MOONS'
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TSM34P

Integrated Step-Servo Motor

Hardware Manual
Rev. 1.0

SHANGHAI AMP&MOONS' AUTOMATION CO.,LTD.

Table of Contents

TSM34P Models Available

Model	Communications
	RS-232
TSM34P-1AG	✓
TSM34P-3AG	✓
TSM34P-5AG	✓
TSM34P-6AG	✓

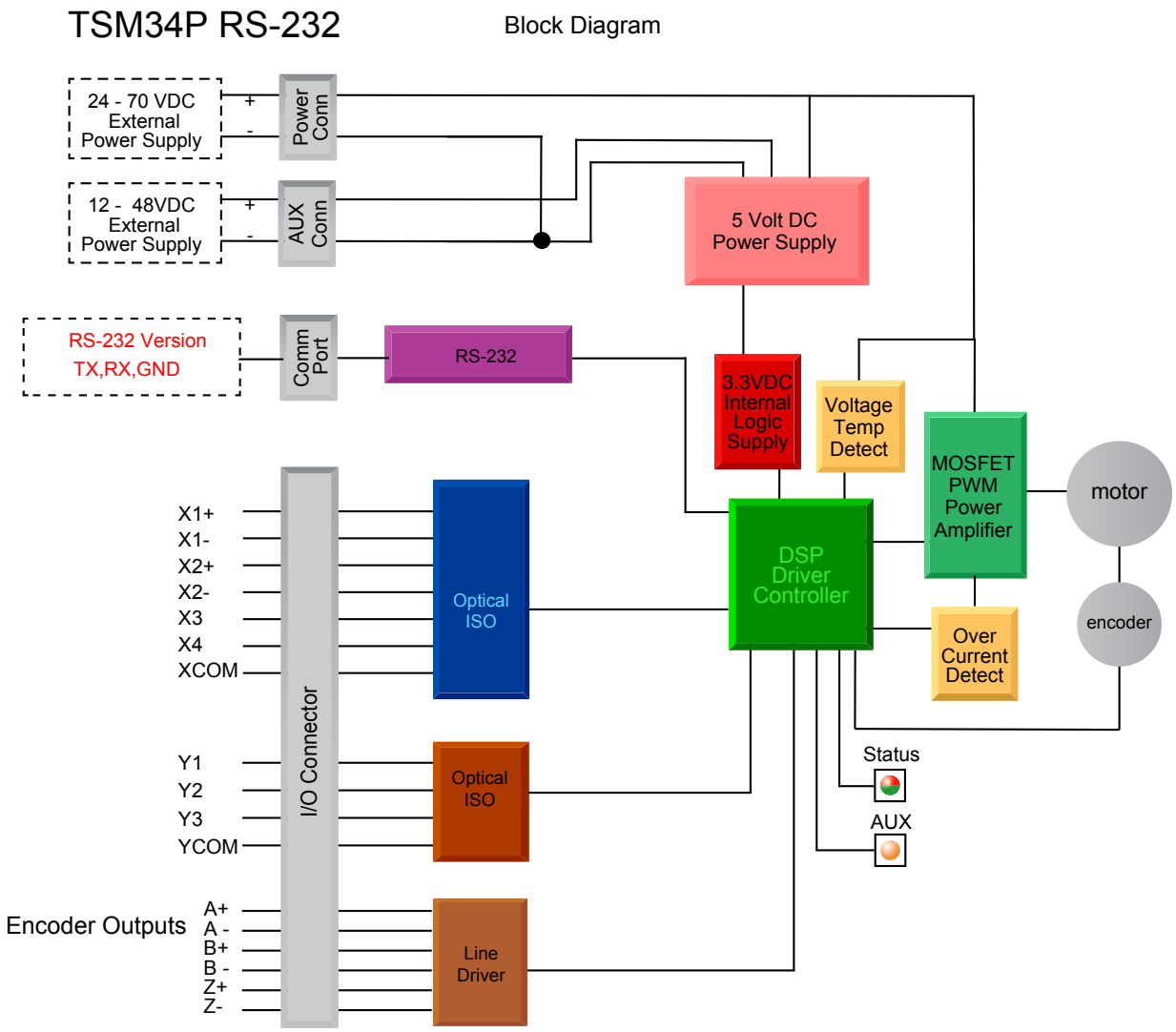
1 Introduction

Thank you for selecting MOONS' TSM34P Integrated Motor. The TSM line of integrated step-servo motors combines servo technology with an integrated motor to create a product with exceptional features and broad capabilities. 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 from 12 to 48 volt DC
- Control Modes
    - Position Control Digital Signal type
    - Step & Direction
    - CW & CCW pulse
    - A/B Quadrature (Encoder Following)
- Communications
    - RS-232
- 5000 line (20,000 counts/rev) encoder feedback
- Available torque
    - TSM34P-1AG: Up to 2.9N•m Continuous
    - TSM34P-3AG: Up to 5.6N•m Continuous
    - TSM34P-5AG: Up to 7.2N•m Continuous
    - TSM34P-6AG: Up to 9.5N•m Continuous
- I/O
    - 4 optically isolated digital inputs, with adjustable bandwidth digital noise rejection filter, 5 to 24 volts
    - 3 optically isolated digital outputs, 30V/100 mA max.
    - Differential encoder outputs (A±, B±, Z±), 26C31 line driver, 20 mA sink or source max
- Technological advances
    - Full servo control, Closed loop
    - Efficient, Accurate, Fast, Smooth
    - Intelligent, Compact

1.2 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. MOONS' 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.

2 Getting Started

The following items are needed:

- a 24 - 70 Volt DC power supply, see the section below entitled “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, or Windows 7, 8, or 10
- a MOONS’ programming cable (included)

2.1 Installing the Software

Before using the TSM34P Integrated Step-Servo Motor and Step-Servo Quick Tuner Software in an application, the following steps are necessary. See the Quick Setup Guide for brief information on setting up and configuring the PC and drive.

- Download the Step-Servo Quick Tuner from MOONS' website.
- Install the Step-Servo Quick Tuner software application.
- Connect the drive to the PC using the programming cable. (See section 3.2.1 "Connecting to a PC using RS-232")
- Choose the correct COM port. (See Section 3.2.2 "Choosing the Right COM Port")
- Run the software application.
- Apply power to the drive.
- The software will communicate with the drive and display the model & firmware version.
- Follow the steps in the Step-Servo Quick Tune” to set up.

2.2 Mounting the Hardware

As with any step motor, the TSM34P 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 put the drive where it can get wet.
- Never use the drive where metal or other electrically conductive particles can infiltrate 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 TSM34P 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 TSM34P 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 voltage 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, TSM34 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 Keep Alive Recovery with I/O Function

1. After the main power is removed and the logic remains powered, an undervoltage or internal bad voltage 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 bad voltage 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 reenable after using the alarm reset function.

3. Resume motion and normal program operation.

2.3.2.2 Keep Alive Recovery with SCL

1. After the main power is removed and the logic remains powered, an undervoltage 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.

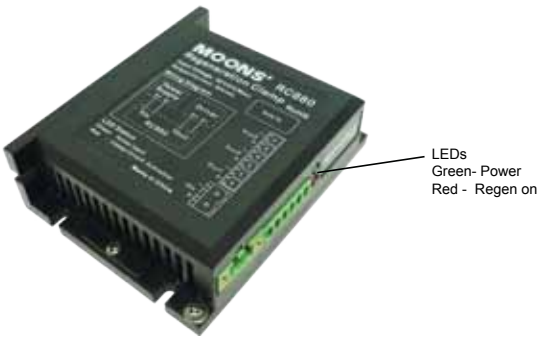
3. After the main power supply has been restored, the fault must be cleared. To clear the fault, send the AR command. The alarm word will become 0. If the fault that occurred wasinternal voltage out of range, the motor will remain disabled. Send the ME command to enable the motor. The the fault was undervoltage,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

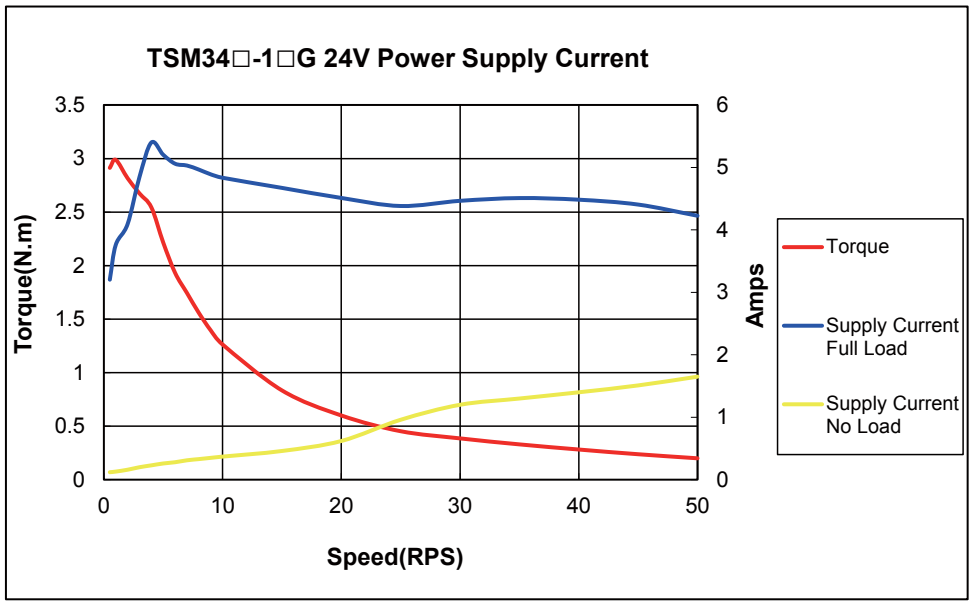


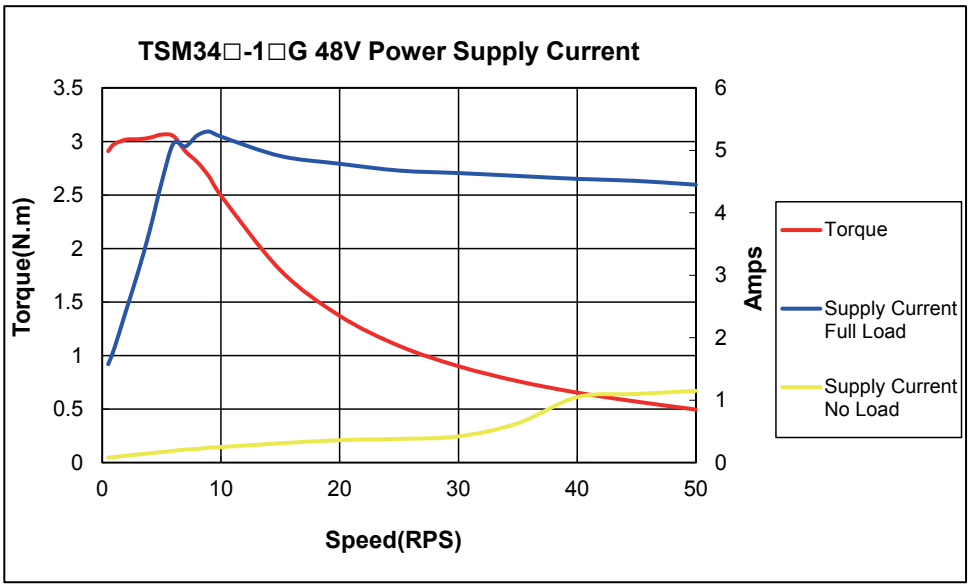
RC880 Regen Clamp

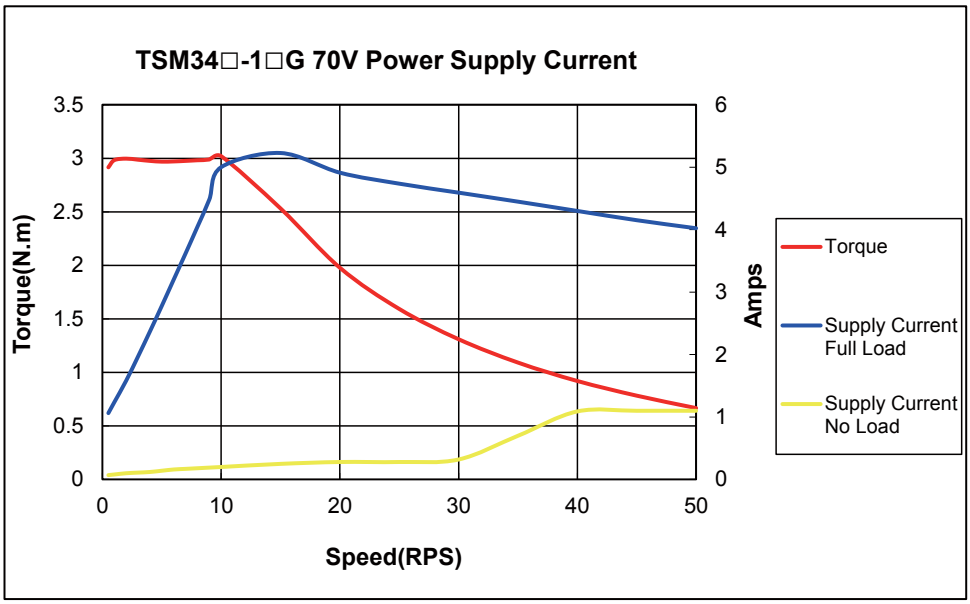
2.3.4 Supply Current

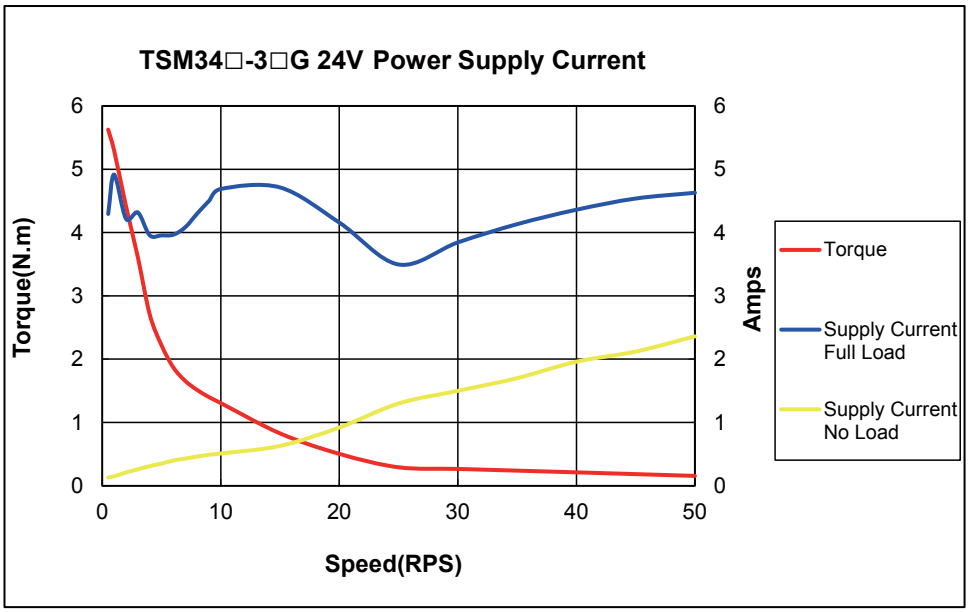
The maximum supply currents required by the TSM34P are shown in the charts below at different power supply voltage inputs. The TSM34P power supply current is lower than the winding currents because it uses switching amplifiers to convert a high voltage and low current into lower voltage and higher current. The more the power supply voltage exceeds the motor voltage, the less current will be required from the power supply.

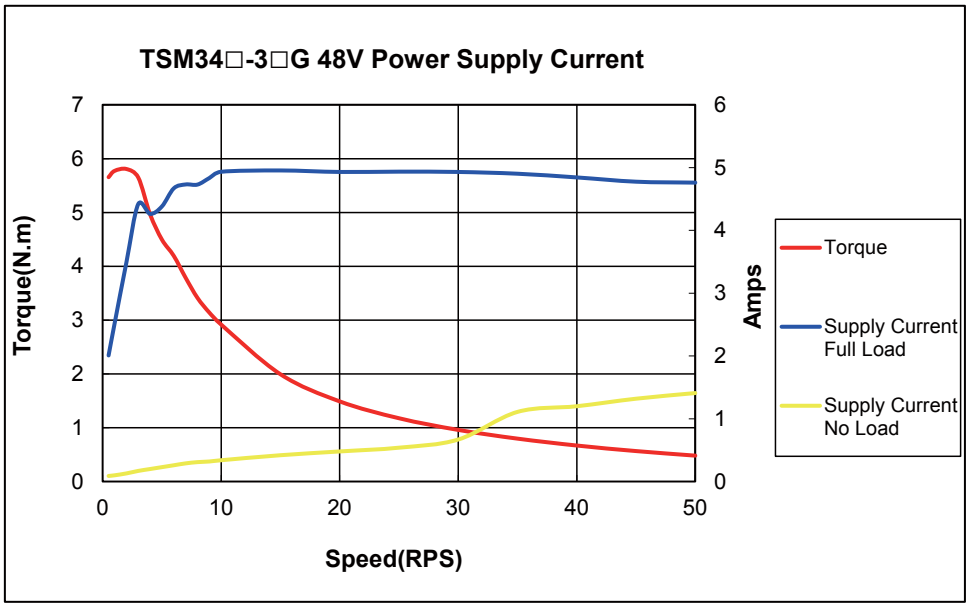
It is important to note that the current draw is significantly different at higher speeds depending on the torque load to the motor. Estimating how much current is necessary may require a good analysis of the load the motor will encounter.

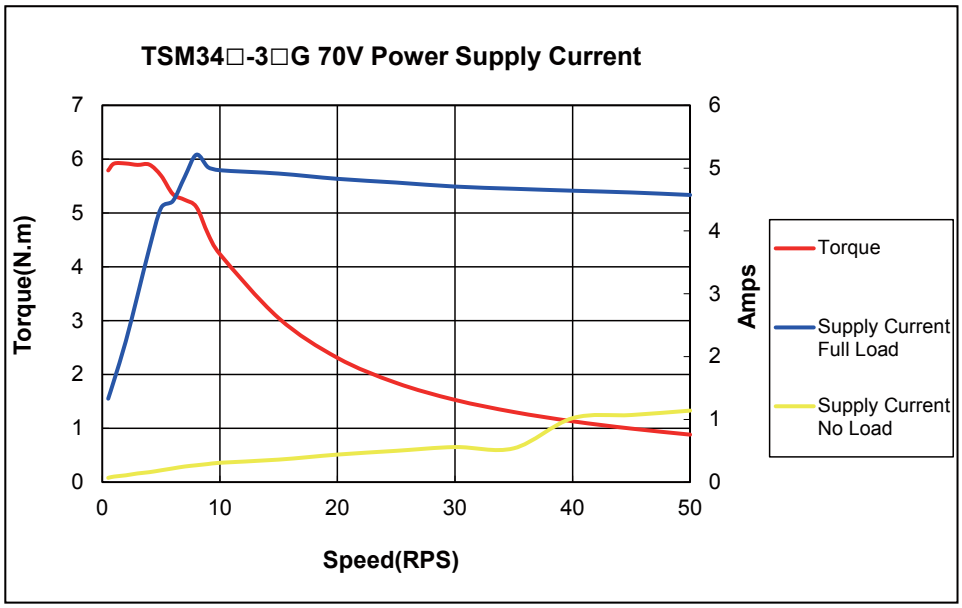

TSM34□-1□G 24V Power Supply Current
Torque(N.m)
Amps
Speed(RPS)
Torque
Supply Current Full Load
Supply Current No Load

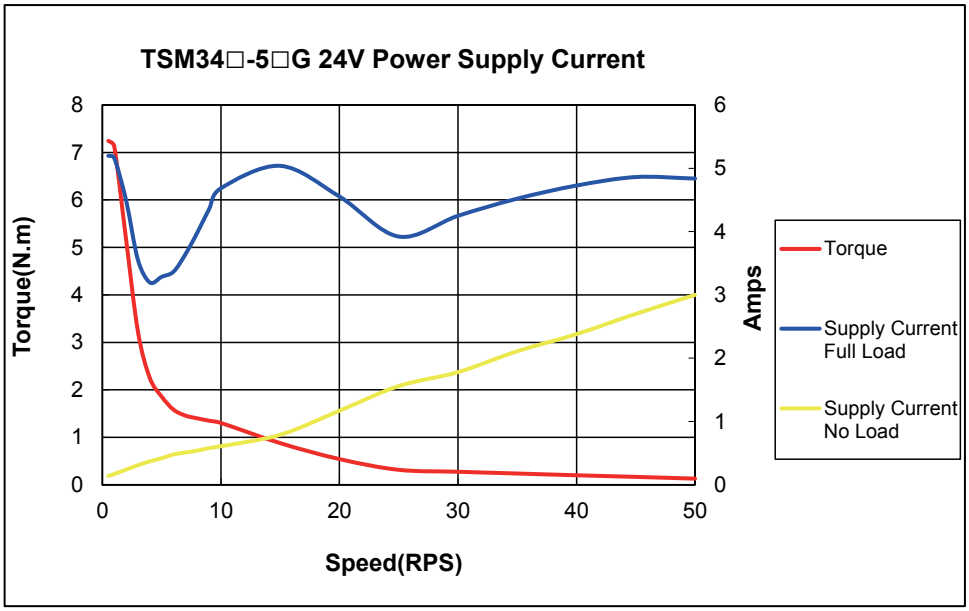

TSM34□-1□G 48V Power Supply Current
Torque(N.m)
Amps
Speed(RPS)
Torque
Supply Current Full Load
Supply Current No Load

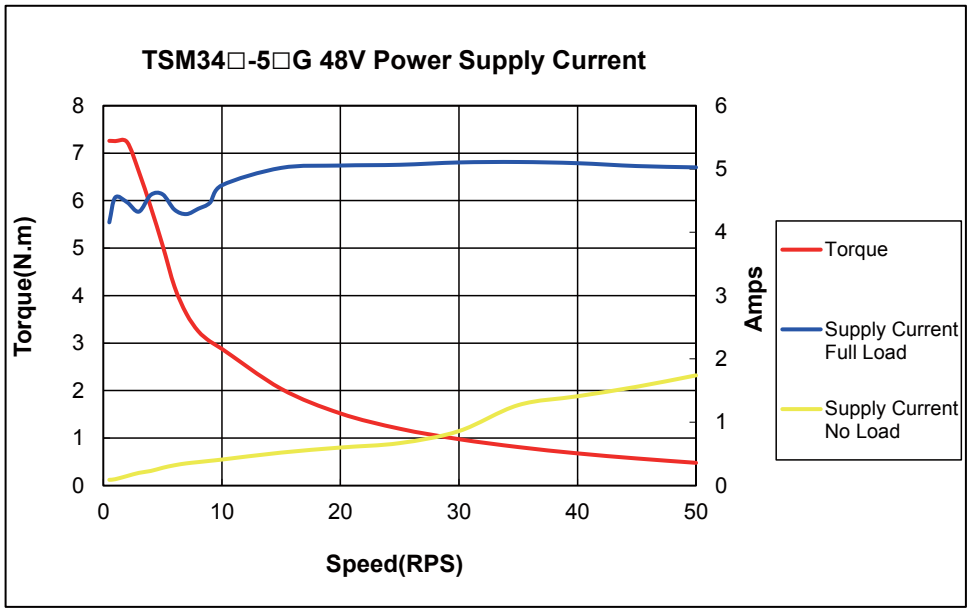

TSM34□-1□G 70V Power Supply Current
Torque(N.m)
Amps
Speed(RPS)
Torque
Supply Current Full Load
Supply Current No Load

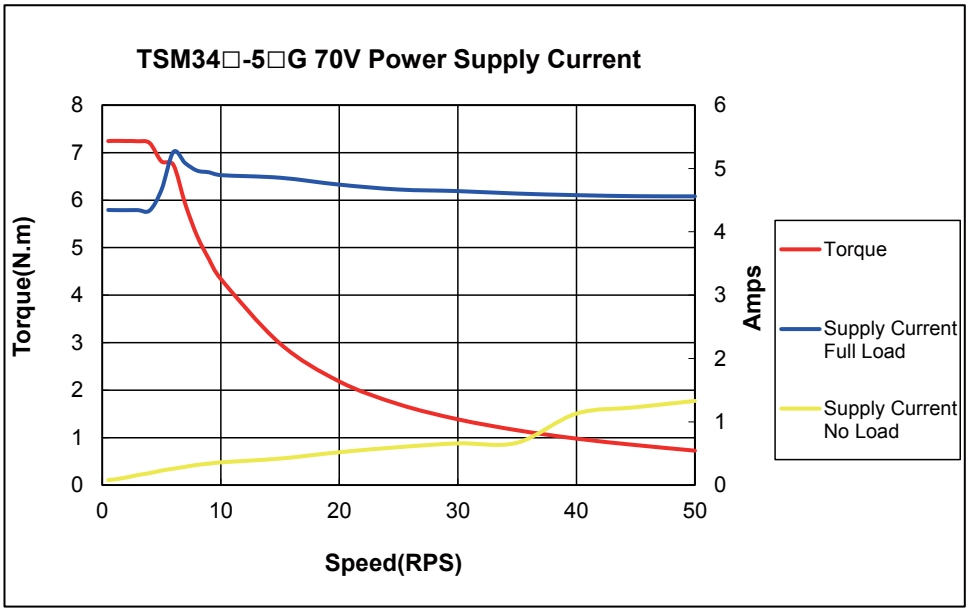

TSM34□-3□G 24V Power Supply Current
Torque(N.m)
Amps
Speed(RPS)
Torque
Supply Current Full Load
Supply Current No Load


TSM34□-3□G 48V Power Supply Current
Torque(N.m)
Amps
Speed(RPS)
Torque
Supply Current Full Load
Supply Current No Load


TSM34□-3□G 70V Power Supply Current
Torque(N.m)
Amps
Speed(RPS)
Torque
Supply Current Full Load
Supply Current No Load


TSM34□-5□G 24V Power Supply Current
Torque(N.m)
Amps
Speed(RPS)
Torque
Supply Current Full Load
Supply Current No Load


TSM34□-5□G 48V Power Supply Current
Torque(N.m)
Amps
Speed(RPS)
Torque
Supply Current Full Load
Supply Current No Load


TSM34□-5□G 70V Power Supply Current
Torque(N.m)
Amps
Speed(RPS)
Torque
Supply Current Full Load
Supply Current No Load

3 Installation/Connections

3.1 Connecting the Power Supply

Use 16 to 20-gauge wire to connect the TSM34 to a power supply. It contains an internal fuse connected to the “+” terminal that is not user replaceable. If a user serviceable fuse is desired, install a 10 amp fast acting fuse in line with the “+” power supply lead.

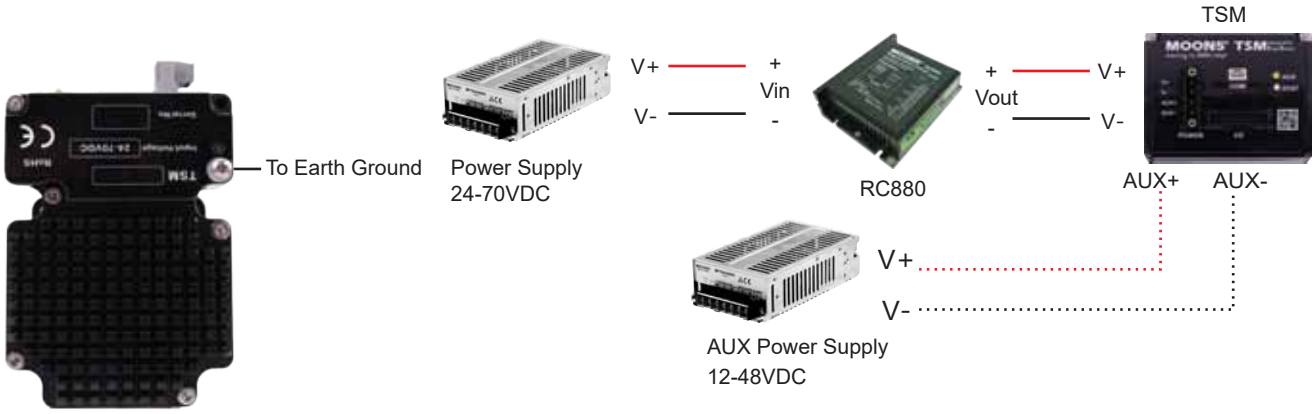
3.1.1 Connect Main Power Supply

Connect power supply “+” to drive’s “V+” terminal

Connect power supply “-” to drive’s “V-” terminal

TSM34 needs 24 to 70VDC for the main power supply

Be careful not to reverse the wires. Reversing the connection may open the internal fuse on the drive and void the warranty.



3.1.2 Connect Auxiliary Power Supply

If auxiliary power is needed to use the Keep Alive function, an extra power supply is required.

Connect power supply “+” to drive’s “AUX+” terminal

Connect power supply “-” to drive’s “AUX-” terminal

TSM34 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.

3.2 Connecting the TSM34P Communications

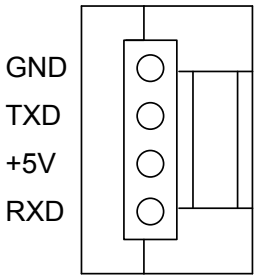
The TSM34P comes with a cable that will provide the interface to an RS-232 port through a DB9 style connector.

3.2.1 Connecting to a PC using RS-232

Locate the TSM34P within 1.5 meters of the PC. Plug the DB9 connector of the communication cable that came with the drive into the serial port of the PC. Plug the small end into the crimp style connector on the TSM34P. Secure the cable to the PC with the screws on the DB9 connector.

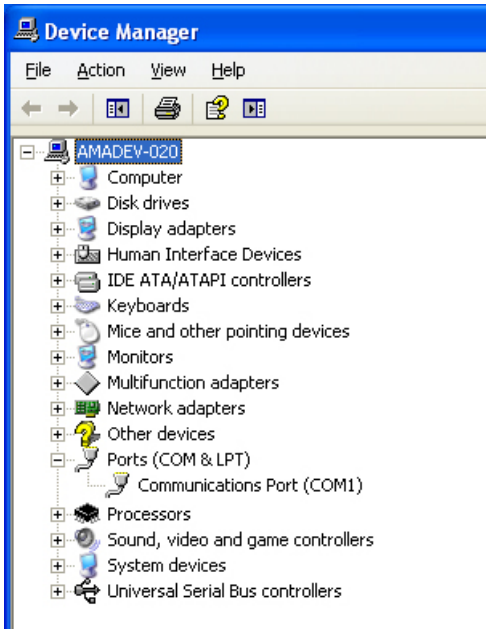
Note: If the PC does not have an RS-232 serial port, a USB to RS-232 Serial Converter will be needed. You can contact MOONS' to buy a USB to RS-232 converter.

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.



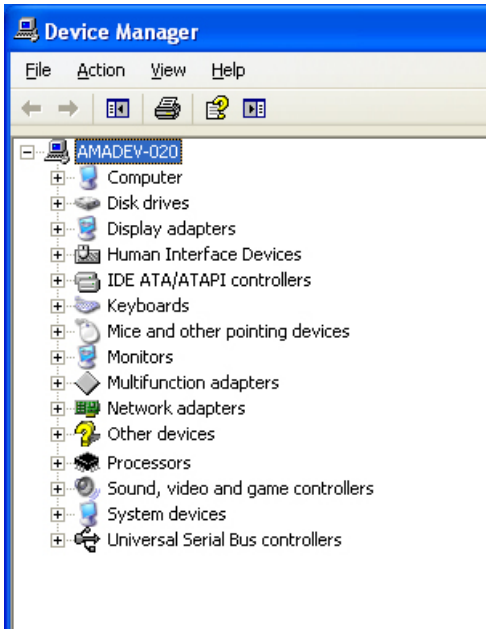
3.2.2 Choosing the Right COM Port

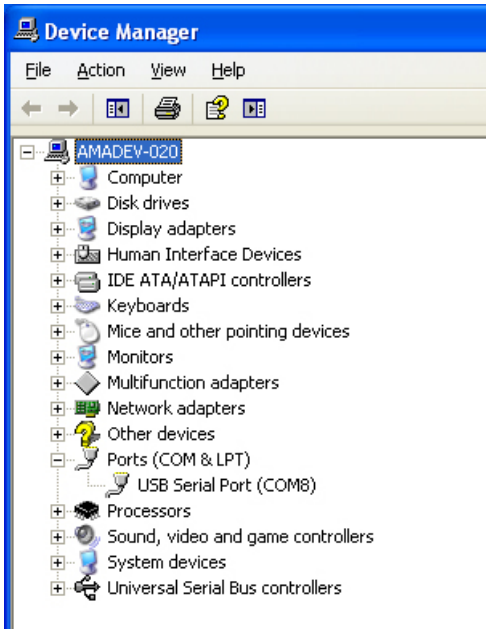
Open the "Device Manager" on the PC. If the PC has an built-in RS-232 serial port, "Ports (COM & LPT)" will be displayed. Connect the PC and drive with the included RS-232 communication cable. Choose the connected COM(n) port in the Step-Servo Quick Tuner software.



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. Connect the adapter to the PC, this USB adapter COM port should then be displayed. Choose this new COM(n) port in the Step-Servo Quick Tuner software.

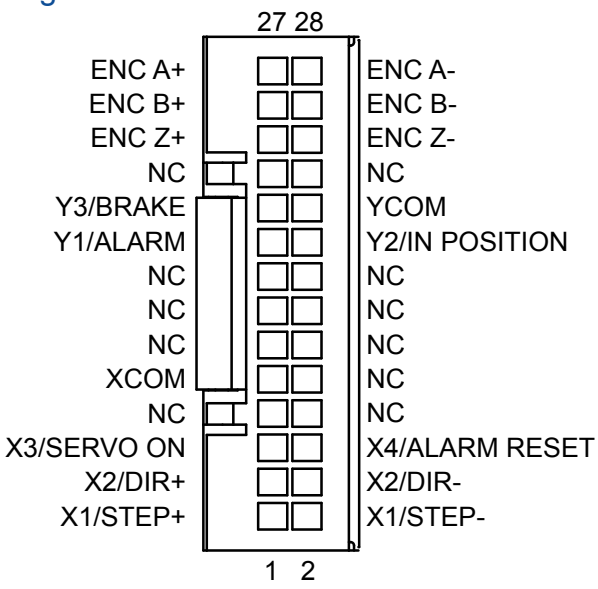


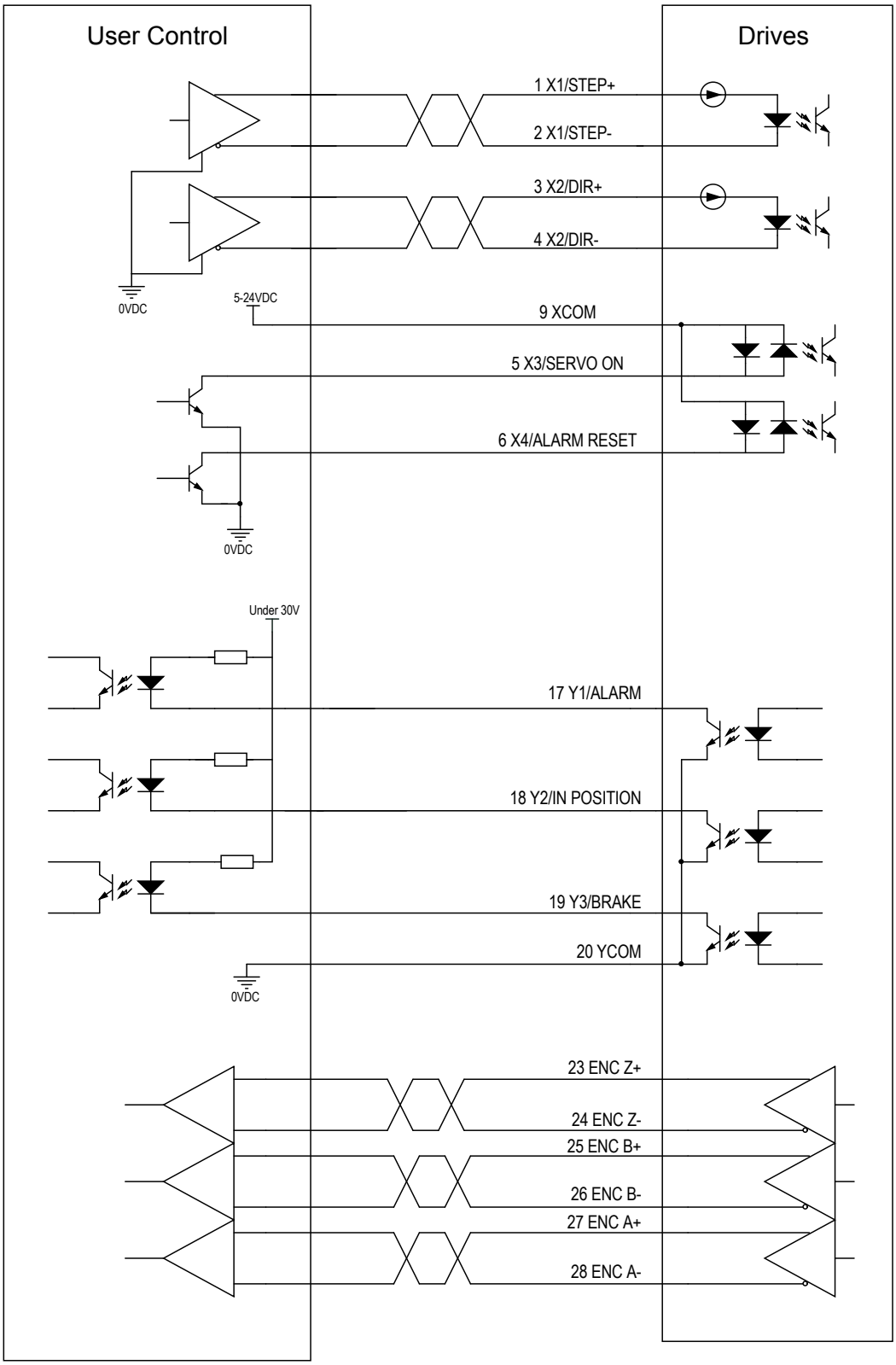


3.3 Inputs and Outputs

All TSM34P drives include 4 digital inputs and 3 digital outputs.

3.3.1 Connector Pin Diagram




User Control
Drives
1 X1/STEP+
2 X1/STEP-
3 X2/DIR+
4 X2/DIR-
0VDC
5-24VDC
9 XCOM
5 X3/SERVO ON
6 X4/ALARM RESET
0VDC
Under 30V
17 Y1/ALARM
18 Y2/IN POSITION
19 Y3/BRAKE
20 YCOM
0VDC
23 ENC Z+
24 ENC Z-
25 ENC B+
26 ENC B-
27 ENC A+
28 ENC A-

3.3.2 X1/STEP and X2/DIR High Speed Digital Inputs

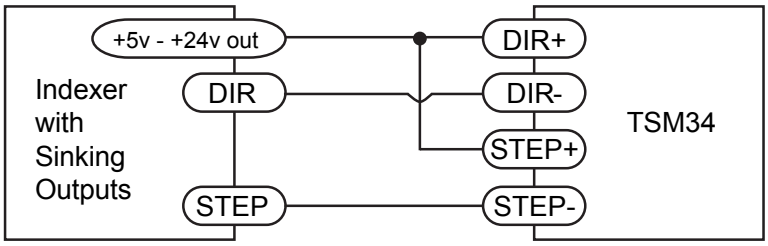
The TSM34P drives include two high-speed inputs: X1/STEP and X2/DIR. They accept 5 to 24 volt single-ended or differential signals, up to 2 MHz. Typically these inputs connect to an external controller that provides step & direction command signals. You can also connect a master encoder to the high-speed inputs for “following” applications.

The functions for X1/STEP and X2/DIR can be configured by the Step-Servo Quick Tuner software. The function are as follows:

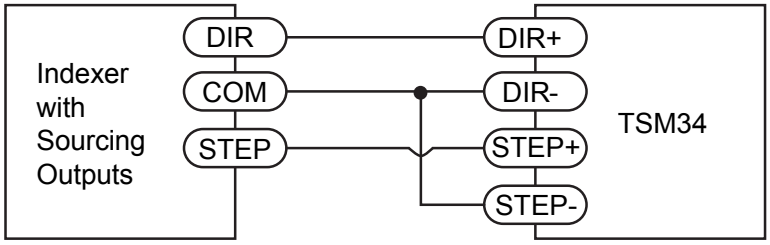
X1/STEP: Step signal; CW pulse signal; Quadrature signal A

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

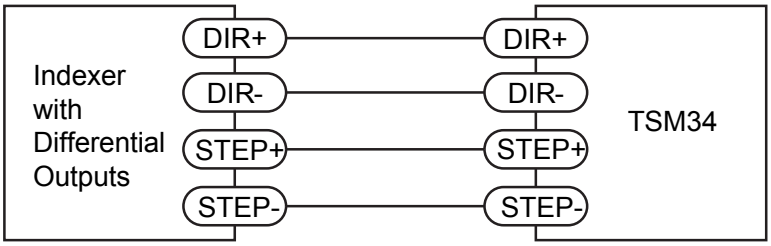
The diagrams below show how to connect the STEP & DIR Inputs to various commonly used devices.



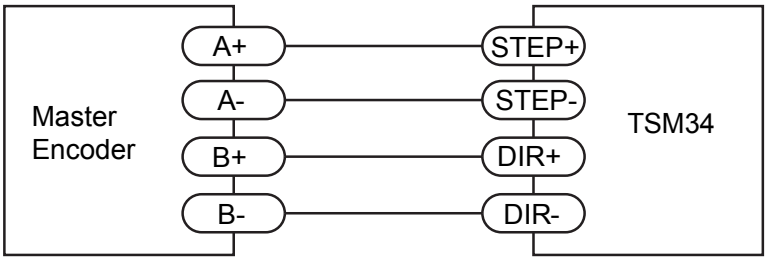
Connecting to Indexer with Sinking Outputs



Connecting to Indexer with Sourcing Outputs



Connecting to Indexer with Differential Outputs
Many high-speed indexers have differential outputs



Wiring for Encoder Following

3.3.3 X3/EN and X4/AR Digital Inputs

The TSM34 drives include two single ended inputs: X3/EN and X4/AR. 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.

The functions for X3/EN and X4/AR can be configured by the Step-Servo Quick Tuner software. The functions are as follows:

X3/EN: Enable signal for the motor; General purpose

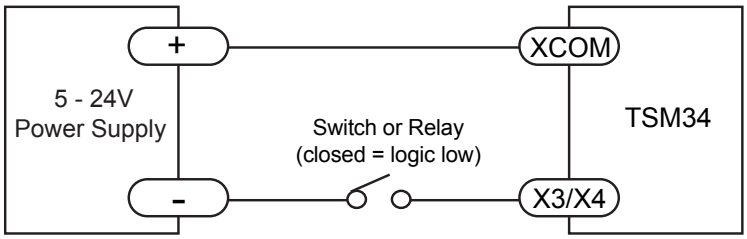
X4/AR: Waring and Fault Alarm reset signal; General purpose

What is COM?

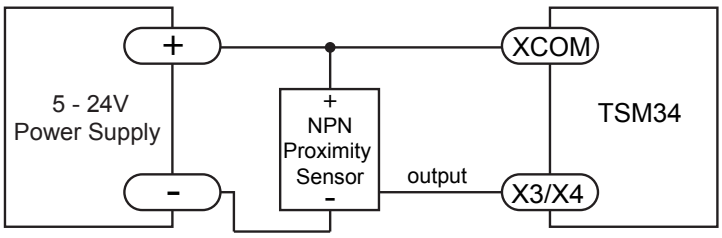
"Common" is an electronics term for an electrical connection to a common voltage. Sometimes "common" means the same thing as "ground", but not always. In the case of the TSM34 drives, if you are using sourcing (PNP) input signals, then you will want to connect COM to ground (power supply -). If you are using sinking (NPN) signals, then COM must connect to power supply +.

Note: If current is flowing into or out of an input, the logic state of that input is low or closed. If no current is flowing, or the input is not connected, the logic state is high or open.

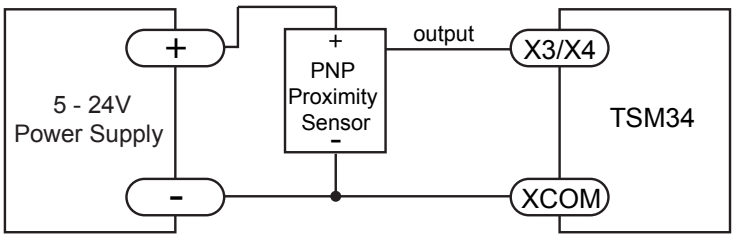
The diagrams below show how to connect the inputs to various commonly used devices.



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)

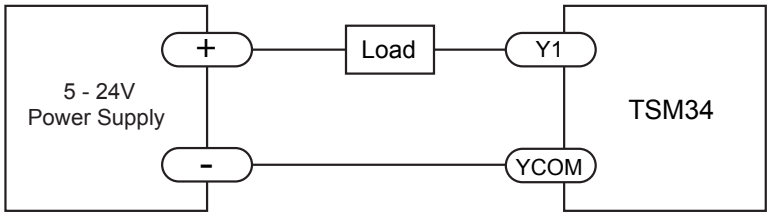
3.3.4 Y1, Y2, Y3 Programmable Outputs

The TSM34P drives feature three optically isolated digital outputs (Y1, Y2 and Y3) which share the common terminal YCOM.

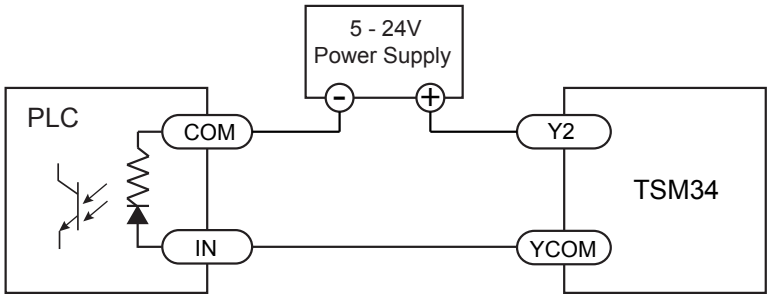
- Y1 can be set to signal a fault condition.
- Y2 can be set to indicate whether the motor is in position (dynamic).
- Y3 can be set to control a motor brake, to provide an output frequency proportional to motor speed (tach signal), to provide a timing output (50 pulses/rev), or to indicate whether the motor is in position (static).

These outputs can also be turned on and off by program instructions like Set Output (SO) or through the Step-Servo Quick Tuner software. 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.

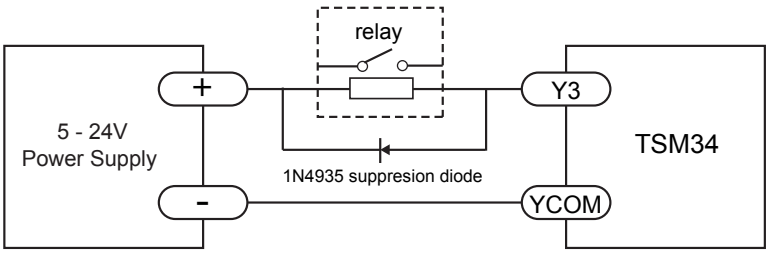
Do not connect the outputs to more than 30 volts. The current through each output terminal must not exceed 100mA.



Connecting a Sinking Output



Connecting a Sourcing Output

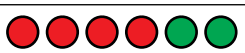
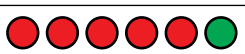
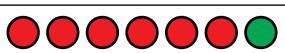
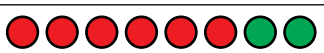
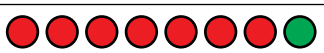
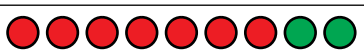


Driving a Relay

4 Troubleshooting

4.1 Status (STAT) LED Error Codes

The TSM34P uses red and green LEDs to indicate status. When the motor is enabled, the green LED flashes slowly. When the green LED is solid, 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 the 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.

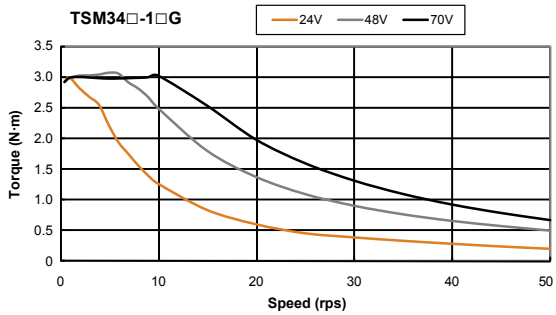
4.2 Auxiliary Power (AUX) LED

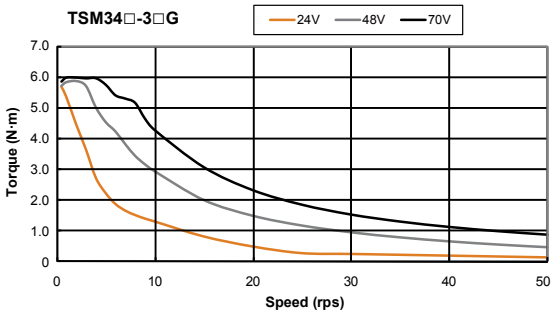
If the auxiliary power is connected, this yellow LED will be solid when the power is on.

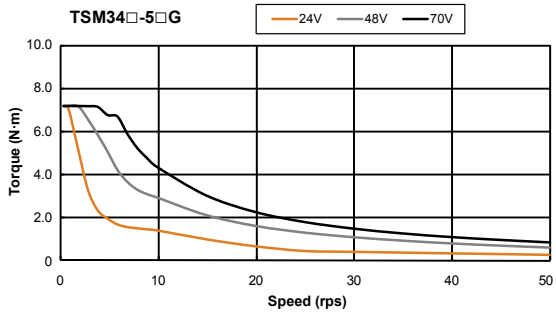
5 Reference Materials

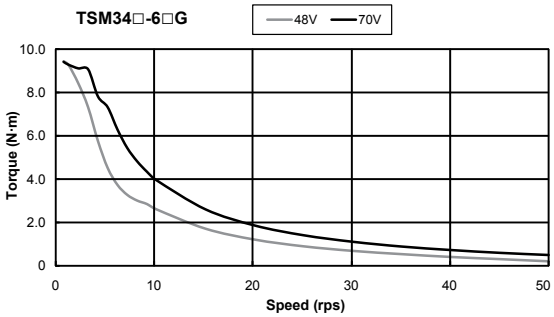
5.1 Torque Speed Curves

Note: All torque curves are at 10 amps rated continuous current.

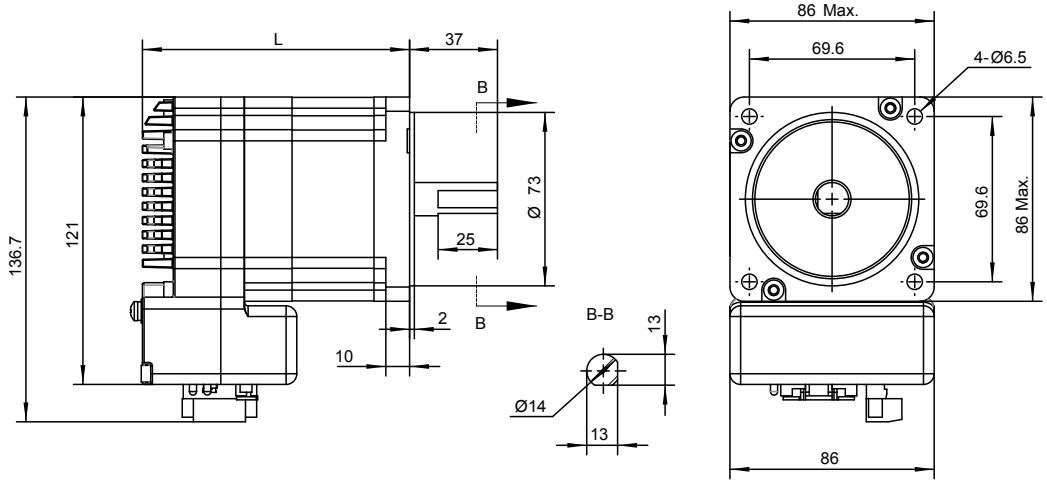








5.2 Mechanical Outlines



Unit: mm

Model	Length "L"	Front shaft diameter
TSM34P-1AG	112.5	14
TSM34P-3AG	143	
TSM34P-5AG	172.5	
TSM34P-6AG	203	

5.3 Technical Specifications

Power Amplifier	
Amplifier Type	Dual H-Bridge, 4 Quadrant
Current Control	4 state PWM at 20 KHz
Output Torque	TSM34P-1AG up to 2.7 N•m Continuous (3.2 N•m Boost) TSM34P-1AG up to 5.2 N•m Continuous (6.1 N•m Boost) TSM34P-1AG up to 6.7 N•m Continuous (7.2 N•m Boost) TSM34P-1AG up to 8.1 N•m Continuous (9.7 N•m Boost)
Power Supply	External 24-70VDC main power supply, 12-48VDC 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 3600 rpm
Filters	Digital 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	TSM34P: Step & Direction, CW/CCW pulse, A/B quadrature pulse
Digital Inputs	**X1/STEP+/-**: Optically isolated, 5-24 volt; minimum pulse width = 250 ns; maximum pulse frequency = 2MHz Functions: Step, CW step, A quadrature (encoder following) **X2/DIR+/-**: Optically isolated, 5-24 volt; minimum pulse width = 250 ns; maximum pulse frequency = 2MHz Functions: Direction, CCW step, B quadrature (encoder following) **X3/EN, X4/AR**: Optically isolated, 5-24 volt Functions: Enable, Alarm reset or general purpose input
Digital Outputs	**Y1/Y2/Y3**: Optically isolated, 30V/100 mA max Functions: Fault, In position, Brake, Tach, Timing or general purpose programmable
Encoder Output	Standard Line driver outputs: A+/A-/B+/B-/Z+/Z-; 26C31 line driver, 20 mA sink or source max
Communication Interface	RS-232

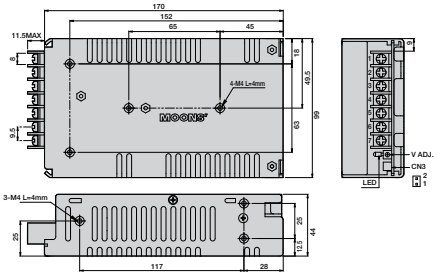
Physical	
Ambient Temperature	0 to 40°C (32 -104°F) when mounted to a suitable heatsink
Humidity	90% max, non-condensing
Mass	TSM34P-1AG: 2100 g TSM34P-3AG: 3200 g TSM34P-5AG: 4300 g TSM34P-6AG: 5500 g
Rotor Inertia	TSM34P-1AG: 915 g•cm2 TSM34P-3AG: 1480 g•cm2 TSM34P-5AG: 2200 g•cm2 TSM34P-6AG: 3660 g•cm2

5.4 Optional Accessories

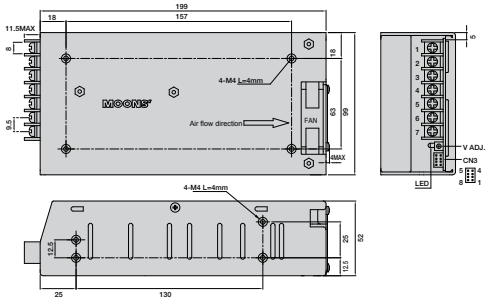
Power Supplies

MOONS' recommends using the following switching power supplies

P/N:MF150A24AG-V 150W, 24VDC



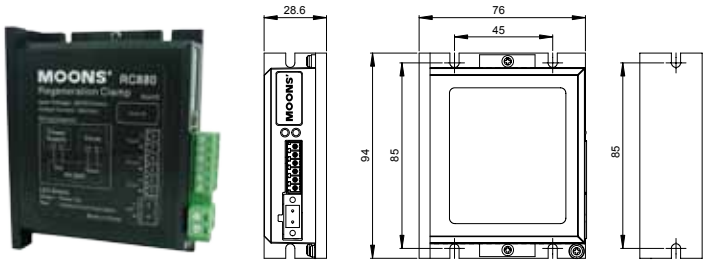
P/N:MF320A48AG-V 320W, 48VDC



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.



MOONS' 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 Converter

Model: MS-USB-RS232-01
Description: USB-RS-232 converter

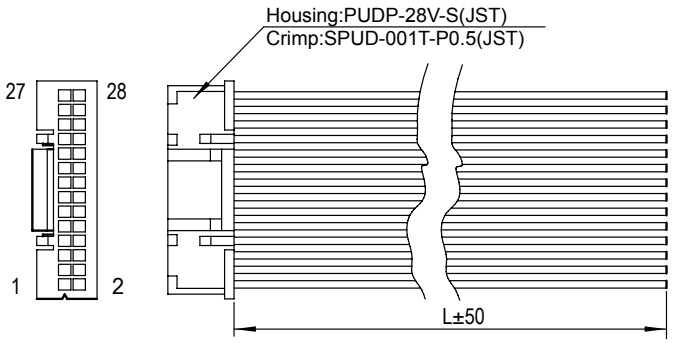
Power Connector

P/N	Vendor
5452570	Phoenix

Cables

General Purpose I/O Cable (unshielded)

P/N	Length
1101-100	1m
1101-200	2m
1101-500	5m

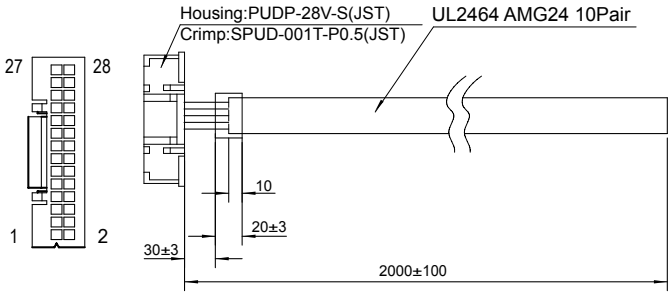


Pin No.	Assignment	Description	Color
1	X1+	High Speed Digital Input	BLU
2	X1-		BLU/WHT
3	X2+	High Speed Digital Input	YEL
4	X2-		YEL/WHT
5	X3	X3 Digital Input	GRN
6	X4	X4 Digital Input	ORG
7	X5	X5 Digital Input	GRY
8	X6	X6 Digital Input	PPL
9	XCOM	X Digital Input COM	WHT
10	+5V	+5V Analog Voltage	RED
11	AIN	Analog Input	BLU
12	GND	Analog Input Ground	BLK
13	X7+	X7 Digital Input	ORG
14	X7-		ORG/WHT

Pin No.	Assignment	Description	Color
15	X8+	X8 Digital Input	GRN
16	X8-		GRN/WHT
17	Y1	Y1 Digital Input	BLU
18	Y2	Y2 Digital Input	YEL
19	Y3	Y3 Digital Input	BRN
20	YCOM	Y Output COM	BLK
21	Y4+	Y4 Digital COM	RED
22	Y4-		RED/WHT
23	Z+	Encoder Output Z (if applicable)	BLK
24	Z-		BLK/WHT
25	B+	Encoder Output B (if applicable)	GRN
26	B-		GRN/WHT
27	A+	Encoder Output A (if applicable)	ORG
28	A-		ORG/WHT

General Purpose I/O Cable (shielded)

P/N	Length
1102-100	1m
1102-200	2m
1102-500	5m

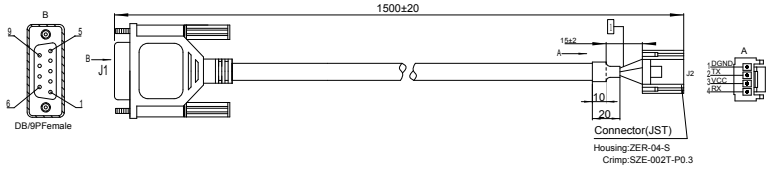


Pin No.	Assignment	Description	Color
1	X1+	High Speed Digital Input	BLK
2	X1-		RED
3	X2+	High Speed Digital Input	BLK
4	X2-		WHT
5	X3	X3 Digital Input	BLK
6	X4	X4 Digital Input	GRN
7	NC		
8	NC		
9	XCOM	X Input COM	BLK
10	+5V	+5V Analog Voltage	BLU
11	AIN	Analog Input	BLK
12	GND	Analog Input Ground	YEL
13	NC		
14	NC		

Pin No.	Assignment	Description	Color
15	NC		
16	NC		
17	Y1	Y1 Digital Output	BLK
18	Y2	Y2 Digital Output	BRN
19	Y3	Y3 Digital Output	BLK
20	YCOM	Y Output COM	ORG
21	NC		
22	NC		
23	Z+	Encoder Output Z (if applicable)	RED
24	Z-		WHT
25	B+	Encoder Output B (if applicable)	RED
26	B-		GRN
27	A+	Encoder Output A (If applicable)	RED
28	A-		BLU

RS-232 Communication Cable

P/N	Length
2101-150	1.5m



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