadrature signals from encoders can also be used. When not being used for the Step & Direction function these inputs can be used for CW & CCW step, (start/stop)/ direction (oscillator mode), or general purpose input.
- X3, X4 and X5 are low speed software programmable inputs and can be used for Motor Enable/ Disable and Alarm/Fault Reset function, CW/CCW Limit, or general purpose input.
- AIN is an analog input for a velocity or position command signal. It can accept 0-5 volts and has gain, filtering, offset and dead-band settings.

3.3.1 Connector Pin Diagram

PIN	Signal	Color
1	Step+ (X1+)	Brown
3	Step- (X1-)	White
6	Direction (X2+)	Yellow
4	Direction- (X2-)	Green
5	Enable+ (X3+)	Pink
8	Enable- (X3-)	Gray
7	CW Limit+ (X4+)	Black
10	CW Limit- (X4-)	Violet
9	CCW Limit+ (X5+)	Red
2	CCW Limit- (X5-)	Blue
11	Fault (Y1)	Gray/Pink
12	Motion out (Y2)	Red/Blue
13	Brake out & Motion out (Y3)	White/Green
14	YCOM	Brown/Green
15	DGND	White/Yellow
+5V	Logic Power	Yellow/Brown
17	Analog Input (AIN)	White/Gray

Circuit diagram

1	BN
3	WH
6	YE
4	GN
5	PK
8	GY
7	BK
10	VT
9	RD
2	BU
11	GY/PK
12	RD/BU
13	WH/GN
14	BN/GN
15	WH/YE
16	YE/BN
17	WH/GY

Controller

Drive

1 X1/STEP+
3 X1/STEP-

6 X2/DIR+
4 X2/DIR-

5 X3+
8 X3-

0VDC

5-24VDC
7 X4/CW LIMIT+
+
NPN
Sensor
-
10 X4/CW LIMIT-

5-24VDC
9 X5/CCW LIMIT+
+
NPN
Sensor
-
2 X5/CCW LIMIT-

16 +5V
100mA Limit

17 AIN
Signal
Conditioning

15 GND

Under 30V

11 Y1/ALARM

12 Y2/IN POSITION

13 Y3/BRAKE

14 YCOM

0VDC

0VDC

0VDC

3.3.2 STEP & DIR Digital Inputs

The TXM34 drives include two high-speed inputs: X1/STEP and X2/DIR. They accept 5 to 24 volt single-ended or differential signals, up to 2 MHz. Typically these inputs connect to an external controller that provides step & direction command signals. You can also connect a master encoder to the high-speed inputs for "following" applications. Or you can use these inputs with Wait Input(WI), Feed to Sensor(FS), Seek Home(SH) and other SCL or Q commands.

The functions for X1/STEP and X2/DIR can be configured by Step-Servo Quick Tuner Software as follows:

X1/STEP: Step signal; CW pulse signal; Quadrature signal A, optional RUN/STOP for velocity mode.

X2/DIR :   Direction signal; CCW pulse signal; Quadrature signal B

The diagrams below show how to connect the STEP & DIR inputs to various commonly used devices.
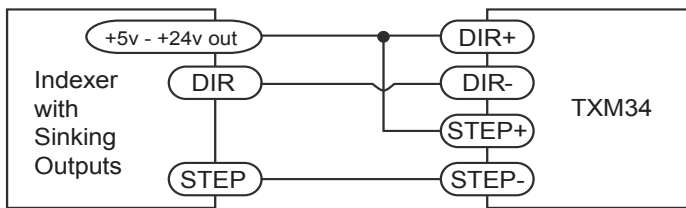
Connecting to Indexer with Sinking Outputs
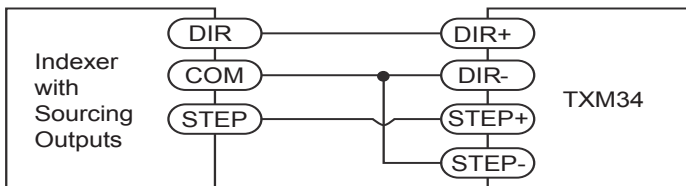
Connecting to Indexer with Sourcing Outputs
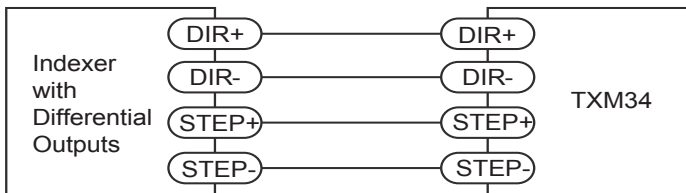
Connecting to Indexer with Differential Outputs
Many high-speed indexers have differential outputs
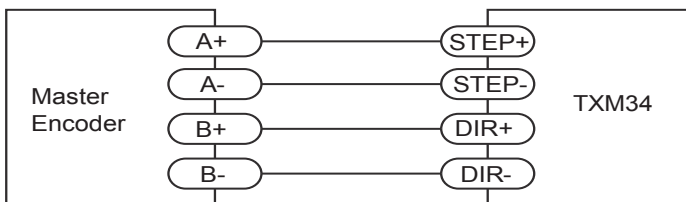
Wiring for Encoder Following

TXM34Q/C/IP Hardware Manual

3.3.3 X3/X4/X5 Digital Inputs

The X3/X4/X5 inputs are designed for low speed digital input operation between 5 and 24 volts optically isolated differential input. They are normally used for end of travel limit switches. The diagrams below show how to connect the X3/X4/X5 Inputs to various commonly used devices.

They can be used with sourcing or sinking signals, 5 to 24 volts. This allows connection to PLCs, sensors, relays and mechanical switches. Because the input circuits are isolated, they require a source of power. If you are connecting to a PLC, you should be able to get power from the PLC power supply. If you are using relays or mechanical switches, you will need a 5-24 V power supply.
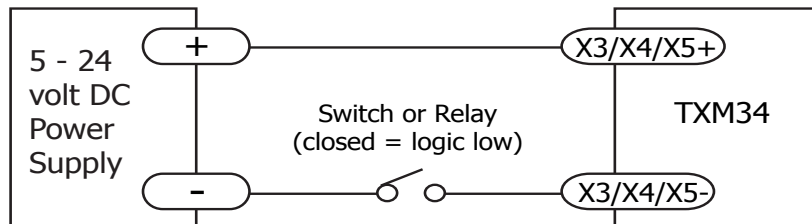
Connecting the Input to a Switch or Relay
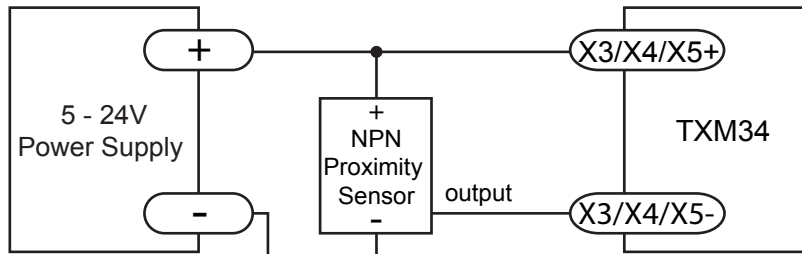
Connecting an NPN type Proximity Sensor to an Input
(when prox sensor activates, input goes low)
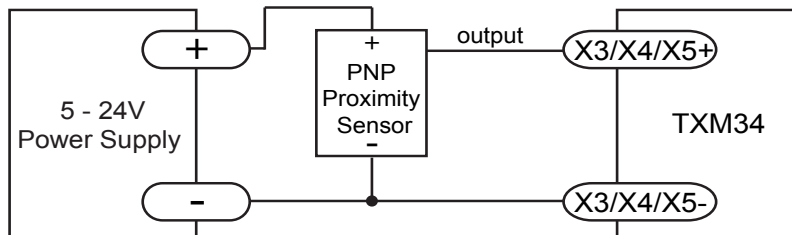
Connecting a PNP type Proximity Sensor to an Input
(when prox sensor activates, input goes low)

3.3.4 AIN Input

The TXM34-Q/C/IP drives have an analog input (AIN) which can accept a signal range of 0 to 5 volts. The drive can be configured to operate at a speed or position that is proportional to the analog signal. Use the Step-Servo Quick Tuner software to set the signal range, offset, dead-band and filter frequency. The TXM34-Q/C/IP provides a +5 volt/100mA limit voltage supply that can be used to power external devices such as potentiometers. It is not the most accurate supply for reference, for more precise readings use an external supply that can provide the desired accuracy.
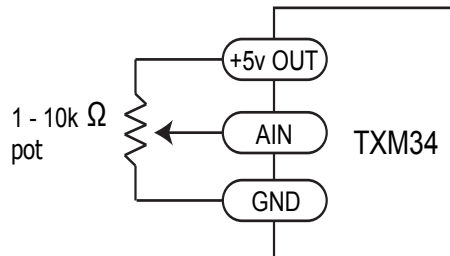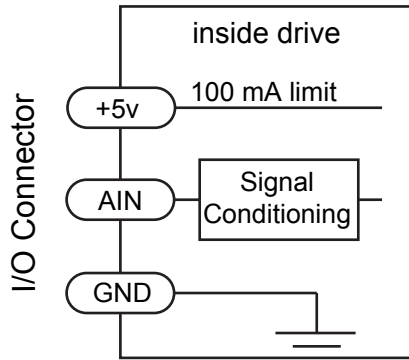
Connecting a Potentiometer to the Analog Input

3.3.5 Programmable Output Y1/Y2/Y3

The TXM34Q/C/IP drives feature three optically isolated digital outputs (Y1 to Y3). Y1, Y2 and Y3 share a common terminal YCOM.

- Y1 can be set to signal a fault condition.
- Y2 can be set to indicate whether the motor is in position(dynamic).
- Y3 can be set to control a motor brake.

These outputs can also be turned on and off by program instructions like Set Output (SO). The output can be used to drive LEDs, relays and the inputs of other electronic devices like PLCs and counters. Diagrams of various connection types follow.

Do not connect the outputs to more than 30 volts. The current through each output terminal must not exceed 100mA
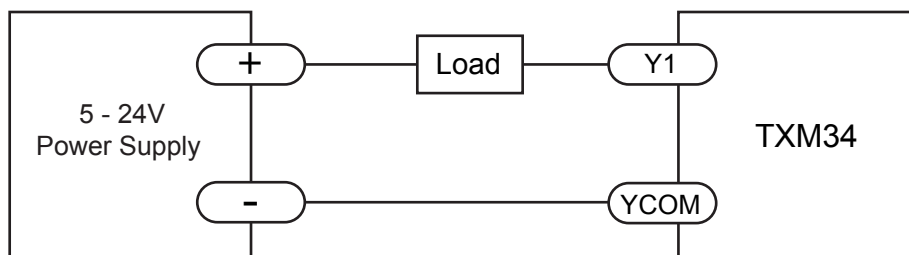
Connecting a Sinking Output
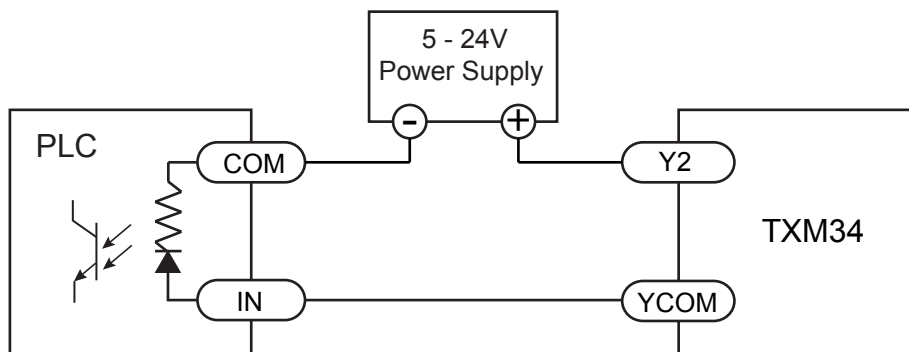
Connecting a Sourcing Output
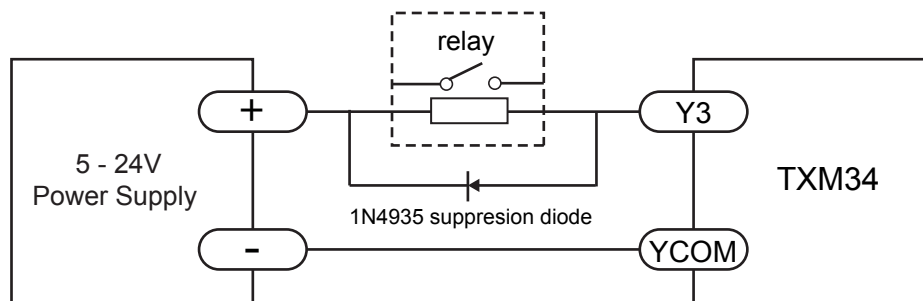
Driving a Relay

4 Troubleshooting

4.1 Status (STAT) LED Error Codes

The TXM34 uses a bi-color LED to indicate status. When the motor is enabled, the LED slowly flashes green. When the LED is solid green, the motor is disabled. Errors are indicated by combinations of red and green flashes as shown below. This feature can be disabled for certain warnings but not for alarms. See software manual for information on how to do this and which warnings may be masked.

Code		Error
🟢	Solid green	no alarm, motor disabled
🟢🟢	Flashing green	no alarm, motor enabled
🔴🟢	1 red, 1 green	*position limit*
🔴🟢🟢	1 red, 2 green	move while disabled
🔴🔴🟢	2 red, 1 green	CCW limit
🔴🔴🟢🟢	2 red, 2 green	CW limit
🔴🔴🔴🟢	3 red, 1 green	*drive over temperature*
🔴🔴🔴🟢🟢	3 red, 2 green	*internal voltage out of range*
🔴🔴🔴🟢🟢🟢	3 red, 3 green	blank Q segment
🔴🔴🔴🔴🟢	4 red, 1 green	*power supply overvoltage*
🔴🔴🔴🔴🟢🟢	4 red, 2 green	power supply undervoltage
🔴🔴🔴🔴🔴🟢	5 red, 1 green	*over current*
🔴🔴🔴🔴🔴🔴🟢	6 red, 1 green	*open winding*
🔴🔴🔴🔴🔴🔴🟢🟢	6 red, 2 green	*bad encoder*
🔴🔴🔴🔴🔴🔴🔴🟢	7 red, 1 green	communication error
🔴🔴🔴🔴🔴🔴🔴🟢🟢	7 red, 2 green	flash memory error

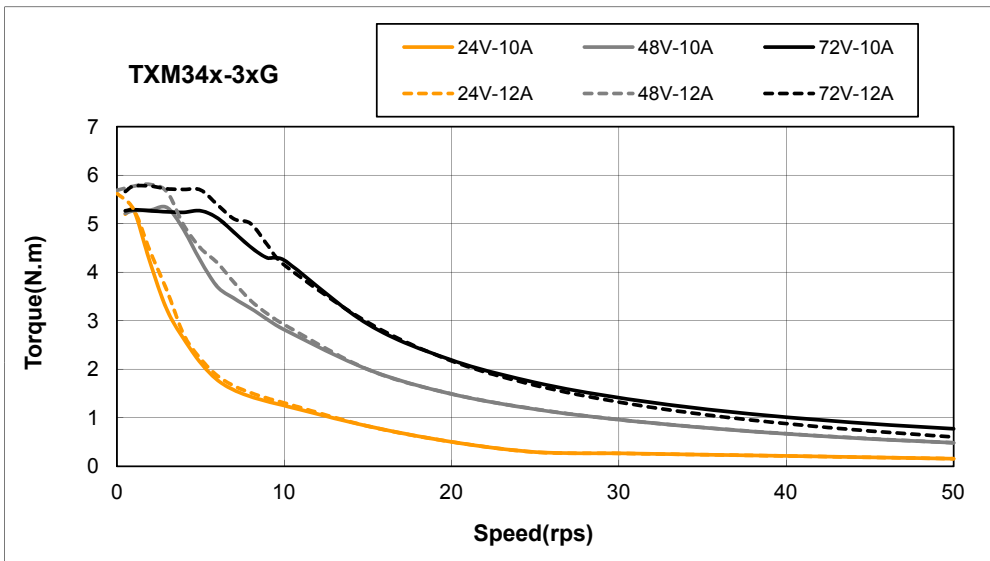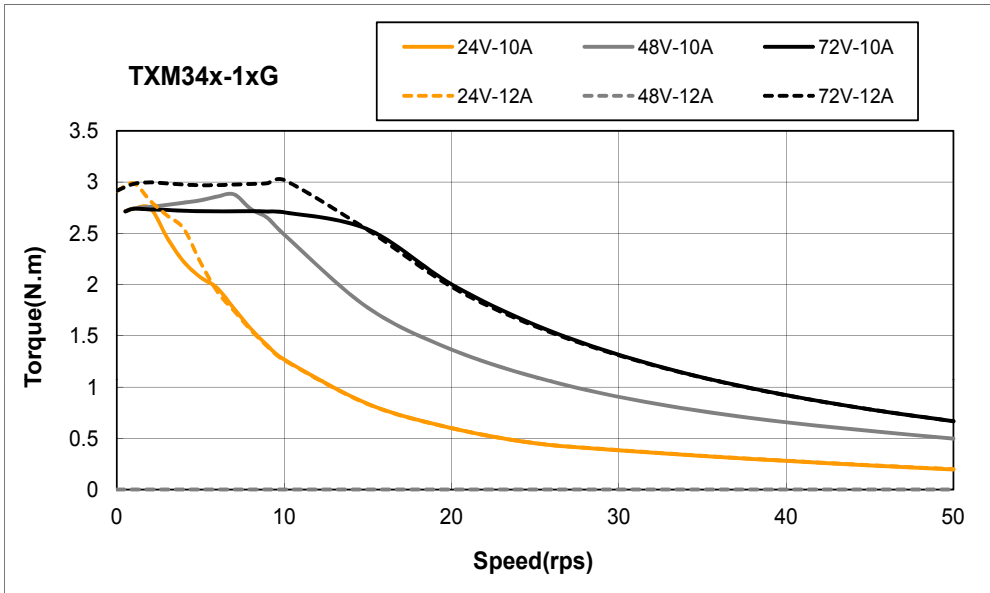NOTE: Items in **bold italic** represent drive Faults, which automatically disable the motor.
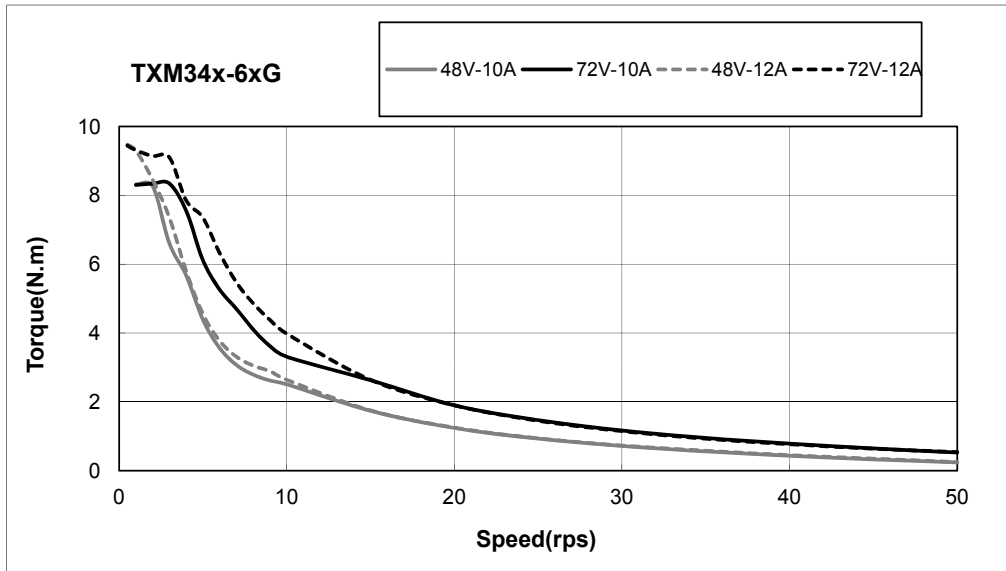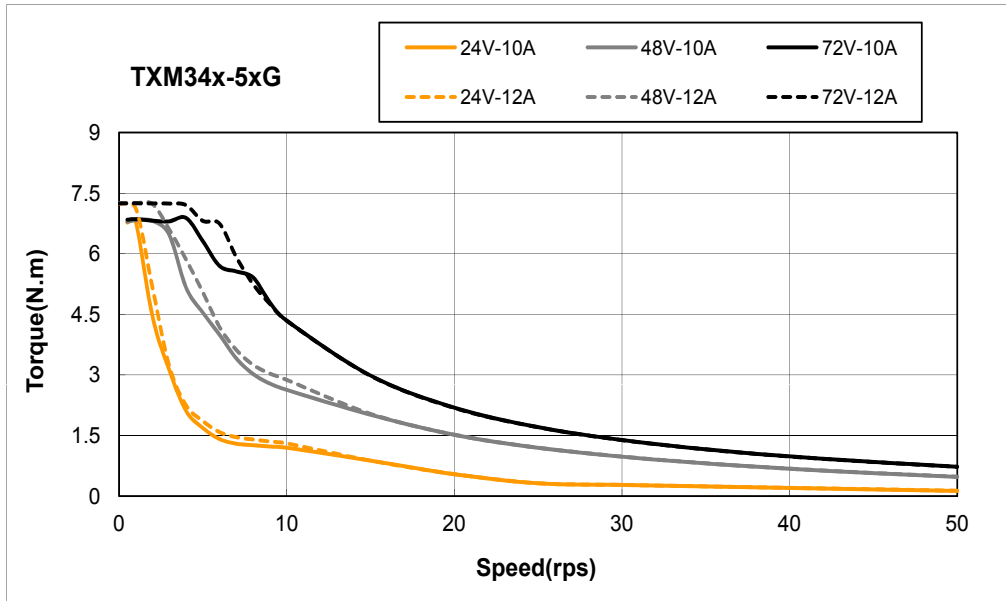
4.2 Auxiliary Power (AUX) LED

If the auxiliary power is connected, this yellow LED will be solid when the power is on.

5 Reference Materials

5.1 Torque-Speed Curves
Note: All torque curves are at 10 amps rated continuous current, and 12A for boost torque

TXM34x-5xG

Legend: 24V-10A, 48V-10A, 72V-10A, 24V-12A, 48V-12A, 72V-12A

Y-axis: Torque(N.m), X-axis: Speed(rps)

TXM34x-6xG

Legend: 48V-10A, 72V-10A, 48V-12A, 72V-12A

Y-axis: Torque(N.m), X-axis: Speed(rps)

5.2 Mechanical Outlines
TXM34Q-xAG
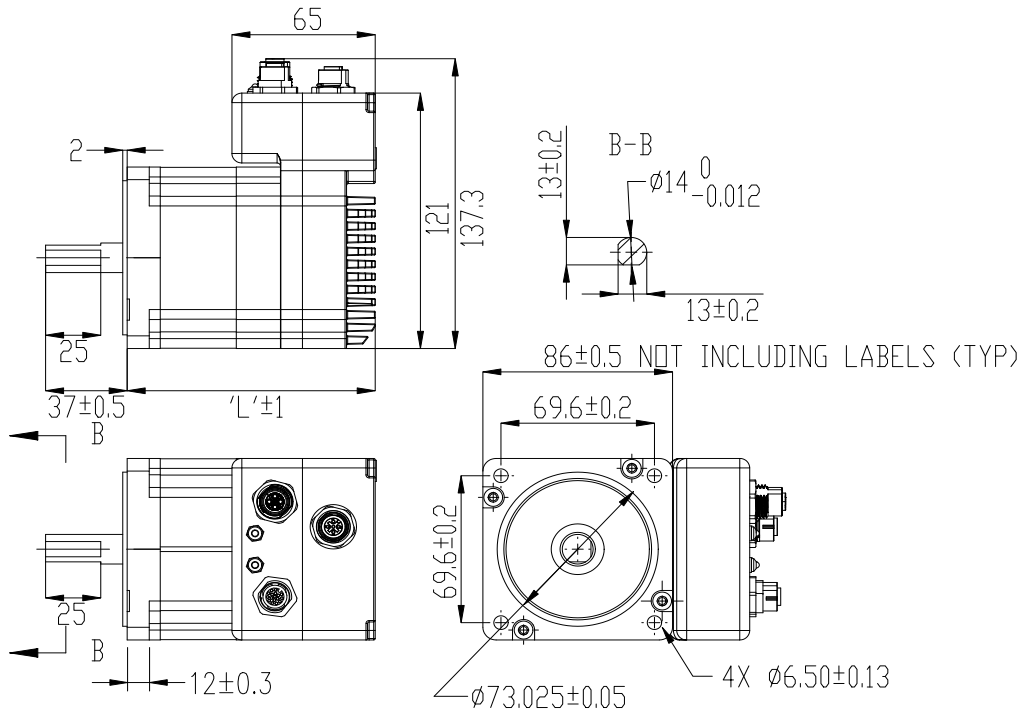
TXM34Q-xRG/TXM34C-xCG
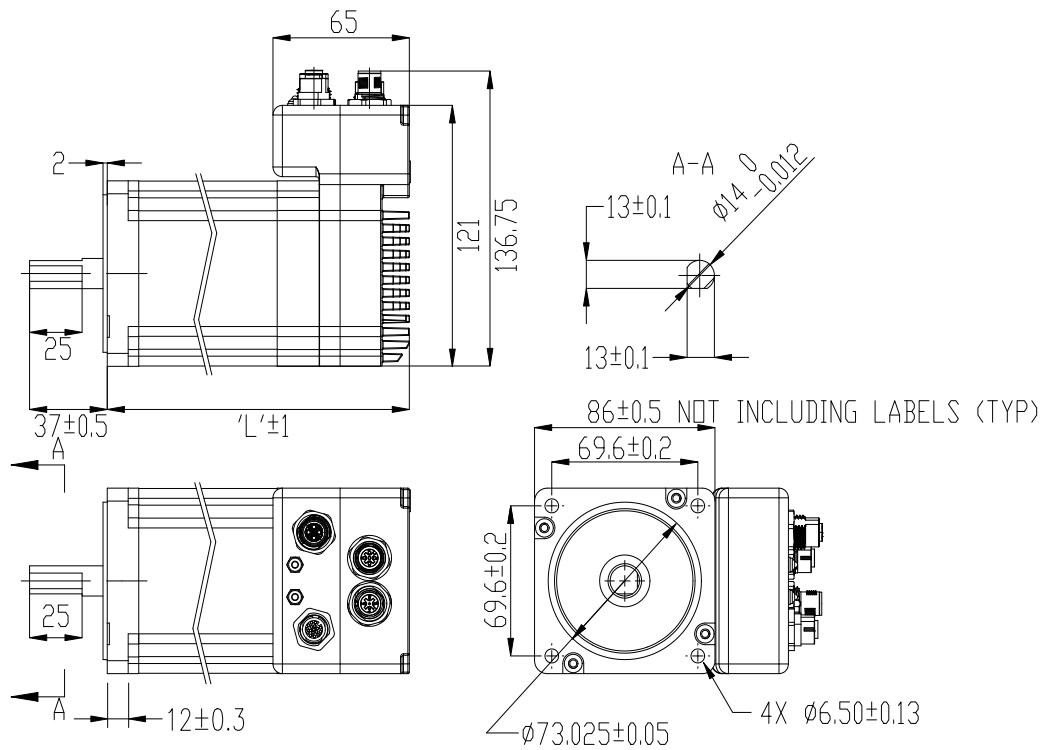
TXM34Q-xDG
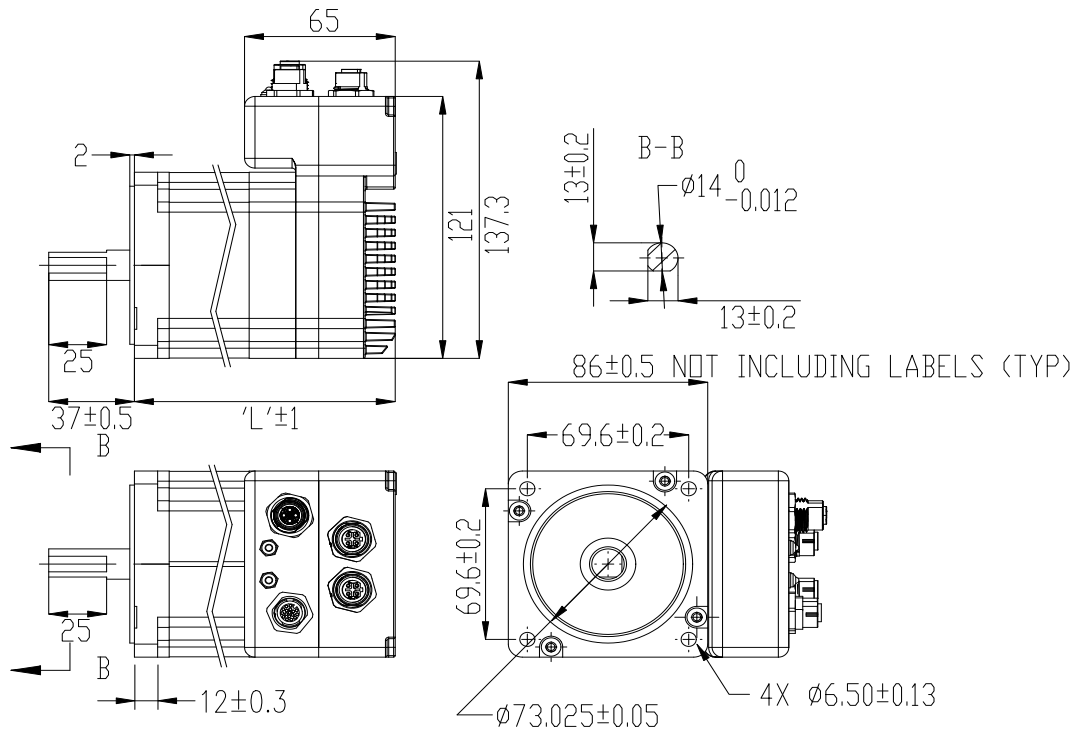
Unit: mm

Model	Length "L"	Front shaft diameter
TXM34□-1□G	112.5	
TXM34□-3□G	143	14
TXM34□-5□G	172.5	
TXM34□-6□G	203	

Shaft Loading Data

Model	Permissable Shaft Loading (unit: n)					Permissable Thrust Load
	Distance (L) from shaft end (mm)					
	0	5	10	15	20	
TXM34□-1□G						
TXM34□-3□G	260	290	340	390	480	Less than the motor mass
TXM34□-5□G						
TXM34□-6□G						

## 5.3 Technical Specifications

| Power Amplifier	
Amplifier Type	Dual H-Bridge, 4 Quadrant
Current Control	4 state PWM at 20 KHz
Output Torque	TXM34Q/C/IP-1□G: Up to 2.9 N-m continuous TXM34Q/C/IP-3□G: Up to 5.6 N-m continuous TXM34Q/C/IP-5□G: Up to 7.2 N-m continuous TXM34Q/C/IP-6□G: Up to 9.5 N-m continuous
Power Supply	External 24 - 70 VDC main power supply, 12-48 VDC auxiliary power supply
Protection	Over-voltage, under-voltage, over-temp, motor/wiring shorts (phase-to-phase, phase-to-ground)
Controller	
Electronic Gearing	Software selectable from 200 to 51200 steps/rev in increments of 2 steps/rev
Encoder Resolution	20000 counts/rev
Speed Range	Up to 3600rpm
Filters	Digital input noise filter, Analog input noise filter, Smoothing filter, PID filter, Notch filter
Non-Volatile Storage	Configurations are saved in FLASH memory on-board the DSP
Modes of Operation	TXM34Q: Step & direction, CW/CCW pulse, A/B quadrature pulse, velocity (oscillator, joystick), streaming commands (SCL or eSCL), Q program execution TXM34C: CANopen control with stored Q program execution
Digital Inputs	Adjustable bandwidth digital noise rejection filter on all inputs **X1/X2**: Optically isolated, 5-24 volt, min. pulse width = 250 ns, max. pulse frequency = 2 MHz Function: Pulse/Direction, CW/CCW Pulse, A/B quadrature (encoder following), (start/stop)/direction (oscillator mode), or general purpose input **X3/X4/X5:** Optically isolated, 5-24 volt, min. pulse width = 100 μs, max. pulse frequency = 5 KHz Function: Servo on/off, Alarm/Fault Reset, CW/CCW Limit, or general purpose input
Digital Outputs	**Y1/Y2/Y3:** Optically isolated, 30V/100mA max Open Collector Output. Function: Alarm/Fault, In Position (dynamic/static), Brake Control, Tach out, Timing out, or general purpose usage
Communication Interface	RS-232 , RS-485, CANopen, Dual port Ethernet, 100 MB
Physical	
Ambient Temperature	0 to 40°C (32 to 104°F) when mounted to a suitable heatsink
Humidity	90% Max., non-condensing
Mass	TXM34Q/C/IP-1□G: 2100 g TXM34Q/C/IP-3□G: 3200 g TXM34Q/C/IP-5□G: 4300 g TXM34Q/C/IP-6□G: 5500 g
Rotor Inertia	TXM34Q/C/IP-1□G: 915 g•cm^2 TXM34Q/C/IP-3□G: 1480 g•cm^2 TXM34Q/C/IP-5□G: 2200 g•cm^2 TXM34Q/C/IP-6□G: 3660 g•cm^2

5.4 Optional Accessories

Power Supplies

Applied Motion Products recommends using the following switching power supplies

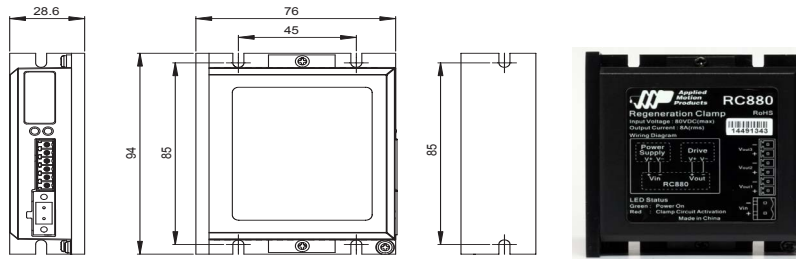### P/N: PS150A24 150W, 24VDC
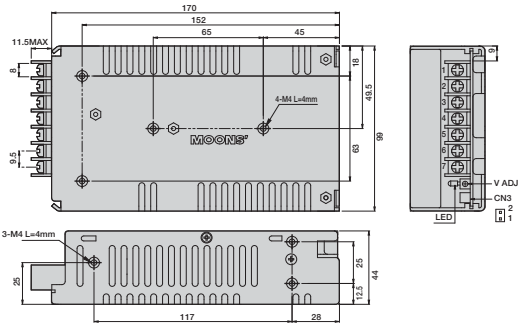
P/N: PS320A48 320W, 48VDC
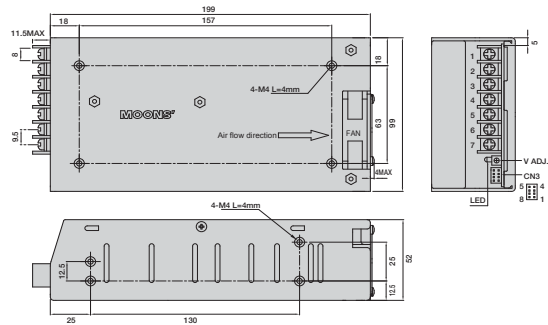
### Regeneration Clamp

P/N: RC880

When using a regulated power supply you may encounter a problem with regeneration. The kinetic energy caused by regeneration is transferred back to the power supply. This can trip the overvoltage protection of a switching power supply, causing it to shut down.

 Applied Motion Products offers the RC880 "regeneration clamp" to solve this problem. If in doubt, use an RC880 for the first installation. If the "regen" LED on the RC880 never flashes, you don't need the clamp.

USB Serial Adapter   P/N: 8500-003

USB to RS-232 P/N: 3004-235 (Optional)
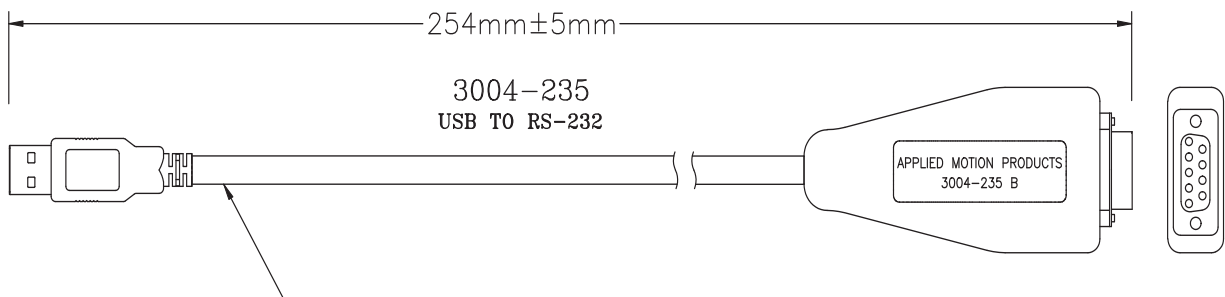
Mating Cables (Optional)

CABLE	PART NUMBER	DESCRIPTION
Power, Angled	3004-331-2M	M12 4 pin angled power cable, 2 meter, S-coded, unshielded
Power, Straight	3004-332-2M	M12 4 pin straight power cable, 2 meter, S-coded, unshielded
I/O, Angled	3004-333-3M	M12 angled I/O cable, 3 meter, A-coded, shielded
I/O, Straight	3004-334-3M	M12 straight I/O cable, 3 meter, A-coded, shielded
RS-232 communication	3004-278-5M	M12 5 pin connector to DB-9F, A-coded, shielded
RS485 & CANopen communication	3004-288-5M	M12 5 pin A coded connector to flying leads, A-coded, shielded
Ethernet configuration	3004-280-5M	M12 4 pin M12 connector to RJ45, D-coded, shielded
Ethernet Daisy chain cable	3004-335-XX	Straight M12, D-coded Ethernet connector on each end
Ethernet Daisy chain cable	3004-345-XX	Angled M12, D-coded Ethernet connector on each end

Available for purchase at Applied Motion Products website.

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