

STF-D/IP

Stepper Motor Drive Hardware Manual

STF03/06-D STF03/06-IP
STF05/10-D STF05/10-IP
STF05/10-D-FC STF05/10-IP-FC



SHANGHAI AMP & MOONS' AUTOMATION CO.,LTD.

Contents

1	Introduction.....	3
1.1	Features	3
1.2	Block Diagram	4
1.3	Safety Instructions.....	5
2	Getting Started	6
2.1	Installing Software	7
2.2	Connect the drive to PC using Ethernet.....	8
2.4	Choosing A Power Supply.....	15
2.4.1	Voltage	15
2.4.2	Current.....	15
2.5	Connecting the Motor.....	16
3	Inputs and Outputs	16
3.1	Digital Inputs.....	17
3.1.1	X1, X2, X3 and X4 Digital Inputs	17
3.1.2	X5, X6, X7 and X8 Digital Inputs	18
3.2	Digital Outputs.....	19
3.2.1	Y1, Y2 and Y3 Digital Outputs	19
3.2.2	Y4 Digital output	20
4	Mounting the Drive	21
5	Reference Materials	22
5.1	Drive Mechanical Outlines.....	22
5.2	Technical Specifications	23
5.3	Recommended Motor.....	24
5.4	Torque Curves	27
5.5	Numbering System.....	30
5.6	Ordering Information	30
5.7	Alarm Code.....	30
6	Accessories (Sold Separately)	31
7	Contacting MOONS'	32

1 Introduction

Thank you for selecting the MOONS' STF series stepper drive. The STF series are high performance fieldbus control stepper drive which also integrates with built-in motion controller. The drives can be controlled by eSCL, Modbus/RTU or EtherNet/IP in real time. Motion profiles can also be programmed and stored in drives (Q Program) and then be triggered by SCL, Modbus/RTU or EtherNet/IP commands. The drives support Ethernet TCP/IP or UDP, EtherNet/IP communication.



This document contains mainly descriptive information about the stepper servo drive:

Model	
STF03/06-D	-
STF03/06-IP	-
STF05/10-D	★ STF05/10-D-FC
STF05/10-IP	★ STF05/10-IP-FC

★: Conforms to UL certification.

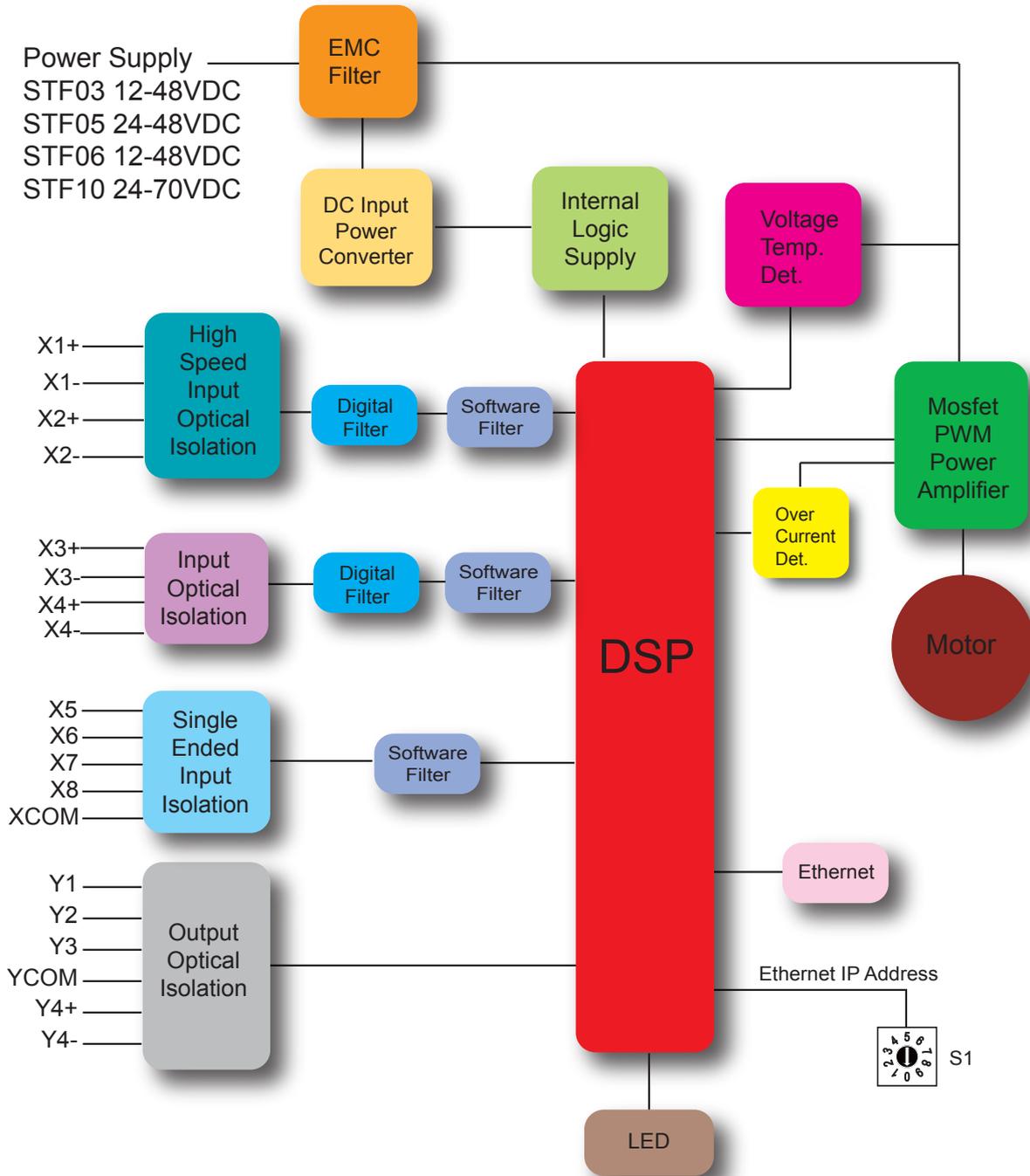


1.1 Features

- Programmable, field bus controlled stepper motor drive in a compact package
- Operating DC voltage range:
 - STF03 12-48V
 - STF05 24-48V
 - STF06 12-48V
 - STF10 24-70V
- Dual Port RJ45 connector for drive configuration, and Ethernet communication based on the widely used 100BASE-TX cabling system and with a baud rate of 100Mbps full-duplex.
- Supported communication modes: Ethernet UDP/TCP, EtherNet/IP, eSCL
- Support MOONS' own Q mode.
- STF03 Output current: Max.3A/phase(peak-of- sine)
- STF05 Output current: Max.5A/phase(peak-of-sine)
- STF06 Output current: Max.6A/phase(peak-of-sine)
- STF10 Output current: Max.10A/phase(peak-of-sine)
- I/O
 - 8 optically isolated digital inputs, 5-24VDC high level voltage
 - 4 optically isolated digital outputs, max 30V/100mA sink or source current

1.2 Block Diagram

STF-D/IP 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:

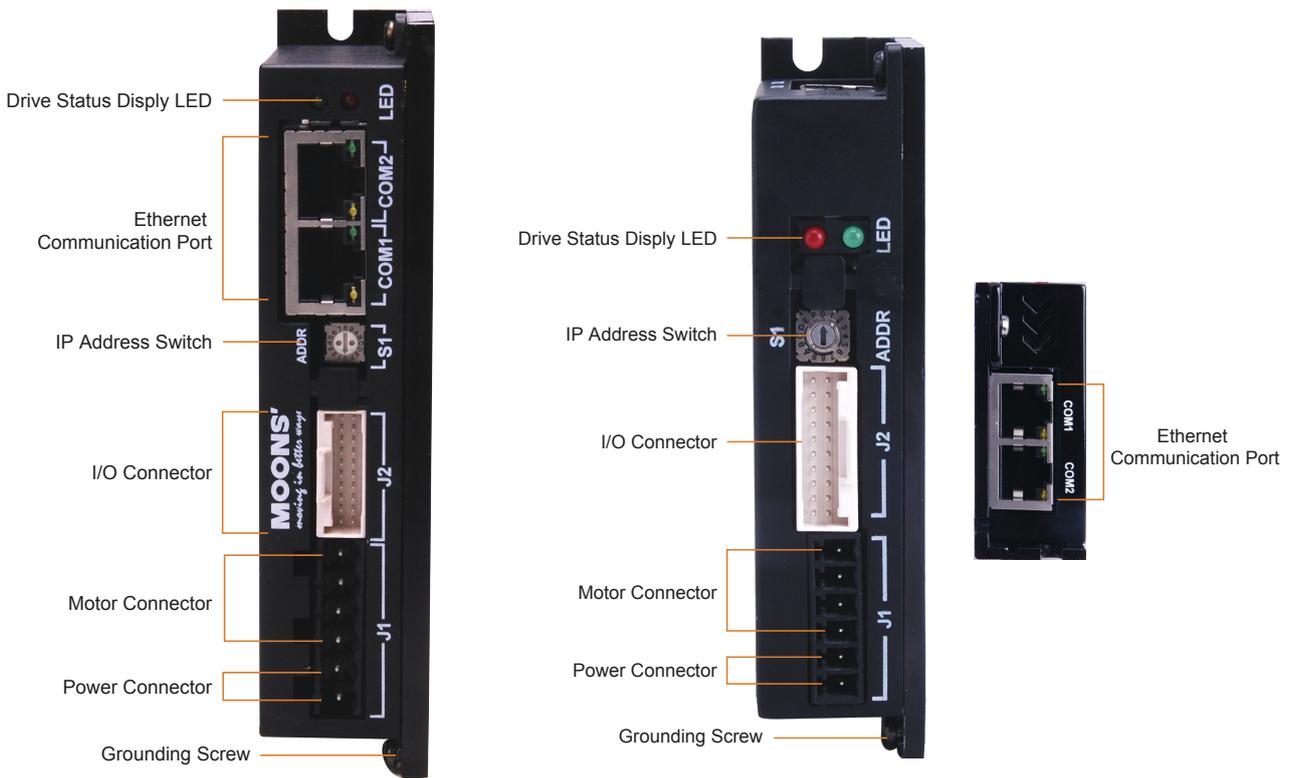
- A 12-48VDC power supply (24-48VDC power supply for STF05, and 24-70VDC power supply for STF10). Please read the section below entitled “Choosing a Power Supply” for help in choosing the right one.
- A compatible stepper motor, please see the section below entitled “Recommended Motor”
- A small flat blade screwdriver for tightening the connectors screw(included)
- A PC running Microsoft Windows XP / Vista / Windows 7/ Windows 8/ Windows 10(32-bit or 64-bit)operation system
- A CAT5 cable for Ethernet daisy chain connection (included).
- Optional I/O cable.
- Install **STF Configurator** software(Available from MOONS’ website).

2.1 Installing Software

Before utilizing the STF-D/IP drive in an application, the following steps are necessary:

- Download and install the **STF Configurator** software.
- Connect the drive to PC directly, and configure the computer to use IP address 10.10.10.11 (For instructions on connecting your STF drive to a local area network (LAN), please read the section " Connect the drive to PC using Ethernet").
- Launch the software by clicking: Start/All programs/MOONS' /**STF Configurator**.
- Connect the drive to the power supply.
- Connect the motor to the drive.
- Apply power to the drive.
- The software will recognize the drive and display the model and firmware version. At this point, it is ready for use.

The connectors and other points of interest are illustrated below:



Model	
STF05-D	STF05-IP
STF10-D	STF10-IP
STF05-D-FC	STF05-IP-FC
STF10-D-FC	STF10-IP-FC

Model	
STF03-D	STF03-IP
STF06-D	STF06-IP

2.2 Connect the drive to PC using Ethernet

Dual port RJ-45 connectors of the STF-D/IP Drive accept standard Ethernet cables and are categorized as 100BASE-TX(100 Mb/s) ports. CAT5 or CAT5e (or higher) cables should be used.

Connecting the drive to PC requires three steps:

- Physically connect the drive to your network (or directly to the PC)
- Set the drive's IP address
- Set the appropriate networking properties on your PC.

Note: the following pages are an excerpt from the “eSCL Communication Reference Guide”.

For more information, please read the rest of the guide.

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:

```
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\moons>ipconfig

Windows IP Configuration

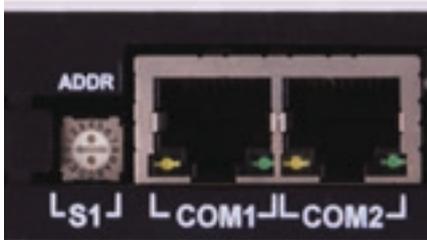
Ethernet adapter Local Area Connection:

    Connection-specific DNS Suffix . . . : 
    IP Address . . . . . : 192.168.0.22
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.0.254
```

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 includes a 16 position rotary switch for setting its IP address. The factory default address for each switch setting is shown in the table on the next page.

Settings 1 through E can be changed using the **STF Configurator** software. Setting 0 is always “10.10.10.10”, the universal recovery address. If someone were to change the other settings and not write it down or tell anyone (I'm not naming names here, but you know who I'm talking about) then you will not be able to communicate with your drive. The only way to “recover” it is to use the universal recovery address.



Rotary Switch	IP Address
0	10.10.10.10
1	192.168.1.10
2	192.168.1.20
3	192.168.1.30
4	192.168.0.40
5	192.168.0.50
6	192.168.0.60
7	192.168.0.70
8	192.168.0.80
9	192.168.0.90
A	192.168.0.100
B	192.168.0.110
C	192.168.0.120
D	192.168.0.130
E	192.168.0.140
F	DHCP

Setting F is “DHCP”, which 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.

On the drive, switch settings 1 through E use the standard class B subnet mask (i.e. “255.255.0.0”). The mask for the universal recovery address is the standard class A (i.e. “255.0.0.0”).

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 any 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.

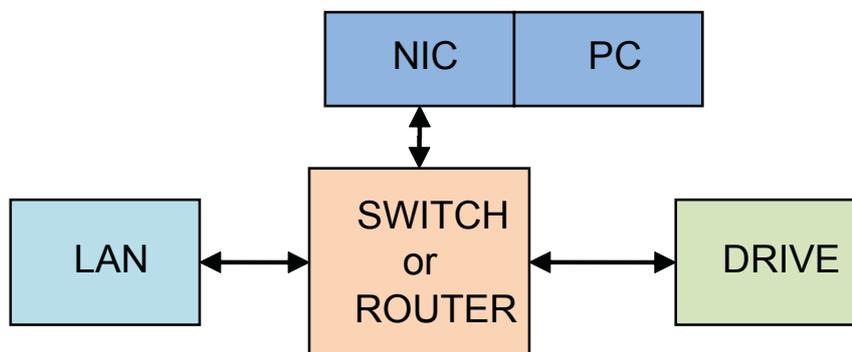
If you need help choosing a port number for your application, you can find a list of commonly used port numbers at <http://www.iana.org/assignments/port-numbers>.

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, please check with your system administrator before connecting anything new to the network. He or she should be able assign you a suitable address and help you get going.

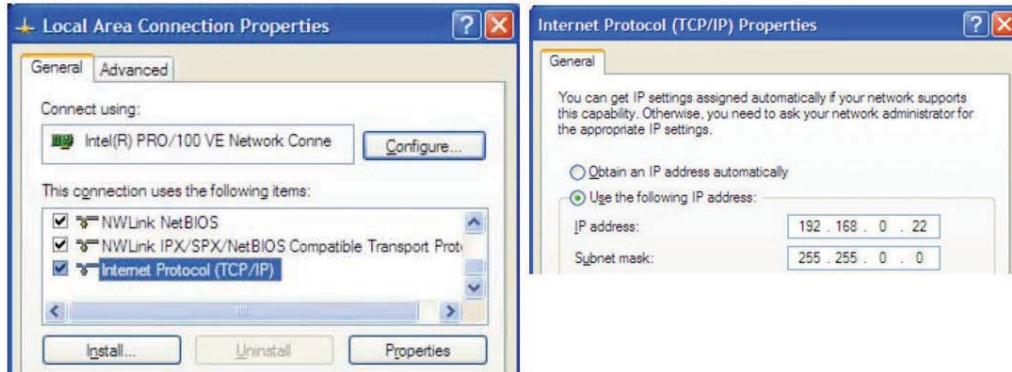
If you are not sure which addresses are already used on your network, you can find out using “Angry IP scanner” , which can be downloaded free from <http://www.angryip.org/w/Download>. But be careful: an address might appear to be unused because a computer or other device is currently turned off. And 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.



Once you’ ve chosen an appropriate IP address for your drive, set the rotary switch according the address table above. If none of the default addresses are acceptable for your network, you can enter a new table of IP addresses using Configurator. If your network uses addresses starting with 192.168.0, the most common subnet, you will want to choose an address from switch settings 4 through E. Another common subnet is 192.168.1. If your network uses addresses in this range, the compatible default selections are 1, 2 and 3.

If your PC address is not in one of the above private 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 and 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

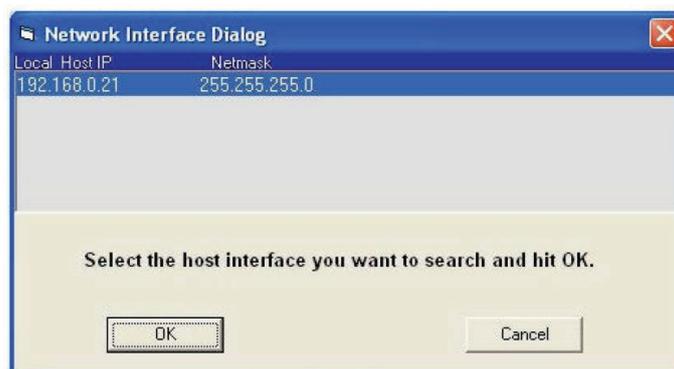
If you want to use your drive on a network where all or most of the devices use dynamic IP addresses supplied by a DHCP server, set the rotary switch to “F”. When the drive is connected to the network and powered on, it will obtain an IP address and a subnet mask from the server that is compatible with your PC. The only catch is that you won’t know what address the server assigns to your drive. ST Configurator can find your drive using the Drive Discovery feature, as long as your network isn’t too large. With the drive connected to the network and powered on, select Drive Discovery from the Drive menu.

You will see a dialog such as this:

Normally, Drive Discovery will only detect one network interface card (NIC), and will select it automatically. If you are using a laptop and have both wireless and wired network connections, a second NIC may appear.

Please select the NIC that you use to connect to the network to which you’ve connected your drive. Then click OK. Drive Discovery will notify you as soon as it has detected a drive.

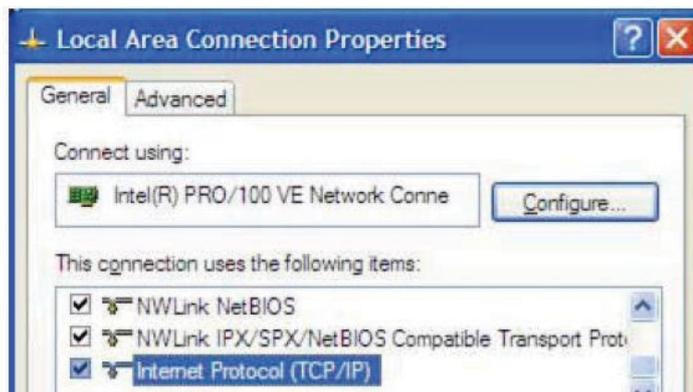
If you think this is the correct drive, click Yes. If you’re not sure, click Not Sure and Drive Discovery will look for additional drives on your network. Once you’ve told Drive Discovery which drive is yours, it will automatically enter that drive’s IP address in the IP address text box so that you are ready to communicate.



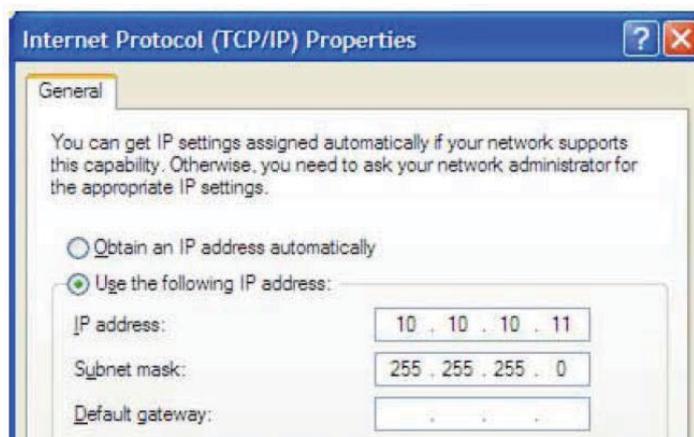
Option 2: Connect a Drive Directly to Your PC

It doesn't get much simpler than this:

1. Connect one end of a CAT5 Ethernet cable into the LAN card (NIC) on your PC and the other into 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. Set the IP address on the drive to "10.10.10.10" by setting the rotary switch at "0".
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 "10.10.10.11". 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.

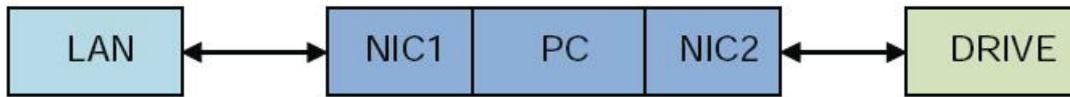


6. Next, enter the subnet mask as "255.255.255.0".
7. Be sure to leave "Default gateway" blank. This will prevent your PC from looking for a router on this subnet.
8. Because you are connected directly to the drive, anytime the drive is not powered on, your PC will annoy you with a small message bubble 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 CAT5 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. Set the IP address on the drive to "10.10.10.10" by setting the rotary switch at "0".
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 "10.10.10.11". 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."

2.3 Connecting the Power Supply

Connect power supply “+” terminal to the drive terminal labeled “V+” .

Connect power supply “-” terminal to the drive terminal labeled “V-” .

STF03 accepts DC voltage range from 12 – 48VDC

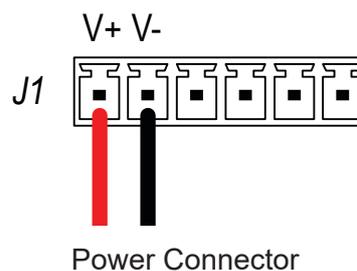
STF05 accepts DC voltage range from 24 – 48VDC

STF06 accepts DC voltage range from 12 – 48VDC

STF10 accepts DC voltage range from 24 – 70VDC

Warning: DO NOT reverse the wires

NOTE: DO NOT apply power until all connections to the drive have been made



Ensure a proper earth ground connection by using the screw on the left side of the chassis.



Please read “choosing a power supply” for more details.

2.4 Choosing A Power Supply

The main considerations when choosing a power supply are the voltage and current requirements of the application.

2.4.1 Voltage

The STF drive and motor is designed to give optimum performance between 24~48 Volts DC. Choosing the voltage depends on the performance needed and diver/motor heating that acceptable and/or does not cause a drive over-temperature. Higher voltage will give higher speed performance, but will cause the drive to produce higher temperatures. Using power supplies with voltage outputs that are near the drive maximum may significantly reduce the operational duty cycle.

The STF03/06 drive extended range of operation can be as low as 11VDC minimum to as high as 53VDC maximum(18-53VDC for STF05 Drives, and 18-75VDC for STF10 Drives). When operation below 11VDC, the STF03/06 series will work unstable. The supply input cannot go below 11VDC for reliable operation, otherwise under voltage alarm will be triggered. STF03/06 drive will stop working when this alarm is triggered.

STF03/05/06

If a regulated power supply is used, and that is near the driver maximum voltage of 53VDC ,a voltage clamp may be required to prevent the voltage over 53VDC which will occurs a overvoltage fault. When using an unregulated power supply, make sure the no-load voltage of the supply does not exceed the maximum input voltage 53VDC.

STF10

If a regulated power supply is used, and that is near the driver maximum voltage of 75VDC ,a voltage clamp may be required to prevent the voltage over 75VDC which will occurs a overvoltage fault. When using an unregulated power supply, make sure the no-load voltage of the supply does not exceed the maximum input voltage 75VDC.

2.4.2 Current

When STF drives work with different motors, the recommended power supply output current capacity under different supply voltage is shown in below table. The STF drive power supply current is lower than the the winding currents because it uses switching amplifiers to convert a high voltage and low current into low voltage and high current. The more power supply voltage exceeds the motor voltage,the less current will be required from the power supply.

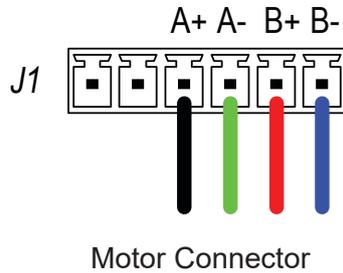
It is important to note that the current draw is significantly different at higher speeds depending on the torque load to the motor. Estimating how much current is necessary may require a good analysis of the load to the motor.

Drive	Motor	Voltage	Current
STF03 STF05 STF06	AM8	24V	Above 1A
	AM11	24V	Above 1A
	AM14	24V	Above 1A
	AM17	24V	Above 1.5A
		48V	Above 1.5A
	AM23	24V	Above 3A
		48V	Above 4A
	AM24	24V	Above 4.5A
		48V	Above 4.5A

Drive	Motor	Voltage	Current
STF10	AM23	24V	Above 3A
		48V	Above 4A
		70V	Above 4A
	AM24	24V	Above 4.5A
		48V	Above 4.5A
		70V	Above 4.5A
	AM34	24V	Above 6A
		48V	Above 6A
		70V	Above 6A

2.5 Connecting the Motor

For MOONS' stepper motor, please connect black, green, red, blue wires to drive' s A+, A-, B+ and B- correspondingly.

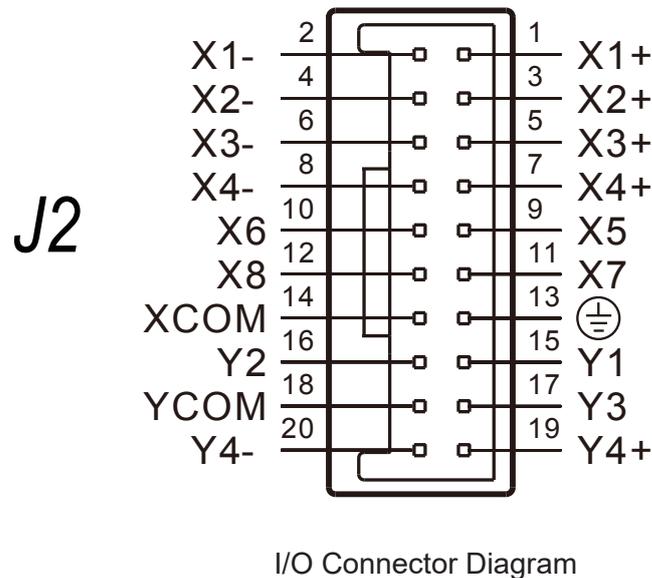


If using a non-MOONS' motor, please refer to your motor specs for wiring information.

3 Inputs and Outputs

STF series drive inputs and outputs include:

- 8 optically isolated digital inputs, 5-24VDC for high level voltage
- 4 optically isolated digital outputs, maximum voltage 30V, maximum sinking or sourcing current 100mA.



3.1 Digital Inputs

3.1.1 X1, X2, X3 and X4 Digital Inputs

X1, X2: optically isolated, differential, 5-24VDC for high level voltage, minimum pulse width 250ns, maximum pulse frequency 2MHz

X3, X4: optically isolated, differential, 5-24VDC for high level voltage, minimum pulse width 100 μ s, maximum pulse frequency 5KHz

X1 can be used as general purpose input.

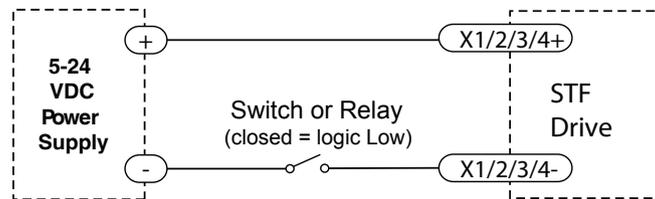
X2 can be used as general purpose input.

X3 can be used as CW limit input or general purpose input.

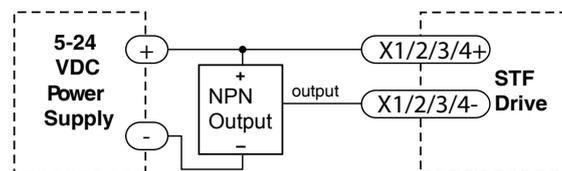
X4 can be used as CCW limit input or general purpose input.

Please use STF Configurator software for X1,X2,X3 and X4 function configuration.

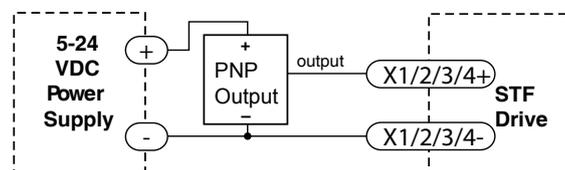
Following graphs shows some common connection methods for the inputs:



Connecting the inputs to a Switch or Relay



Connecting the inputs to a NPN type output



Connecting the inputs to a PNP type output

3.1.2 X5, X6, X7 and X8 Digital Inputs

X5, X6, X7 and X8: optically isolated, single-ended, 5-24VDC for high level voltage, minimum pulse width $100 \mu s$, maximum pulse frequency 5KHz

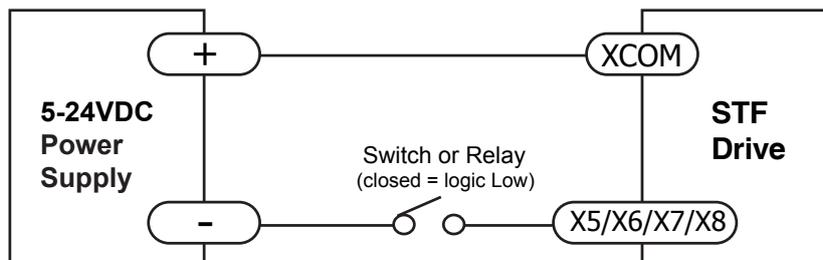
- X5 can be used as motor enable input or general purpose input.
- X6 can be used as alarm reset input or general purpose input.
- X7 can be used as general purpose input or touch Probe 1 trigger input.
- X8 can be used as general purpose input or touch Probe 2 trigger input.

Because the input is an optically isolated circuit, a 5-24V power supply is needed. For example, you can use the power supply of the PLC when you are using a PLC control system, but if you want to connect a relay or mechanical switch to the input, you must need a power supply.

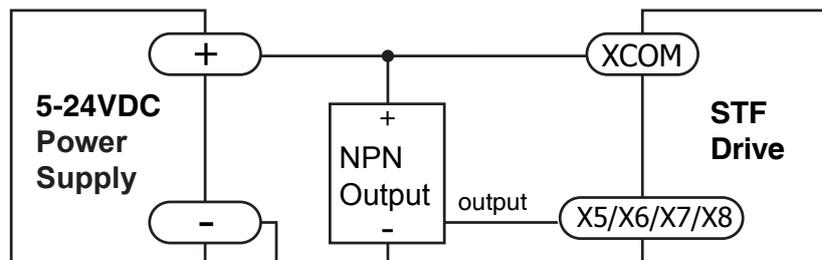
XCOM is an electronics term for a single-ended signal connection to a common voltage. If you are using a sourcing (PNP) input signals, you need to connect XCOM to the ground (power supply -), if you are using a sinking(NPN) input signals, the XCOM need to be connected to the power supply +.

Use **STF Configurator** software for X5, X6, X7 and X8 function configuration.

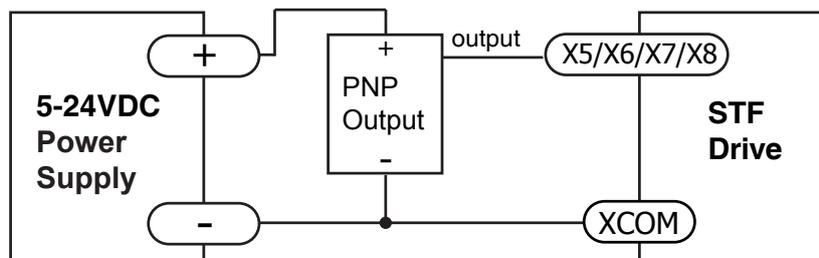
The following graphs show some common connection methods for the inputs:



Connecting the inputs to a Switch or Relay



Connecting the inputs to a NPN type output



Connecting the inputs to a PNP type output

3.2 Digital Outputs

3.2.1 Y1, Y2 and Y3 Digital Outputs

Y1 can be used as alarm output, motion status output or general purpose output.

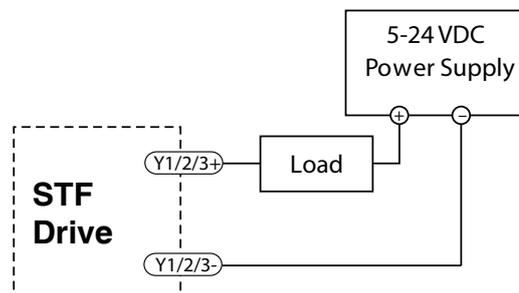
Y2 can be used as brake output, motion status output or general purpose output.

Y3 can be used as tach-out, timing signal output(50pulse/rev), motion status output or general purpose output.

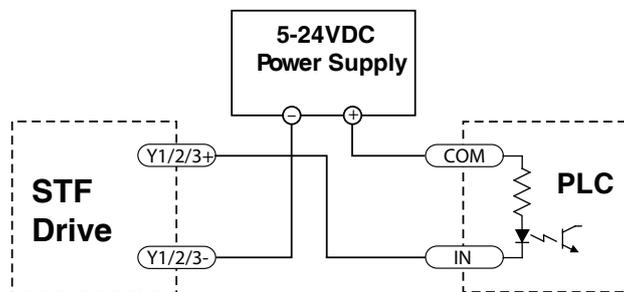
Please use **STF Configurator** software for Y1,Y2 and Y3 function configuration.

Following graphs shows some common connection methods for the outputs:

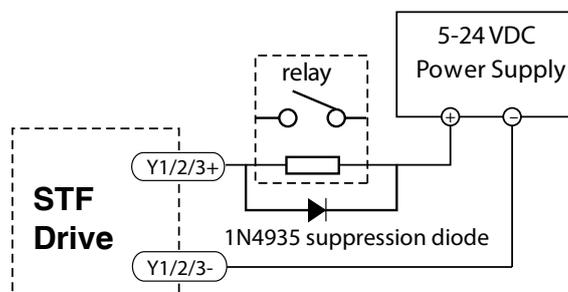
NOTE: Do not connect the outputs to more than 30VDC power supply. And the current of each output terminal must not exceed 100mA!



Connecting a sinking output



Connecting a sinking output with PLC's input



Driving a relay

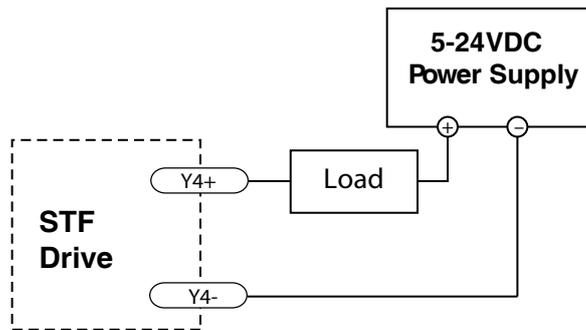
3.2.2 Y4 Digital output

- Y4 can be used as motion status output or general purpose output.

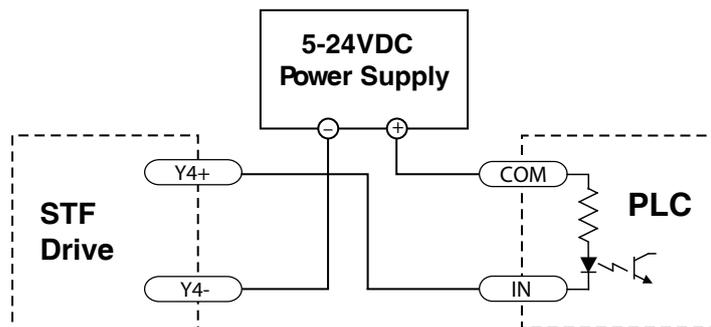
Please use STF Configurator software for Y4 function configuration.

Following graphs shows some common connection methods for the outputs.

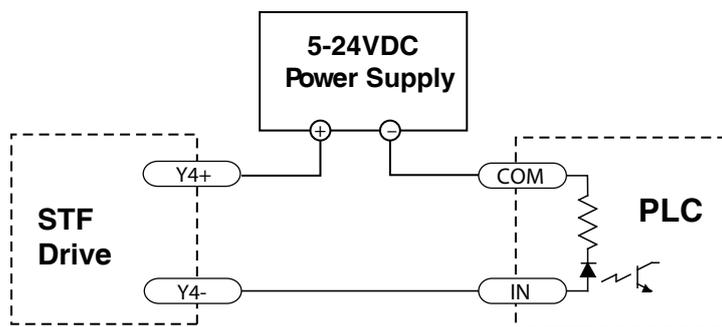
NOTE: Do not connect the outputs to more than 30VDC power supply. And the current of each output terminal must not exceed 100mA.



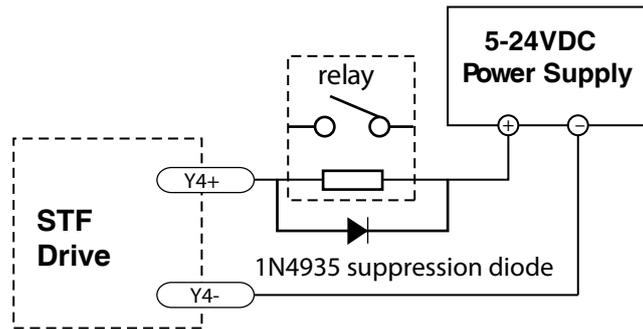
Connecting a sinking output



Connecting a sinking output with PLC's input



Connecting a sourcing output with PLC's input



Driving a relay

4 Mounting the Drive

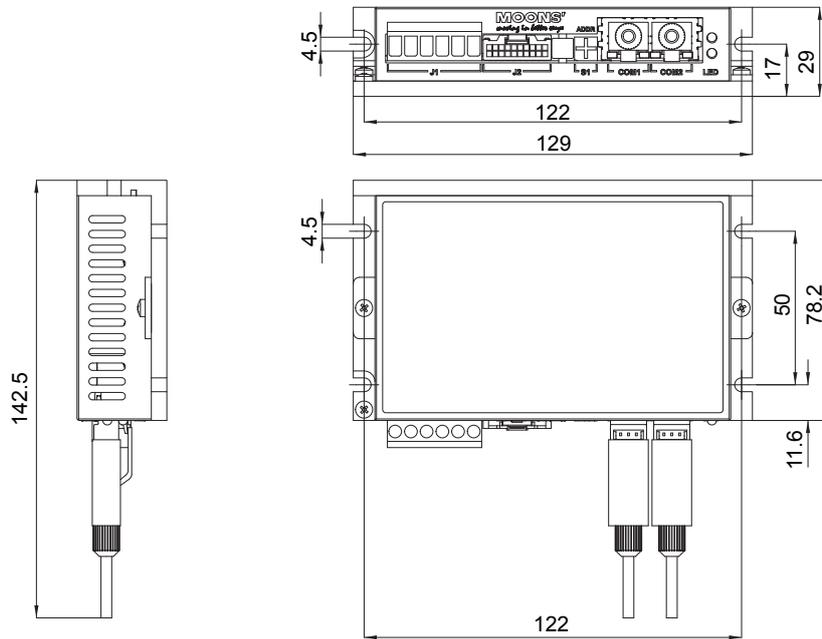
Use the M3 or M4 screw to mount the STF series drive. The drive should be securely fastened to a smooth, flat metal surface that will help conduct heat away from the chassis. If this is not possible, forced airflow from a fan maybe required to prevent the drive from overheating.



- Never use the drive in a place where there is no air flow or the surrounding air is more than 40°C.
- Never put the drive where it can get wet or where metal or other electrically conductive particle particles can get on the circuitry.
- Always provide air flow around the drive. When mounting multiple STF drives near each other, maintain at least 2cm of space between drives.

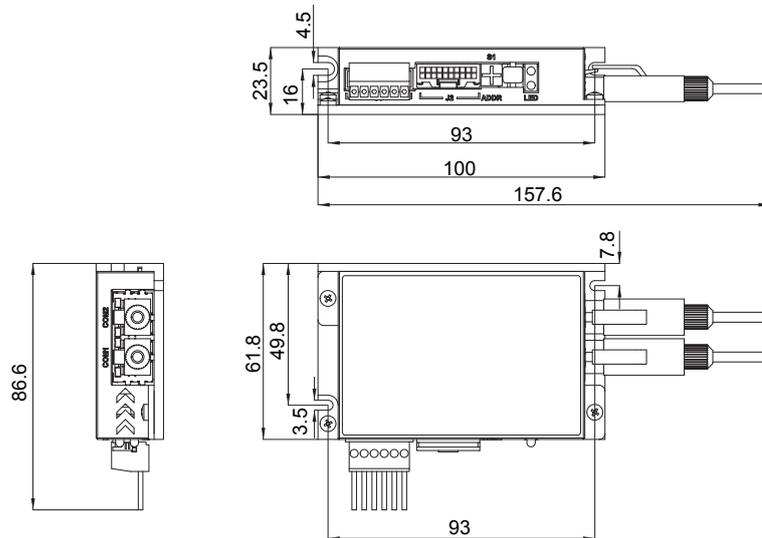
5 Reference Materials

5.1 Drive Mechanical Outlines



Unit: mm

Model	
STF05/10-D	STF05/10-IP
STF05/10-D-FC	STF05/10-IP-FC



Unit: mm

Model	
STF03-D	STF03-IP
STF06-D	STF06-IP

5.2 Technical Specifications

Power Amplifier	
Amplifier Type	Dual H-Bridge, 4 Quadrant
Current Control	4 state PWM at 20KHz
Output Current	STF03: 0.1 - 3.0A/phase(Peak-of-Sine) in 0.01Amp increment
	STF05: 0.1 - 5.0A/phase(Peak-of-Sine) in 0.01Amp increment
	STF06: 0.1 - 6.0A/phase(Peak-of-Sine) in 0.01Amp increment
	STF10: 0.1 - 10.0A/phase(Peak-of-Sine) in 0.01Amp increment
Rated input voltage	STF03: 12 - 48VDC
	STF05: 24 - 48VDC
	STF06: 12 - 48VDC
	STF10: 24 - 70VDC
Absolute maximum input voltage range	STF03: 11 - 53VDC
	STF05: 18 - 53VDC
	STF06: 11 - 53VDC
	STF10: 18 - 75VDC
Protection	Over voltage, under voltage, over temp, over current, open winding, communication cable disconnection
Idle Current Reduction	Reduction range of 0 - 90% of running current after a delay selectable in milliseconds
Controller	
Anti-Resonance	Raises the system-damping ratio to eliminate midrange instability and allow stable operation throughout the speed range of the motor
Torque Ripple Smoothing	Allows for fine adjustment of phase current waveform harmonic content to reduce low-speed torque ripple in the range of 0.25 to 1.5 rps
Auto Test & Auto Setup	Auto test and setup at power on (ie. motor resistance, and capacitance) to optimize your system performance.
Non-Volatile Storage	Configurations are saved in FLASH memory on-board the DSP
Operation Mode	Step & direction, CW/CCW pulse, A/B quadrature, velocity(oscillator, joystick), streaming commands(SCL or eSCL), Q program execution.
Digital Input	8 digital inputs
	X1, X2: Optically isolated, differential, 5-24VDC for high level voltage, minimum pulse width = 250ns, maximum pulse frequency = 2MHz
	X3, X4: Optically isolated, differential, 5-24VDC for high level voltage, minimum pulse width = 100 μ s, maximum pulse frequency = 5KHz
	X5 ~ X8: Optically isolated, single-ended, 5-24VDC for high level voltage, minimum pulse width = 100 μ s, maximum pulse frequency = 5KHz
Digital Output	4 digital outputs Y1 ~ Y4: Optically isolated, maximum voltage 30V, maximum sinking or sourcing current 100mA
Communication Interface	Ethernet TCP/UDP, EtherNet/IP
Physical	
Ambient Temperature	0-40° C (32-104° F)(when mounted to a suitable heat sink)
Humidity	90% non-condensing

5.3 Recommended Motor

Standard type step motor

Model	Features	Lead number	Length(mm)	Holding Torque(N.m)	Current(A)	Rotor Inertia(g.cm ²)	Mass(Kg)	Mass Dielectric Strength
AM8HY2050-01N	Single Shaft	4	31.5	0.015	0.5	2	0.05	500VAC/1Minute
AM8HY2050-02N	Double Shaft	4						
AM8HY4043-01N	Single Shaft	4	47	0.037		4.2	0.09	
AM8HY4043-02N	Double Shaft	4						
AM11HS1008-07	Single Shaft	4	31	0.05	1.6	9	0.1	
AM11HS3007-02	Single Shaft	4	40	0.08		12	0.15	
AM11HS5008-01	Single Shaft	4	51	0.12		18	0.2	
AM14HYB401-03	Single Shaft	4	40	0.2	1	20	0.21	
AM17HD4452-02N	Single Shaft	4	34.3	0.25	1.8	38	0.23	
AM17HD4452-01N	Double Shaft	4						
AM17HD2438-02N	Single Shaft	4	39.8	0.4	1.8	57	0.28	
AM17HD2438-01N	Double Shaft	4						
AM17HD6426-06N	Single Shaft	4	48.3	0.5	1.8	82	0.36	
AM17HD6426-05N	Double Shaft	4						
AM17HDB410-01N	Single Shaft	4	62.8	0.85	1.6	123	0.6	
AM23HS0420-01	Single Shaft	4	41	0.6	2.2	135	0.42	
AM23HS0420-02	Double Shaft	4						
AM23HS2449-01	Single Shaft	4	54	1.2	2.2	260	0.6	
AM23HS2449-02	Double Shaft	4						
AM23HS3454-01	Single Shaft	4	76	1.8	2.2	460	1	
AM23HS3454-02	Double Shaft	4						
AM23HS0421-01	Single Shaft	4	41	0.6	4.5	135	0.42	
AM23HS0421-02	Double Shaft	4						
AM23HS2450-01	Single Shaft	4	54	1.2	4.5	260	0.6	
AM23HS2450-02	Double Shaft	4						
AM23HS3455-01	Single Shaft	4	76	1.8	4.5	460	1	
AM23HS3455-02	Double Shaft	4						
AM23HS04A0-01	Single Shaft	4	39	0.82	2.2	120	0.4	
AM23HS04A0-02	Double Shaft	4						
AM23HS84A0-01	Single Shaft	4	55	1.5	2.2	220	0.6	
AM23HS84A0-02	Double Shaft	4						
AM23HSA4A0-01	Single Shaft	4	77	2.3	2.2	390	1	
AM23HSA4A0-02	Double Shaft	4						
AM23HS04B0-01	Single Shaft	4	39	0.82	4.5	120	0.4	
AM23HS04B0-02	Double Shaft	4						
AM23HS84B0-01	Single Shaft	4	55	1.5	4.5	220	0.6	
AM23HS84B0-02	Double Shaft	4						
AM23HSA4B0-01	Single Shaft	4	77	2.3	4.5	390	1	
AM23HSA4B0-02	Double Shaft	4						
AM23HS04B0-03	Single Shaft	4	39	0.82	4.5	120	0.4	
AM23HS04B0-04	Double Shaft	4						
AM23HS84B0-03	Single Shaft	4	55	1.5	4.5	220	0.6	
AM23HS84B0-04	Double Shaft	4						
AM23HSA4B0-03	Single Shaft	4	77	2.3	4.5	390	1	
AM23HSA4B0-04	Double Shaft	4						
AM24HS2402-08N	Single Shaft	4	54	1.2	4.5	450	0.83	
AM24HS2402-11N	Double Shaft	4						
AM24HS5401-10N	Single Shaft	4	85	2.5	4.5	900	1.4	
AM24HS5401-24N	Double Shaft	4						
AM34HD0404-08	Single Shaft	4	66.5	3	7	1100	1.6	
AM34HD0404-09	Double Shaft	4						
AM34HD1404-06	Single Shaft	4	96	5	7	1850	2.7	
AM34HD1404-07	Double Shaft	4						
AM34HD2403-07	Single Shaft	4	125.5	7.1	7	2750	3.8	
AM34HD2403-08	Double Shaft	4						

IP65 type motor

Model	Features	Lead number	Length(mm)	Holding Torque(N.m)	Current(A)	Rotor Inertia(g.cm ²)	Mass(Kg)	Mass Dielectric Strength
AM23HS2450-03	IP65 Motor	4	61.7	1.2	4.5	260	0.6	500VAC/1Minute
AM23HS3455-05	IP65 Motor	4	83.7	1.8		460	1	
AM24HS5401-44N	IP65 Motor	4	94.5	2.5		900	1.4	
AM34HD1404-13	IP65 Motor	4	98	5	7	1850	2.7	
AM34HD2403-13	IP65 Motor	4	127.5	7.1		2750	3.8	

Brake type motor

Model	Features	Lead number	Length(mm)	Holding Torque(N.m)	Current(A)	Rotor Inertia(g.cm ²)	Mass(Kg)	Mass Dielectric Strength
AM17HD4452-BR01	Brake Motor	4+2	60.3	0.25	1.8	38	0.38	500VAC/1Minute
AM17HD2438-BR01	Brake Motor	4+2	65.8	0.4		57	0.43	
AM17HD6426-BR01	Brake Motor	4+2	74.3	0.5		82	0.51	
AM17HDB410-BR01	Brake Motor	4+2	88.8	0.85		123	0.75	
AM23HS2449-BR01	Brake Motor	4+2	95	1.2	2.2	260	0.8	
AM23HS2450-BR01	Brake Motor	4+2	95	1.2		260	0.8	
AM23HS04B0-BR01	Brake Motor	4+2	80	0.82	4.5	120	0.62	
AM23HS84B0-BR01	Brake Motor	4+2	96	1.5		220	0.8	
AM23HSA4B0-BR01	Brake Motor	4+2	118	2.3		390	1.2	
AM24HS2402-BR01	Brake Motor	4+2	95	1.2	4.5	450	1.03	
AM24HS5401-BR01	Brake Motor	4+2	126	2.5		900	1.6	
AM34HD0404-BR01	Brake Motor	4+2	118.5	3	7	1100	2.2	
AM34HD1404-BR01	Brake Motor	4+2	148	5		1850	3.3	
AM34HD2403-BR01	Brake Motor	4+2	177.5	7.1		2750	4.4	

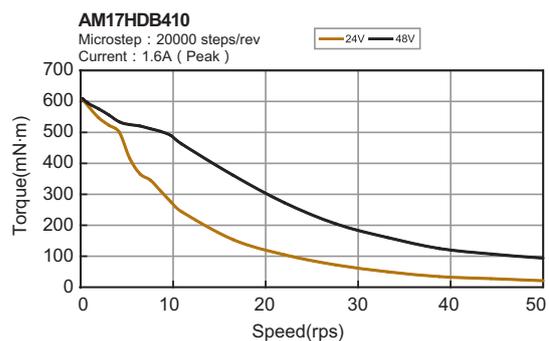
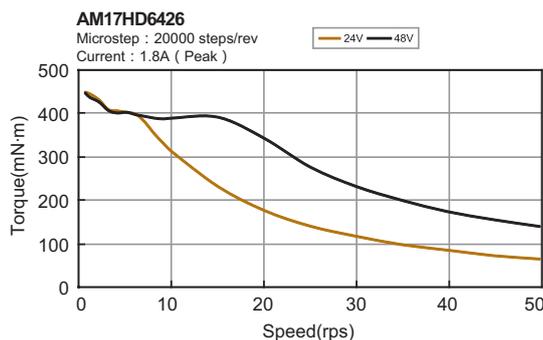
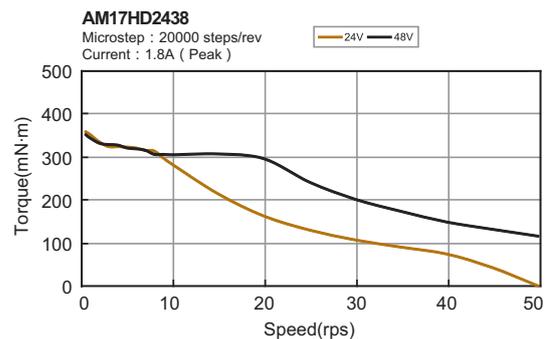
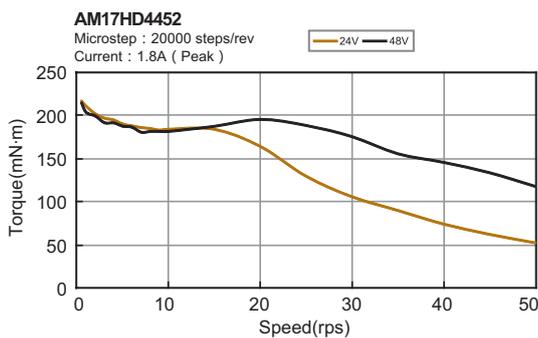
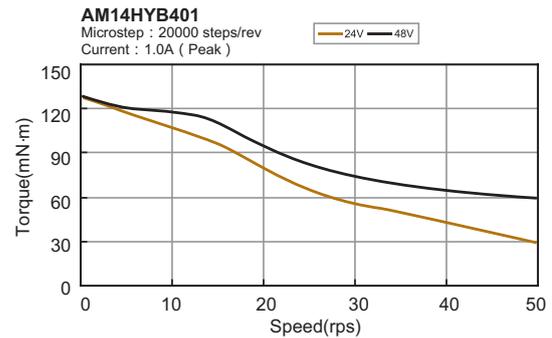
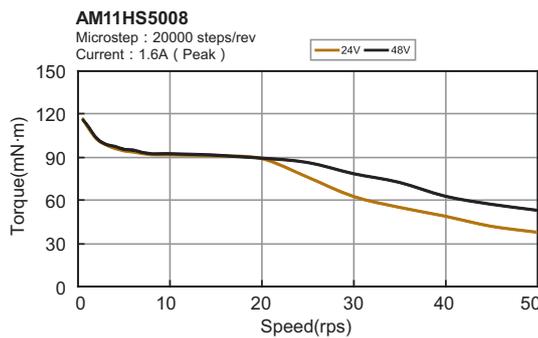
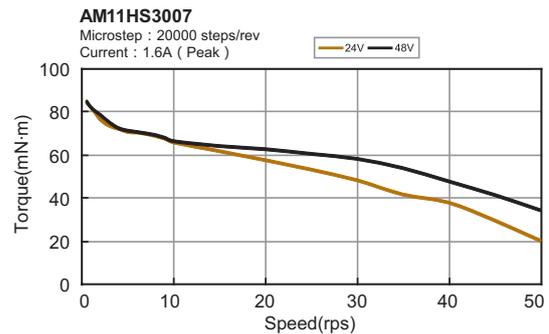
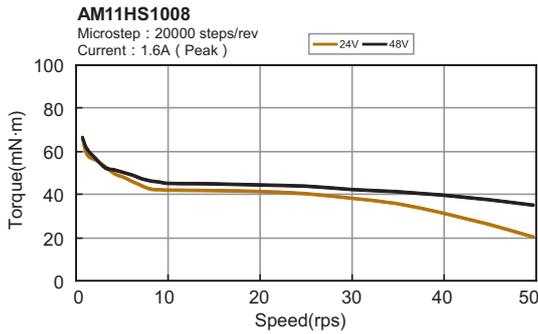
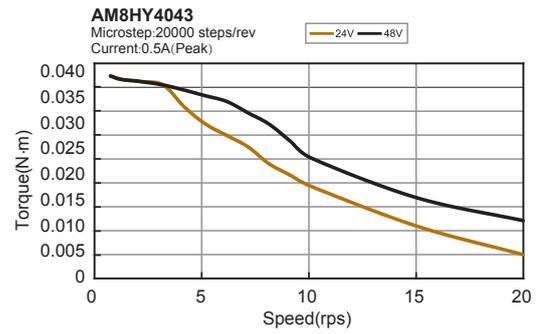
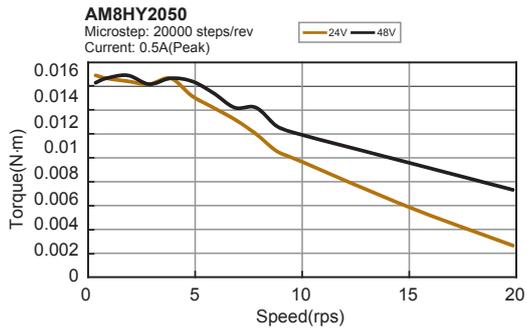
Encoder type motor

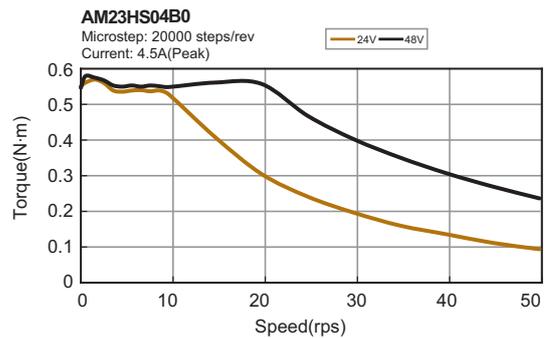
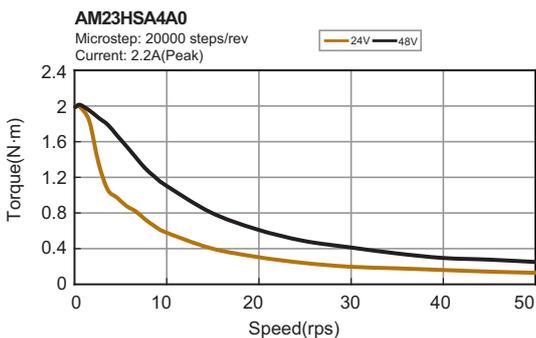
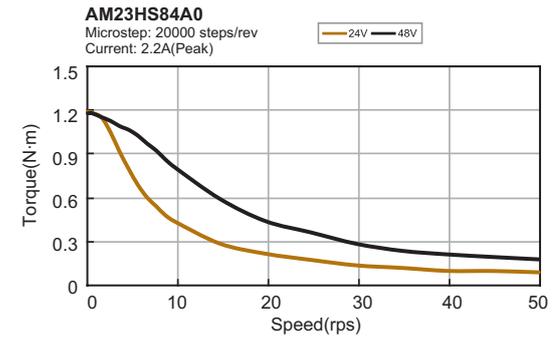
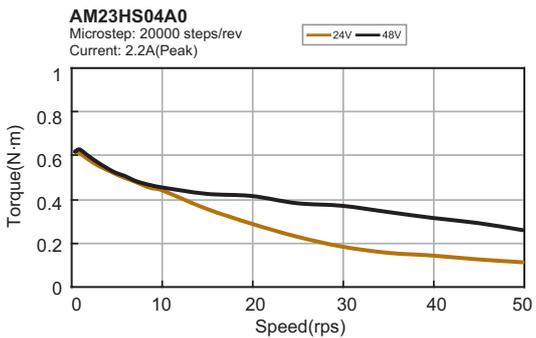
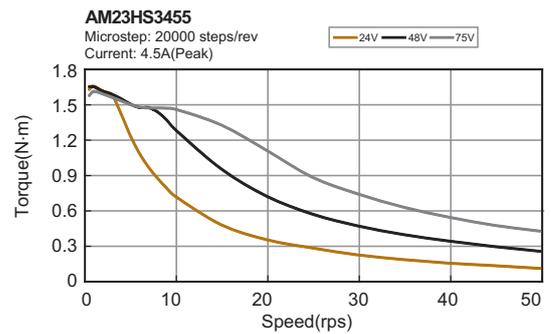
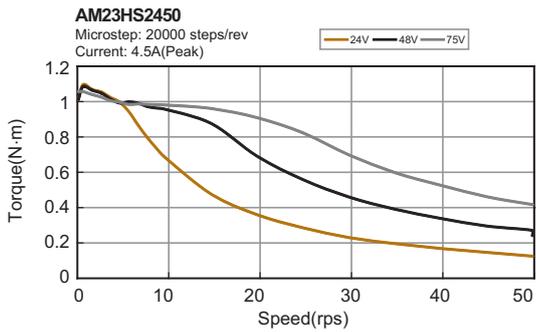
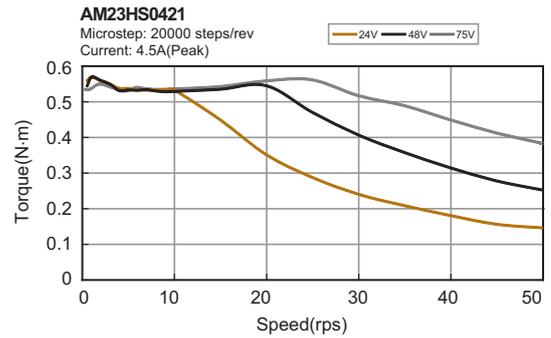
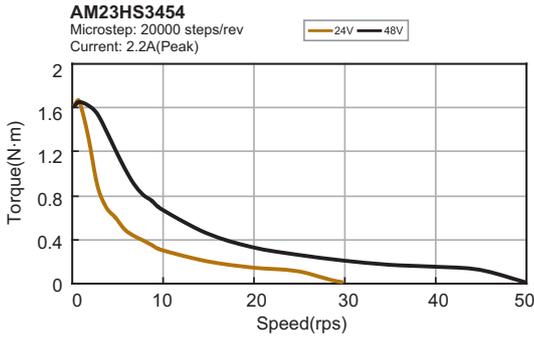
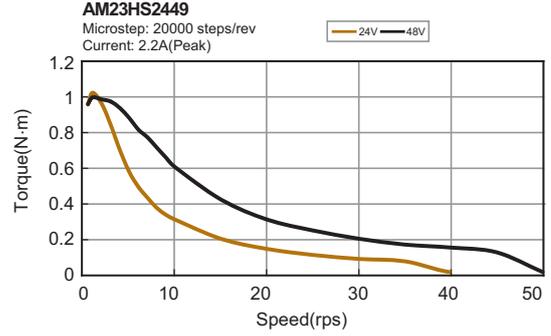
Model	Features	Lead number	Length(mm)	Holding Torque(N.m)	Current(A)	Rotor Inertia(g.cm ²)	Mass(Kg)	Mass Dielectric Strength
AM17HD4452-E1000D	Encoder motor	4	34.3	0.25	1.8	38	0.23	500VAC/1Minute
AM17HD2438-E1000D	Encoder motor	4	39.8	0.4		57	0.28	
AM17HD6426-E1000D	Encoder motor	4	48.3	0.5		82	0.36	
AM23HS0420-E1000D	Encoder motor	4	41	0.6	2.2	135	0.42	
AM23HS2449-E1000D	Encoder motor	4	54	1.2		260	0.6	
AM23HS3454-E1000D	Encoder motor	4	76	1.8		460	1	
AM23HS0421-E1000D	Encoder motor	4	41	0.6		135	0.42	
AM23HS2450-E1000D	Encoder motor	4	54	1.2	4.5	260	0.6	
AM23HS3455-E1000D	Encoder motor	4	76	1.8		460	1	
AM23HS5412-E1000D	Encoder motor	4	111	3.2		750	1.5	
AM24HS2402-E1000D	Encoder motor	4	54	1.2		450	0.83	
AM24HS5401-E1000D	Encoder motor	4	85	2.5	7	900	1.4	
AM34HD0404-E1000D	Encoder motor	4	66.5	3		1100	1.6	
AM34HD1404-E1000D	Encoder motor	4	96	5		1850	2.7	
AM34HD2403-E1000D	Encoder motor	4	125.5	7.1	2750	3.8		

Gearbox type motor

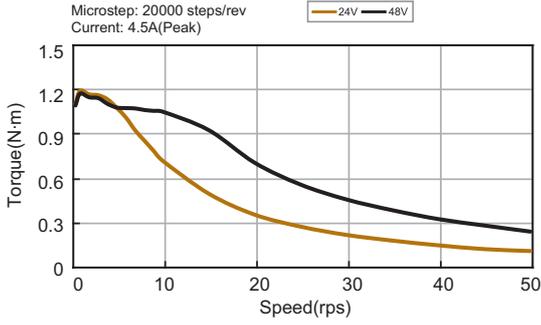
Model	Features	Lead number	Length(mm)	Holding Torque(N.m)	Current(A)	Rotor Inertia(g.cm ²)	Mass(Kg)	Mass Dielectric Strength
AM17HD4452-PG05	5 speed reducer motor	4	101.8	1.25	1.8	950	0.55	500VAC/1Minute
AM17HD4452-PG10	10 speed reducer motor	4	101.8	2.5	1.8	3800	0.55	
AM17HD4452-PG20	20 speed reducer motor	4	114.8	5	1.8	15200	0.63	
AM17HD2438-PG05	5 speed reducer motor	4	107.3	2	1.8	1425	0.6	
AM17HD2438-PG10	10 speed reducer motor	4	107.3	4	1.8	5700	0.6	
AM17HD2438-PG20	20 speed reducer motor	4	120.3	8	1.8	22800	0.68	
AM17HD6426-PG05	5 speed reducer motor	4	115.8	2.5	1.8	2050	0.68	
AM17HD6426-PG10	10 speed reducer motor	4	115.8	5	1.8	8200	0.68	
AM17HD6426-PG20	20 speed reducer motor	4	128.8	10	1.8	32800	0.76	
AM17HDB410-PG05	5 speed reducer motor	4	130.3	4.25	1.6	3075	0.92	
AM17HDB410-PG10	10 speed reducer motor	4	130.3	8.5	1.6	12300	0.92	
AM17HDB410-PG20	20 speed reducer motor	4	143.3	17	1.6	49200	1	
AM23HS04B0-PG05	5 speed reducer motor	4	112.5	4.1	4.5	2625	1.23	
AM23HS04B0-PG10	10 speed reducer motor	4	112.5	8.2	4.5	10500	1.23	
AM23HS04B0-PG20	20 speed reducer motor	4	125.5	16.4	4.5	42000	1.44	
AM23HS84B0-PG05	5 speed reducer motor	4	128.5	7.5	4.5	5375	1.43	
AM23HS84B0-PG10	10 speed reducer motor	4	128.5	15	4.5	21500	1.43	
AM23HS84B0-PG20	20 speed reducer motor	4	141.5	30	4.5	86000	1.64	
AM23HSA4B0-PG05	5 speed reducer motor	4	150.5	11.5	4.5	9125	1.83	
AM23HSA4B0-PG10	10 speed reducer motor	4	150.5	23	4.5	36500	1.83	
AM23HSA4B0-PG20	20 speed reducer motor	4	163.5	46	4.5	146000	2.07	
AM24HS2402-PG05	5 speed reducer motor	4	127.5	6	4.5	11250	1.66	
AM24HS2402-PG10	10 speed reducer motor	4	127.5	12	4.5	45000	1.66	
AM24HS2402-PG20	20 speed reducer motor	4	140.5	24	4.5	180000	1.87	
AM24HS5401-PG05	5 speed reducer motor	4	158.5	12.5	4.5	22500	2.23	
AM24HS5401-PG10	10 speed reducer motor	4	158.5	25	4.5	90000	2.23	
AM24HS5401-PG20	20 speed reducer motor	4	171.5	50	4.5	360000	2.44	
AM34HD0404-PG05	5 speed reducer motor	4	170.5	15	7	27500	3.71	
AM34HD0404-PG10	10 speed reducer motor	4	170.5	30	7	110000	3.71	
AM34HD0404-PG20	20 speed reducer motor	4	188.5	60	7	440000	4.21	
AM34HD1404-PG05	5 speed reducer motor	4	210	25	7	46250	4.81	
AM34HD1404-PG10	10 speed reducer motor	4	210	50	7	185000	4.81	
AM34HD1404-PG20	20 speed reducer motor	4	218	100	7	740000	5.31	
AM34HD2403-PG05	5 speed reducer motor	4	229.5	35.5	7	68750	5.91	
AM34HD2403-PG10	10 speed reducer motor	4	229.5	71	7	275000	5.91	
AM34HD2403-PG20	20 speed reducer motor	4	247.5	142	7	1100000	6.41	

5.4 Torque Curves

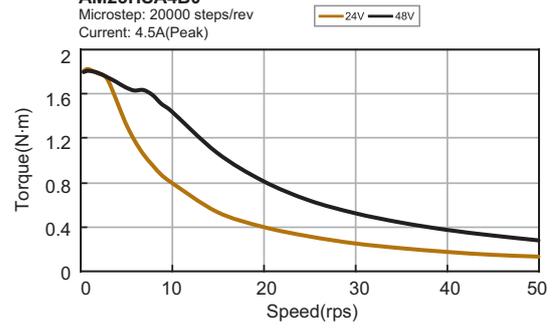




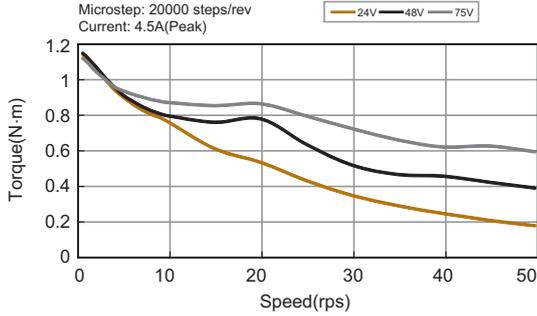
AM23HS84B0
Microstep: 20000 steps/rev
Current: 4.5A(Peak)



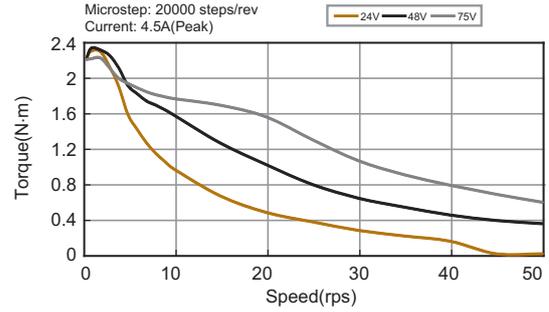
AM23HSA4B0
Microstep: 20000 steps/rev
Current: 4.5A(Peak)



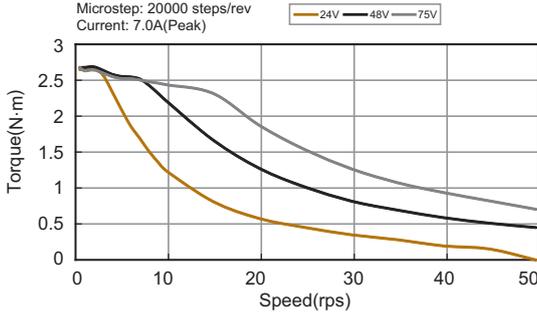
AM24HS2402
Microstep: 20000 steps/rev
Current: 4.5A(Peak)



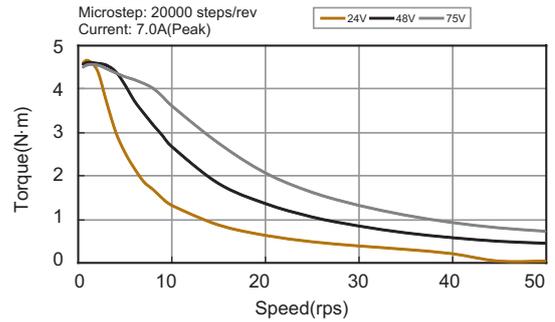
AM24HS5401
Microstep: 20000 steps/rev
Current: 4.5A(Peak)



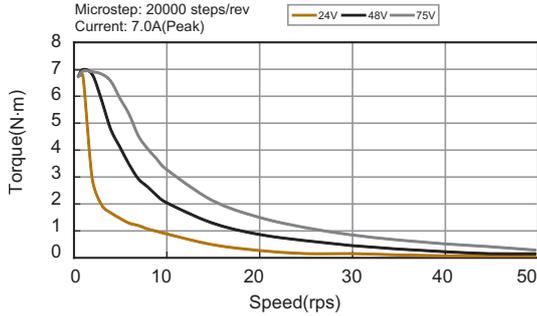
AM34HD0404
Microstep: 20000 steps/rev
Current: 7.0A(Peak)



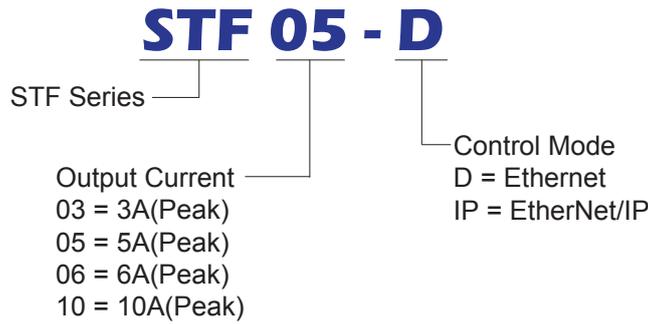
AM34HD1404
Microstep: 20000 steps/rev
Current: 7.0A(Peak)



AM34HD2403
Microstep: 20000 steps/rev
Current: 7.0A(Peak)



5.5 Numbering System



5.6 Ordering Information

Model	Current	Voltage	Ethernet	Modbus/TCP	EtherNet/IP	Q Program
STF03-D	0.1 - 3.0 A	12 - 48 VDC	✓	✓		✓
STF05-D	0.1 - 5.0 A	24 - 48 VDC	✓	✓		✓
STF06-D	0.1 - 6.0 A	12 - 48 VDC	✓	✓		✓
STF10-D	0.1 - 10.0 A	24 - 70 VDC	✓	✓		✓
STF03-IP	0.1 - 3.0 A	12 - 48 VDC	✓	✓	✓	✓
STF05-IP	0.1 - 5.0 A	24 - 48 VDC	✓	✓	✓	✓
STF06-IP	0.1 - 6.0 A	12 - 48 VDC	✓	✓	✓	✓
STF10-IP	0.1 - 10.0 A	24 - 70 VDC	✓	✓	✓	✓

5.7 Alarm Code

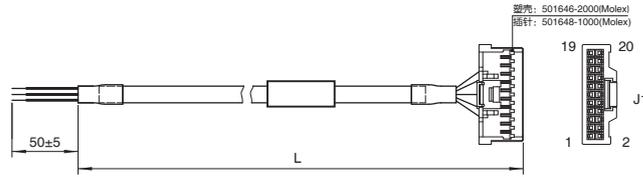
Code	Error
 solid green	no alarm,motor disabled
 flashing green	no alarm,motor enabled
 1 red, 2 green	move while disabled
 2 red, 1 green	CCW limit
 2 red, 2 green	CW limit
 3 red, 1 green	<i>drive over temperature</i>
 3 red, 2 green	<i>internal voltage bad</i>
 3 red, 3 green	blank Q segment
 4 red, 1 green	<i>over voltage</i>
 4 red, 2 green	under voltage
 5 red, 1 green	<i>over current</i>
 6 red, 1 green	<i>open motor winding</i>
 7 red, 1 green	communication error

NOTE: Items in ***bold italic*** represent Drive Faults, which automatically disable the motor.

6 Accessories (Sold Separately)

I/O Cable

P/N	Length
1015-030	0.3m
1015-100	1m
1015-200	2m

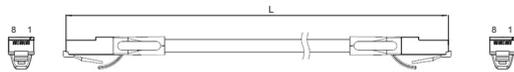


Pin No.	Assignment	Description	Color	Pin No.	Assignment	Description	Color
1	X1+	X1 Digital Input	Blue/White	11	X7	X7 Digital Input	Yellow
2	X1-		Blue/Black	12	X8	X8 Digital Input	Green
3	X2+	X2 Digital Input	Green/White	13	SHIELD	Shield	Shield
4	X2-		Green/Black	14	XCOM	X5-X8 Digital Input COM	Red
5	X3+	X3 Digital Input	Yellow/White	15	Y1	Y1 Digital Output	Brown
6	X3-		Yellow/Black	16	Y2	Y2 Digital Output	Gray
7	X4+	X4 Digital Input	Orange/White	17	Y3	Y3 Digital Output	White
8	X4-		Orange/Black	18	YCOM	Y1-Y3 Digital Output COM	Black
9	X5	X5 Digital Input	Blue	19	Y4+	Y4 Digital Output	Purple/White
10	X6	X6 Digital Input	Purple	20	Y4-		Purple/Black

Bus Communication Daisy Chain Cable

Common Type	Shielded Type	Length
2012-030 *	2013-030	0.3m
2012-300	2013-300	3m

* 2012-030 is included in the drive package.



RC-880

RC-880 is used to limit increase in power supply voltage when the motor is decelerating under load. This is commonly referred to as "regeneration".

RC-880 can clamp the regeneration and prevent the power supply and/or drive being damaged or destroyed. Connect the RC-880 between the power supply and the drive.

Max. Supply Voltage: 80V
 Max. Output Current: 8A(rms)
 Continuous Power: 50W



Mating Connector (included in drive package)

STF05/10

Part	Description	Part Number	Vendor	Qty
J1	Power & Motor Connector	2EDGK-5.08-06P-13-1000AH	DEGSON	1
J2	I/O Connector Housing	501646-2000	Molex	1
J2	I/O Connector Crimp	501648-1000	Molex	20

STF03/06

Part	Description	Part Number	Vendor	Qty
J1	Power & Motor Connector	BCP-381-6 BK	Phoenix	1
J2	I/O Connector Housing	501646-2000	Molex	1
J2	I/O Connector Crimp	501648-1000	Molex	20

7 Contacting MOONS'



Customer Service Center

+86-400-820-9661

MOONS' Headquarter

168 Mingjia Road, Minhang District, Shanghai 201107, P.R. China

MOONS' Taicang

No. 18 Yingang Rd, Fuqiao Town, Taicang City Jiangsu Province, 215434, P.R. China

Domestic Office

Beijing

Room 1206, Jing Liang Mansion, No.16 Middle Road of East,3rd Ring, Chaoyang District, Beijing 100022, P.R. China

Qingdao

Room1913,Scientific and Technological Innovation Building,Floor19, No.171, ShanDong Road,Shibei District,QingDao, Shangdong Province, 266033, P.R. China

Xi'an

Room 1006, Tower D, Wangzuo International City, No.1 Tangyan Road, Xi'an, Shanxi Province, 710065, P.R. China

Wuhan

Room 3001, World Trade Tower, No.686 Jiefang Avenue, Jianghan District, Wuhan, Hubei Province, 430022, P.R. China

Hefei

Room 1521, Building B, CBC Tuoji Plaza, Jinggang Road, Shushan District, Hefei, Anhui Province, 230088, P.R. China

Nanjing

Room 1101-1102, Building 2, New Town Development Center, No.126 Tianyuan Road, Moling Street, Jiangning District, Jiangsu Province, China, 211106, P.R. China

Suzhou

Room 1103-1105, North Building 4, Huizu Plaza, 758 Nanhuan East Rd, Gusu District, Suzhou, Jiangsu Province, 215007, P.R. China

Ningbo

Room 309, Tower B, Taifu Plaza, 565 Jiangjia Road, Jiandong District, Ningbo, Zhejiang Province, 315040, P.R. China

Chengdu

Room 3907, Maoye Plaza, No.19, Dongyu Street, Jinjiang Distrit, Chengdu Sichuan Province, 610066, P.R. China

Chongqing

Room 2108, South yuanzhu Building 20, No.18 Fuquan Rd., Jiangbei District, Chongqing, 400000, P.R. China

Guangzhou

Room 4006, Tower B, China Shine Plaza, 9 Linhe Xi Road, Tianhe District, Guangzhou, Guangdong Province, 510610, P.R. China

Dongguan

Room 1106-1207, Building 5, Linrunzhigu, No.1 RD 5th Rd, Songshan Lake, Dongguan, Guangdong Province, 523000, P.R. China

Shenzhen

Room 3901, Building A, Zhongguan Times Square, No 4168 Liuxian Avenue, Nanshan District, Shenzhen, Guangdong Province, 518000, P.R. China

North America

USA

MOONS' INDUSTRIES (AMERICA), INC. (Chicago)

1113 North Prospect Avenue, Itasca, IL 60143, USA

MOONS' INDUSTRIES (AMERICA), INC. (Boston)

36 Cordage Park Circle, Suite 310 Plymouth, MA 02360, USA

APPLIED MOTION PRODUCTS, INC. (Morgan Hill)

18645 Madrone Parkway, Morgan Hill, CA 95037, USA

LIN ENGINEERING, Inc. (Morgan Hill)

16245 Vineyard Blvd., Morgan Hill, CA 95037, USA

Europe

Italy

MOONS' INDUSTRIES (EUROPE) HEAD QUARTER S.R.L.

Via Torri Bianche n.1 20871 Vimercate(MB) Italy

Germany

AMP & MOONS' AUTOMATION (GERMANY) GMBH

Kaiserhofstr. 15
60313 Frankfurt am Main Germany

Switzerland

TECHNOFT SA

Avenue des Alpes 20
CH 2000 Neuchâtel Switzerland

U.K

MOONS' INDUSTRIES (UK), LIMITED

Reading, Berkshire, UK

Asia

Singapore

MOONS' INDUSTRIES (SOUTH-EAST ASIA) PTE. LTD.

33 Ubi Avenue 3 #08-23 Vertex Singapore 408868

Japan

MOONS' INDUSTRIES JAPAN CO., LTD.

Room 602, 6F, Shin Yokohama Koushin Building,
2-12-1, Shin-Yokohama, Kohoku-ku, Yokohama, Kanagawa,
Japan 222-0033

India

MOONS' INTELLIGENT MOTION SYSTEM INDIA PVT. LTD.

Room. 908, 9th Floor, Amar Business Park,
Tal. Haveli, Baner, Pune, India 411045

Vietnam

MOONS' VIETNAM MANUFACTURING SITE

Factory C1&D1, Lot IN3-11*A, VSIP Hai Phong Industrial Park in Dinh Vu - Cat Hai Economic Zone, Lap Le Commune, Thuy Nguyen District, Hai Phong City, Vietnam

<https://www.moonsindustries.com/>

E-mail: ama-info@moons.com.cn

MOONS'
moving in better ways

• All the specifications, technical parameters of the products provided in this catalog are for reference only, subject to change without notice.