

SSDC-A

Step-Servo System Hardware Manual

SSDC03/06/10-A
SSDC03/06/10-A-FC



SHANGHAI AMP&MOONS' AUTOMATION CO.,LTD.

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1 Introduction

Thank you for selecting the MOONS' SSDC series Step-Servo drive and motor. SSDC series combines servo technology with a stepper motor to create a product with exceptional feature and broad capability.

The SSDC series is a high performance, intelligent Step-Servo system with multi-axes field bus control.

SSDC-A supports the RS-232 serial communication. The SCL commands and the Modbus commands can be used to control the drive and motor in real time. The motion control program can be stored in the drive (Q program) and then the SCL commands and Modbus commands can be used to call programs flexibly.

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

Model
SSDC03-A
SSDC06-A
SSDC10-A
★ SSDC03-A-FC
★ SSDC06-A-FC
★ SSDC10-A-FC

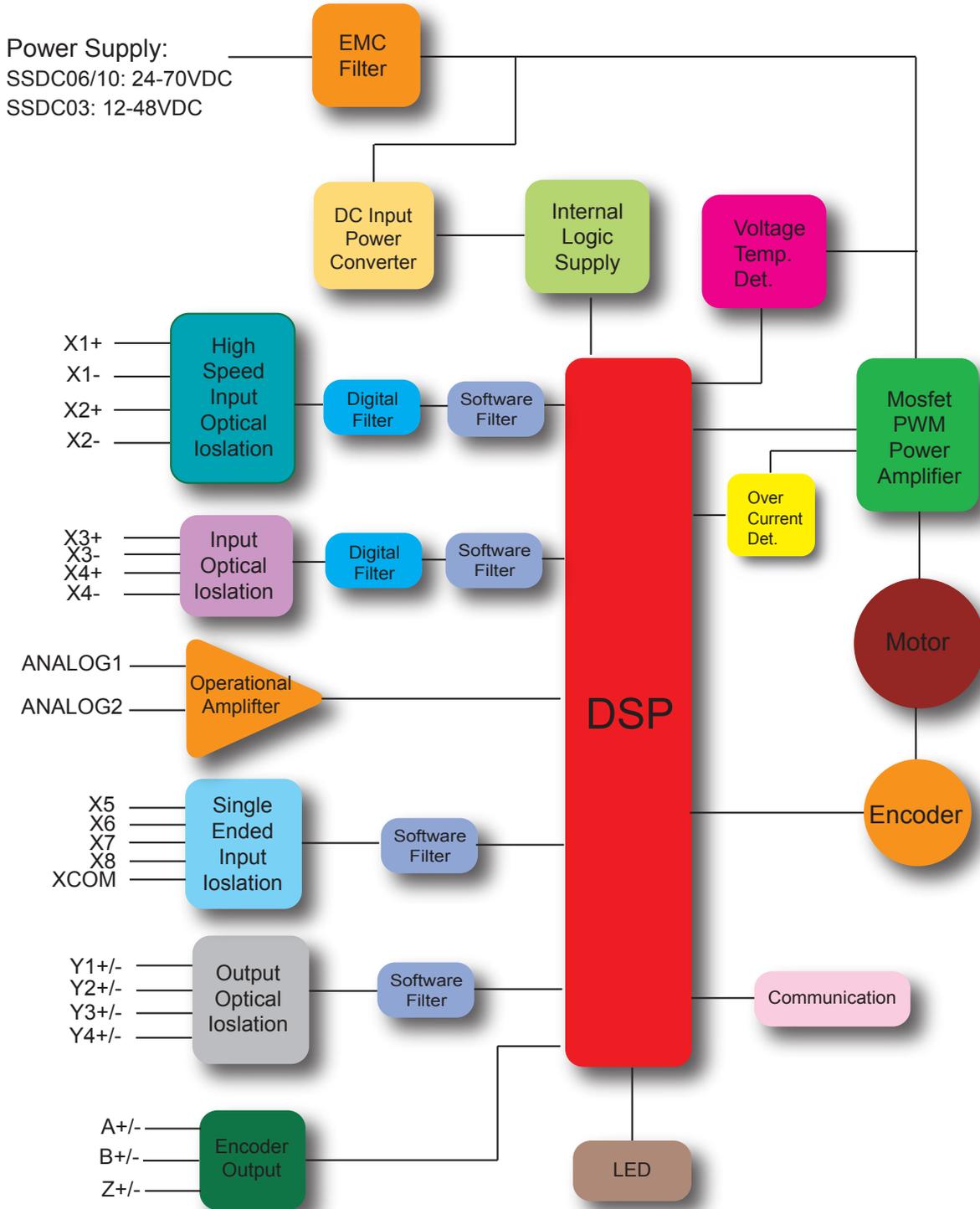
★: Conforms to UL certification. 

1.1 Features

- Programmable, digital step-servo drive and motor package
- Control modes:
 - Velocity Control: Digital signal control, Analog control, SCL command, Q programming
 - Position Control: Digital signal control, Analog control, SCL command, Q programming
 - Torque Control: Analog control, SCL command, Q programming
- Multi-operation modes:
 - Closed-loop Servo control mode, Closed-loop Step control mode, Full closed-loop mode
- Current output
 - SSDC03 output current: continuous 3A/phase (peak of sin) , boost 4A(1.5s)
 - SSDC06 output current: continuous 6A/phase (peak of sin) , boost 7.5A(1.5s)
 - SSDC10 output current: continuous 10A/phase (peak of sin) , boost 15A(1.5s)
- Wide range input voltage:
 - SSDC03: 12~48VDC
 - SSDC06: 24~70VDC
 - SSDC10: 24~70VDC
- Encoder resolution: 20000 counts/rev (AM17/23/24/34SS-N motor)
4096 counts/rev (AM11/17/23/24/34RS motor)
- Differential encoder outputs (ENC A+/-, ENC B+/-, ENC Z+/-), 26C31 line driver, 20 mA sink or source max
- Support secondary encoder signal input(single-ended or differential) for full closed-loop control
- Abundant I/O interface
 - 8 optically isolated digital inputs,5-24VDC
 - 4 optically isolated digital outputs,max30V/100mA
 - 2 analog inputs can be configured to 0-5V, 0-10V, $\pm 5V$ or $\pm 10V$ signal ranges
- RS-232 serial communication, Modbus/RTU(single axis)

1.2 Block Diagram

SSDC 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 12-70VDC power supply, see the section below entitled “Choose a Power Supply” for helping to choose the right one.
- A compatible SS or RS 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/7/8(Using serial communication port. Prepare an USB to Serial converter if the PC doesn’ t have it.
- Install the Step-Servo Quick Tuner software (download from MOONS website: www.moonsindustries.com)
- A power cable(included)
- A RS-232 communication cable(included)
- Optional extended motor cable(Sold separately)
- Optional extended encoder cable(Sold separately)
- Optional extended I/O cable(Sold separately)

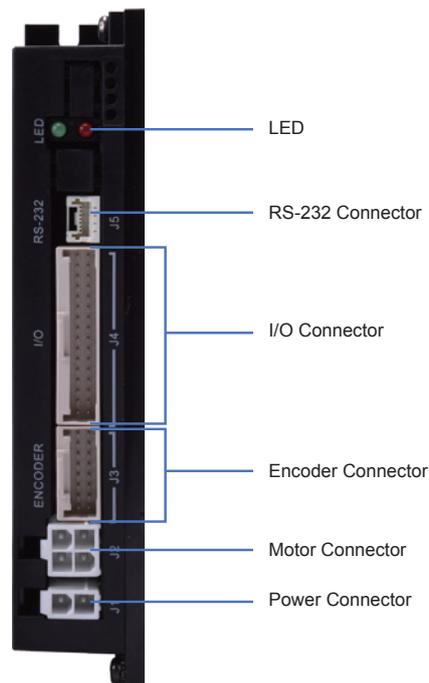
2.1 Installing Software

Step-Servo Quick Tuner is the PC based software application used to configure, and perform servo tuning, drive testing and evaluation of the step-servo products. System servo control gains, drive functionality and I/O configuration are set with Step-Servo Quick Tuner. It also contains an oscilloscope function to help set the servo control gains.

- Download the Step-Servo Quick Tuner from the MOONS' website and install it.
- Launch the software by clicking Start----Programs ----MOONS'
- Connect the drive to PC by RS-232 cable. Please see the section below entitled "Choosing the Right COM Port" .
- Connect the drive to the Power Supply.
- Connect the motor to the drive.
- Power up the drive.
- The software will recognize your drive, display the model and firmware version and be ready for action.

The connectors and other points of interest are illustrated below:

SSDC-A, RS-232 Communication type



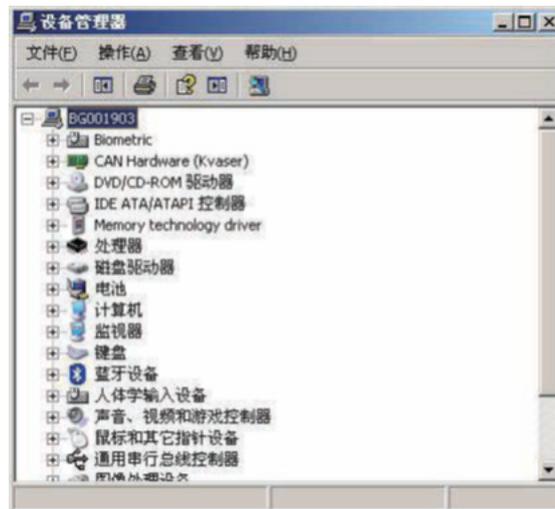
2.2 Connecting to the PC using RS-232

Connector J5 is RS-232 communication port, please use the included RS-232 cable to connect the drive and PC. Use the **Step-Servo Quick Tuner** software to configure the drive parameter, tuning, monitoring the status of drive and motor.

PIN	Definition
1	DGND
2	TX
3	VCC
4	RX

2.3 Choosing the Right COM Port

Open the “Device Manager” on the PC. There may or may not be a “Ports” selection. Connect the mini USB cable to the PC. The connected COM port should then be displayed. Choose this new COM(n) port in the Step-Servo Quick Tuner software.



2.4 Connecting the Power Supply

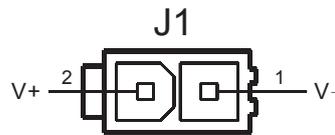
The SSDC series step-servo drive and motor are shipped with a power cable, 2 meters long. Connect the red wire to the positive of the power supply. Connect the black wire to the negative of the power supply. Plug the cable into the power connector of the drive.

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

SSDC03: 12 – 48VDC

SSDC06: 24 – 70VDC

SSDC10: 24 – 70VDC



Power Connector

Connect the chassis to the earth ground through the grounding screws.



The section entitled “Choosing a Power Supply” will help you to select a right power supply.

2.5 Choosing a Power Supply

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

2.5.1 Voltage

The SSDC drive is designed to give optimum performance between 24 and 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 RS driver to produce higher temperatures. Using power supplies with voltage outputs that are near the drive maximum may significantly reduce the operational duty-cycle.

SSDC03

For the SSDC03 drive, the extended range of operation can be as low as 11 VDC minimum to as high as 53 VDC maximum. When operating below 11 VDC, 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 11 VDC for reliable operation. This will not fault the drive. Absolute maximum power supply input is 53 VDC 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 53 VDC, 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 53 VDC.

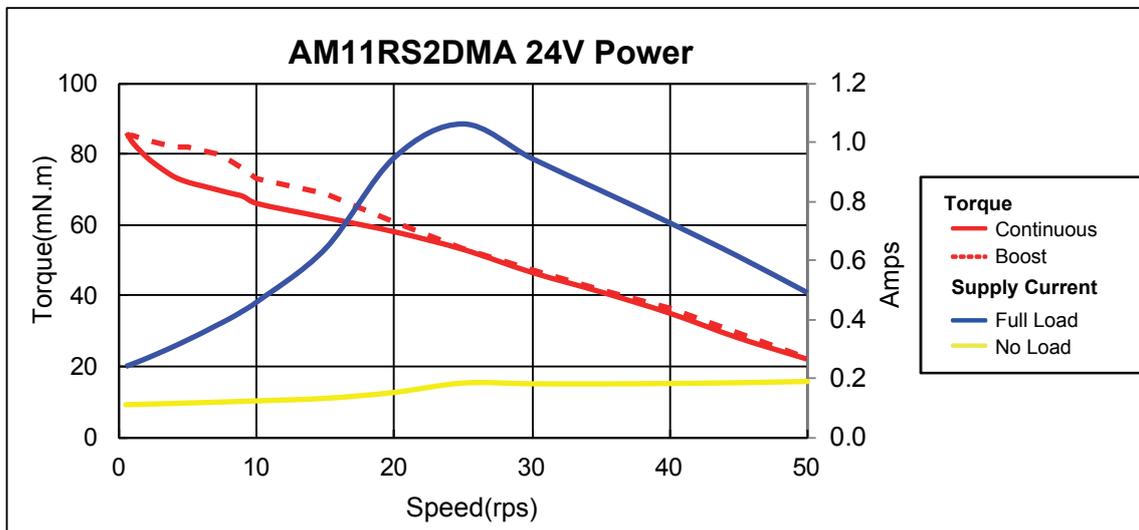
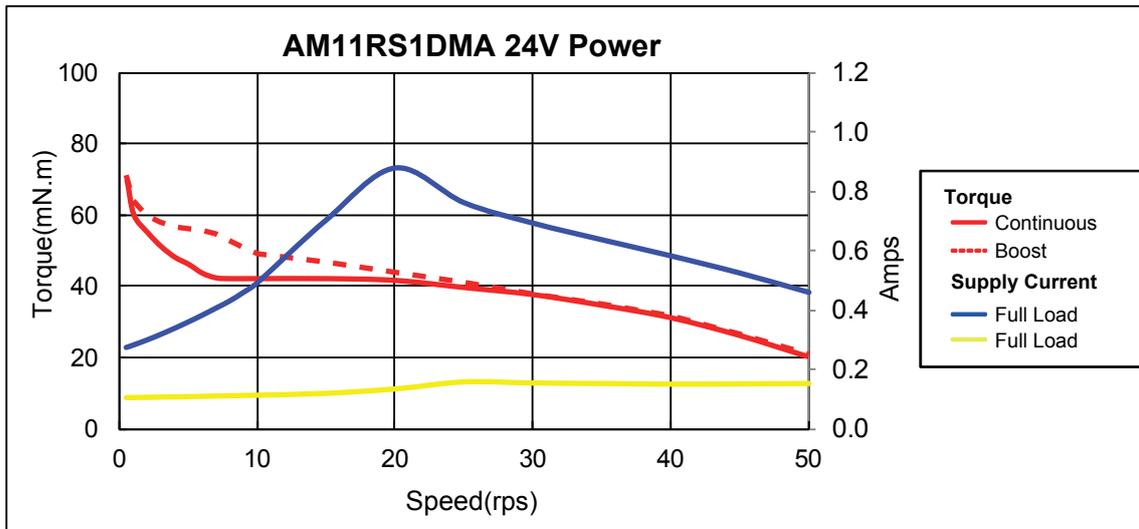
SSDC06/10

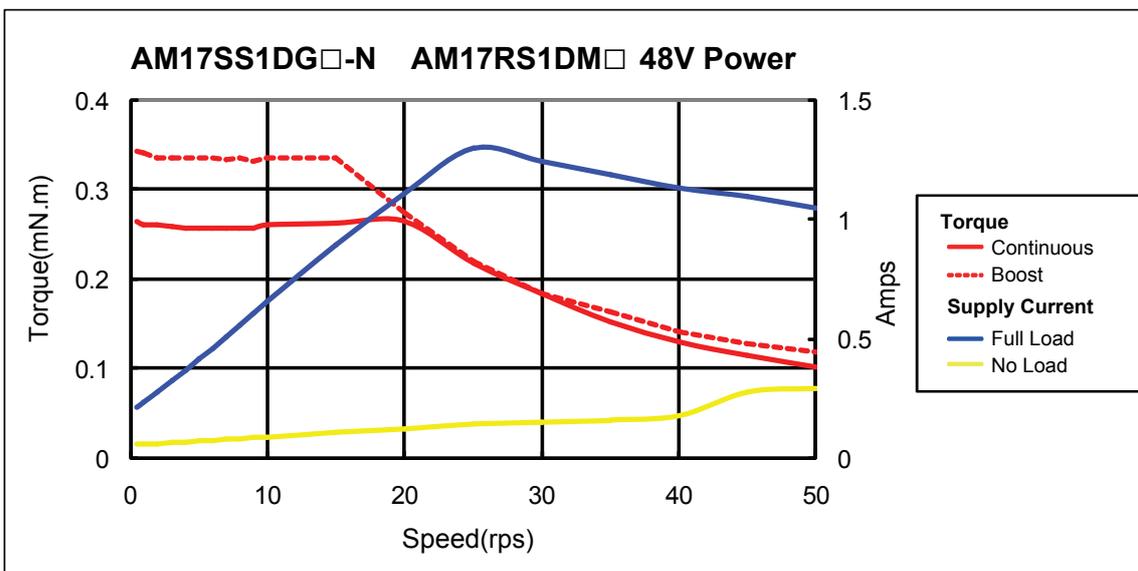
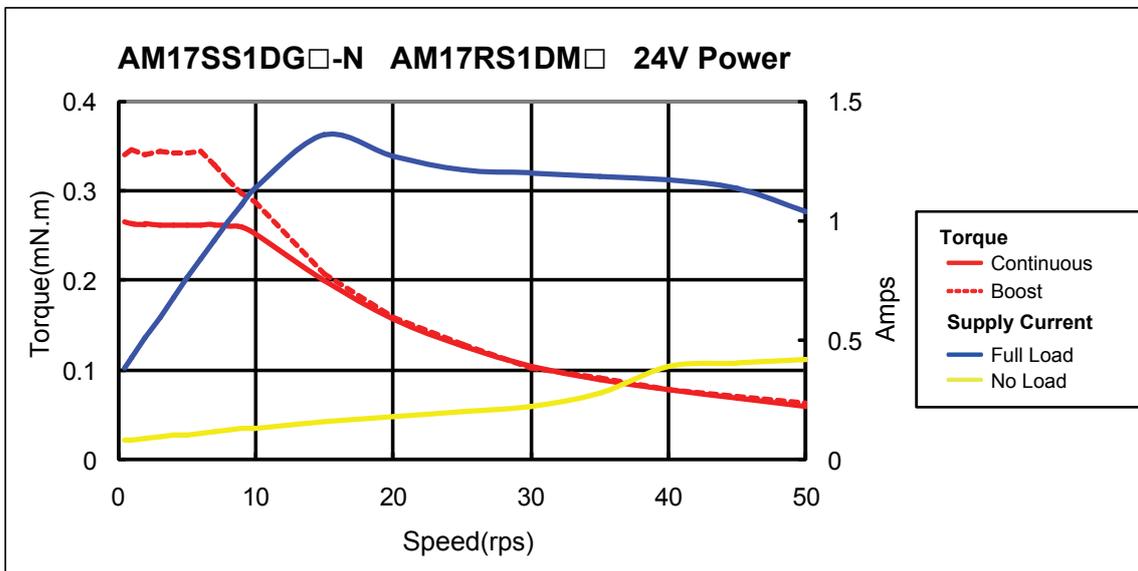
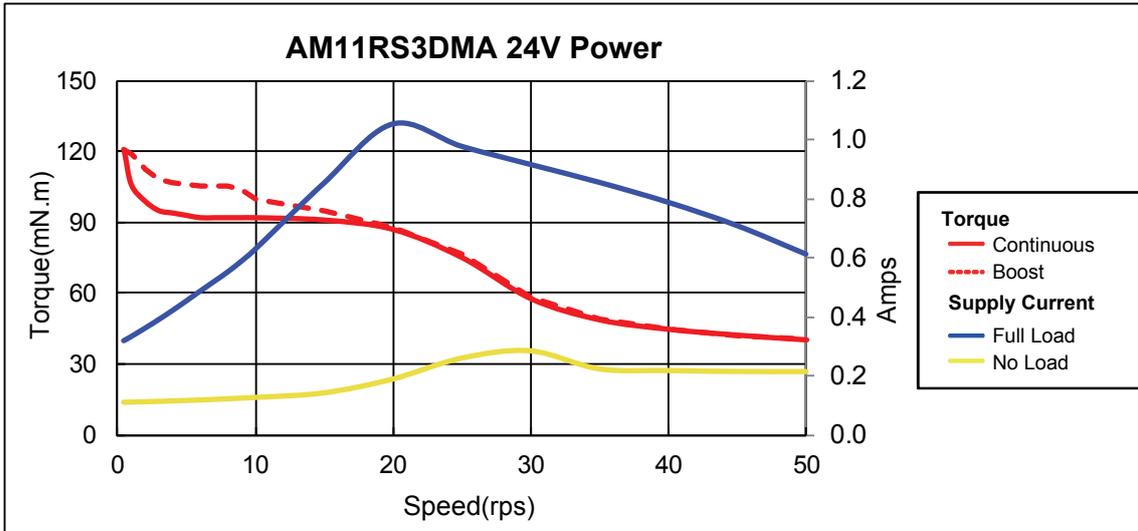
For the SSDC06/10 drive, the extended range of operation can be as low as 18 VDC minimum to as high as 75 VDC maximum. When operating below 18 VDC, the power supply input may require larger capacitance to prevent under-voltage and internal-supply alarms. Current spikes may make supply readings erratic. The supply input cannot go below 18 VDC for reliable operation. This will not fault the drive. Absolute maximum power supply input is 75 VDC 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 75 VDC, 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 75 VDC.

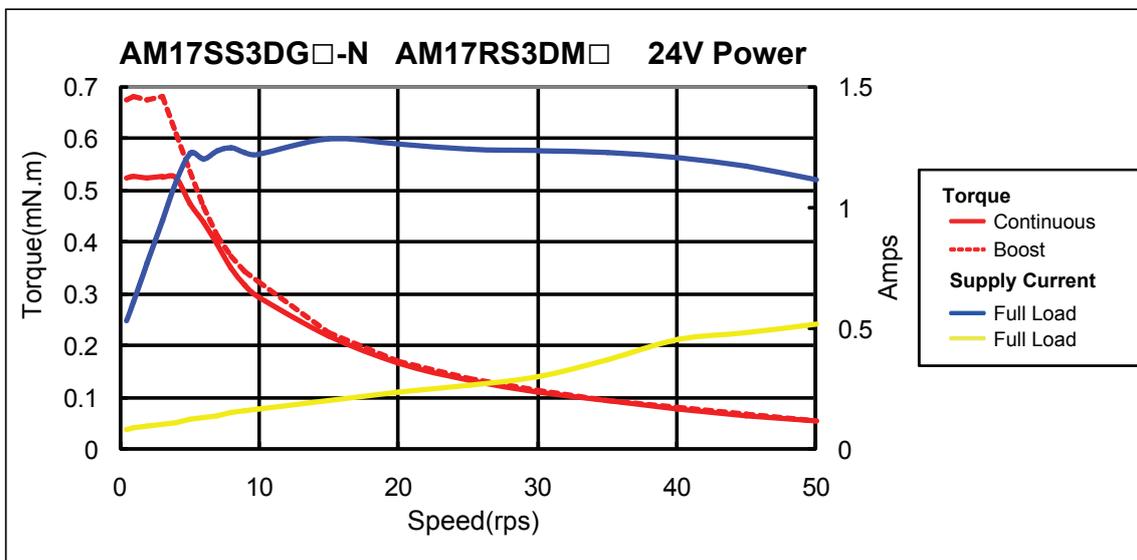
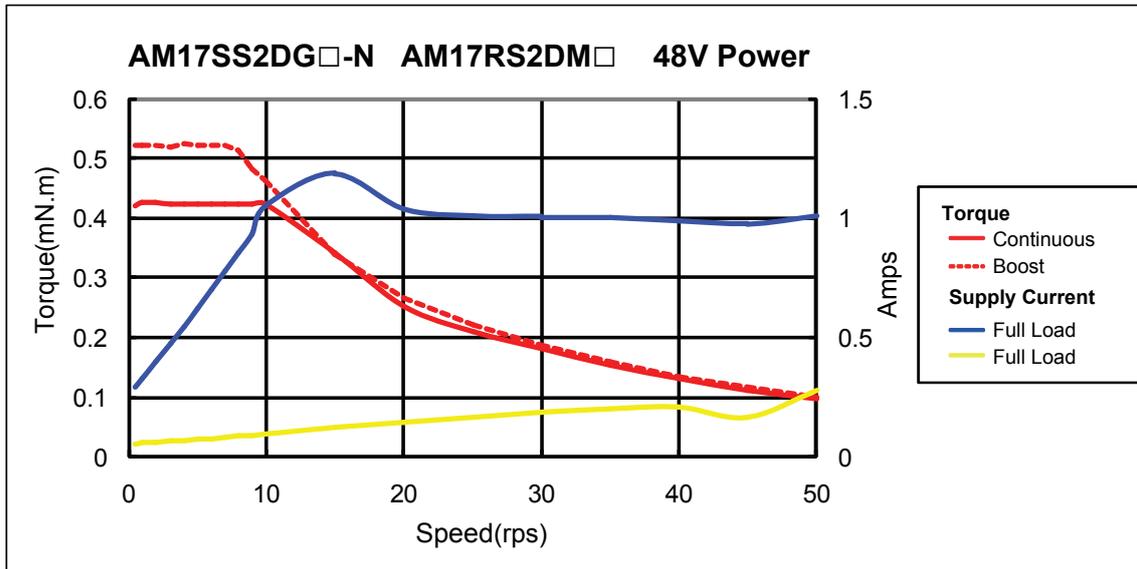
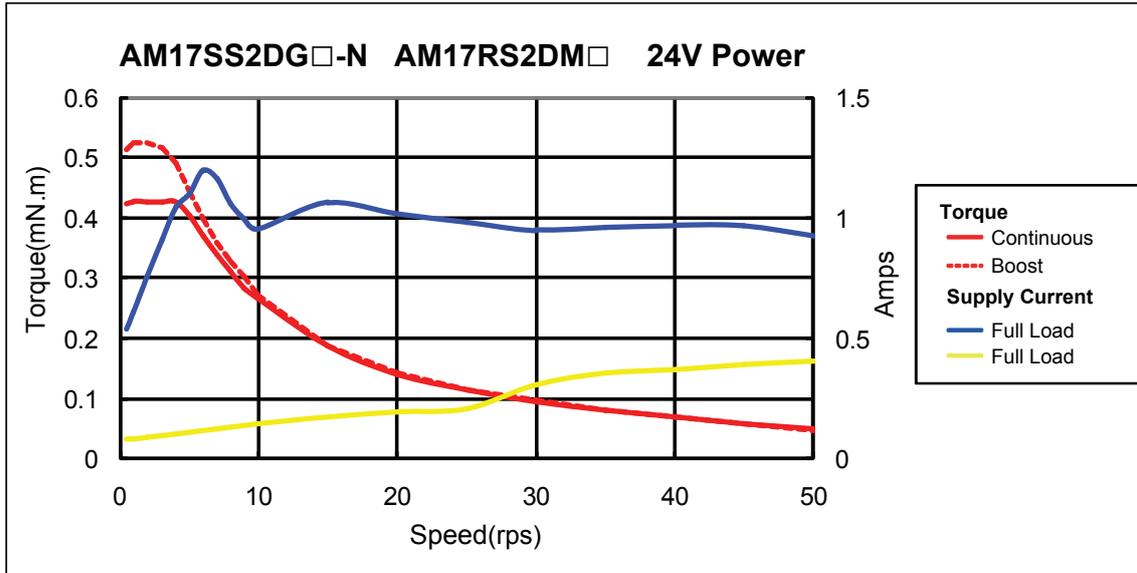
2.5.2 Current

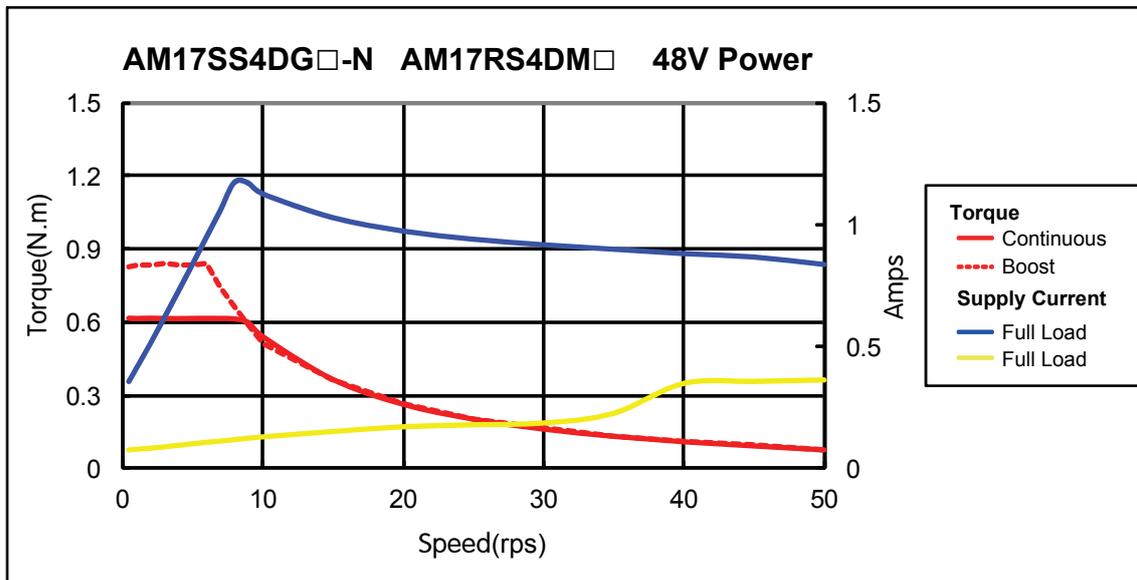
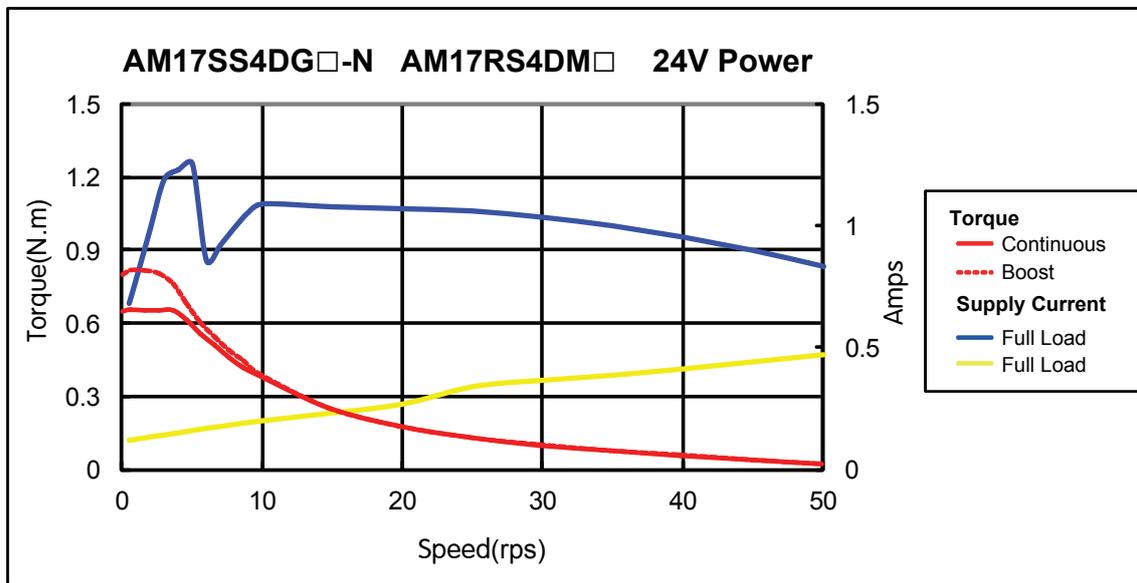
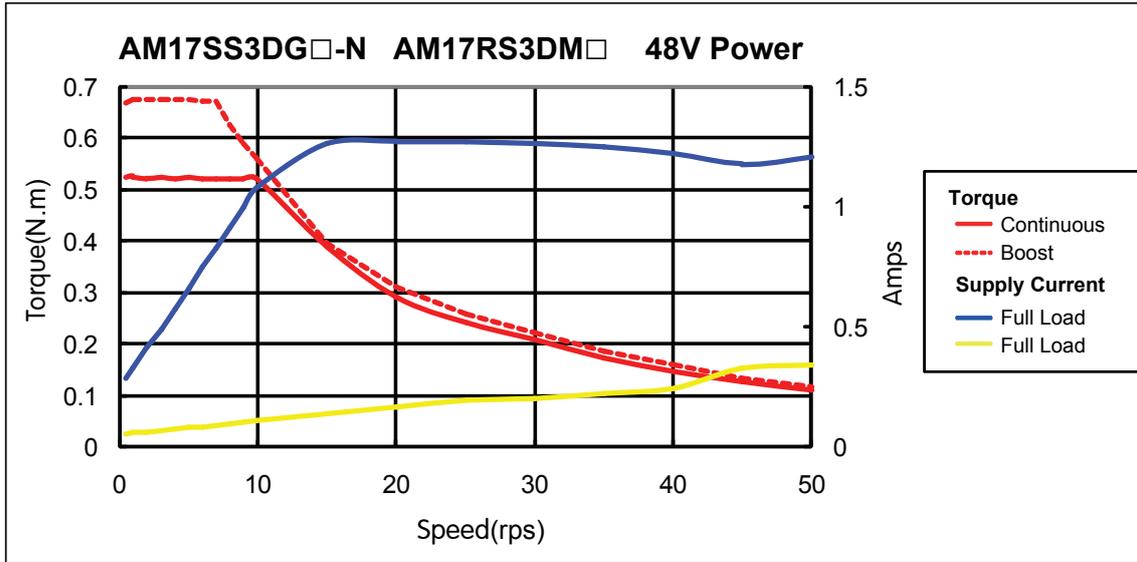
The maximum supply currents required by the SSDC series step servo drive and motor are shown below in charts at different power supply voltage input. The SSDC drive power supply current is lower than the winding currents because it uses switching amplifiers to convert a high voltage and low current into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

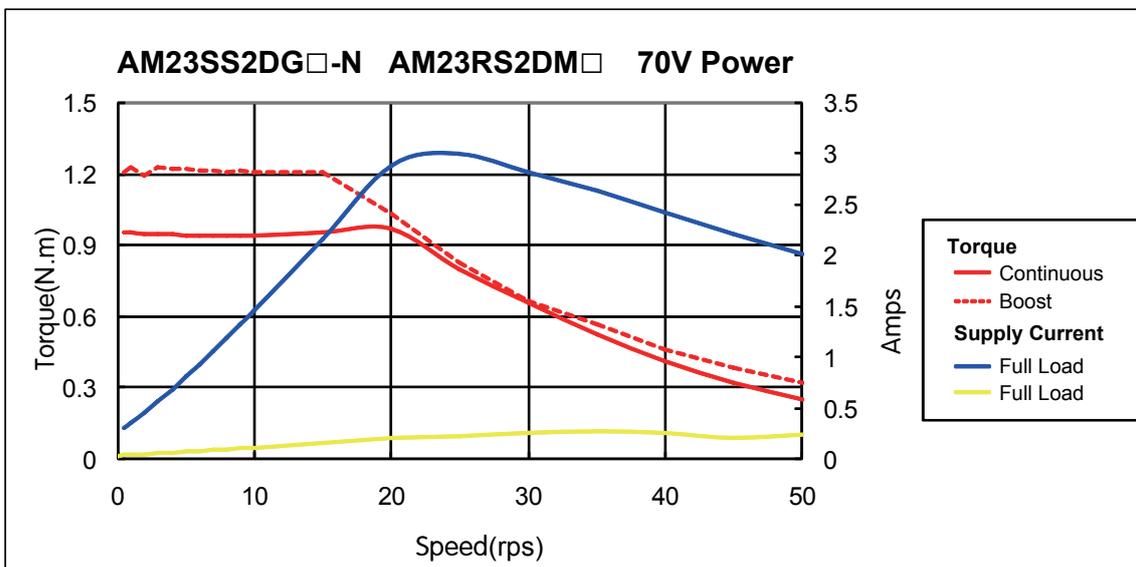
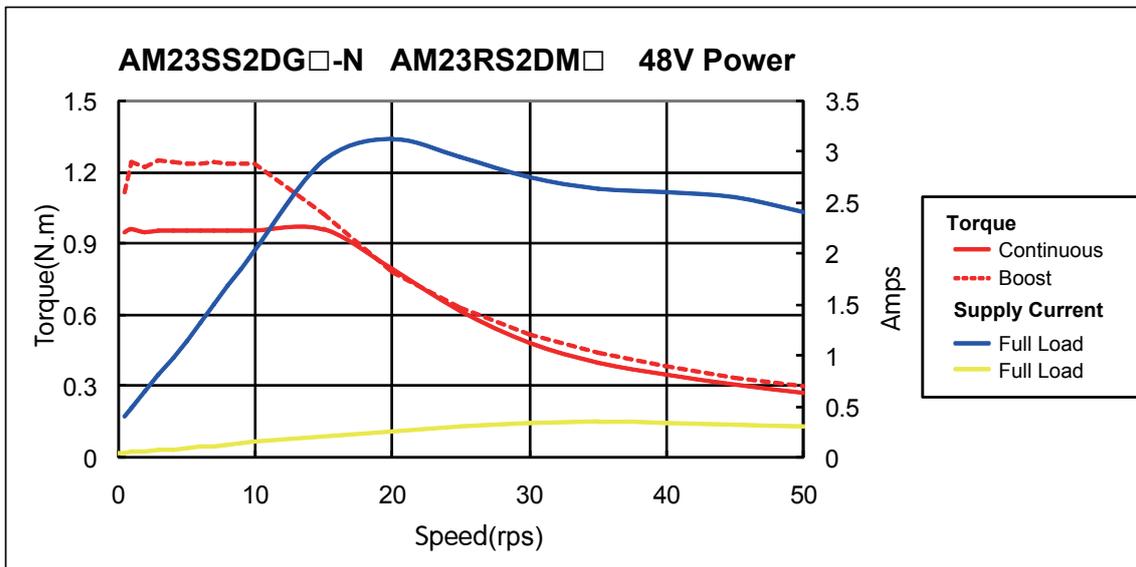
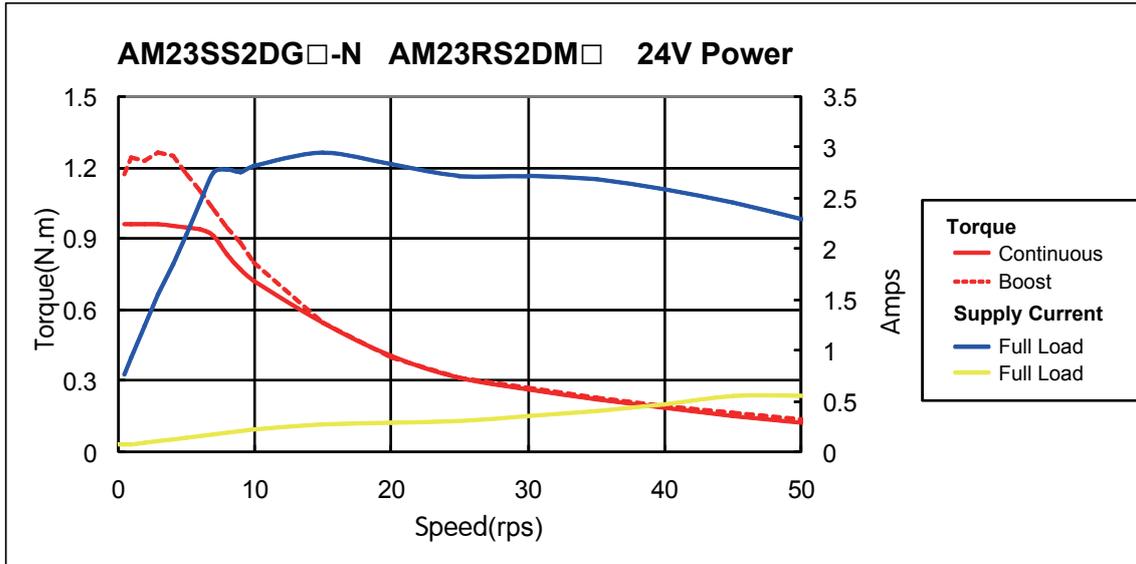
It is important to note that the current draw is significantly different at higher speeds depending on the torque load to the motor. Estimating how much current is necessary may require a good analysis of the load to the motor.

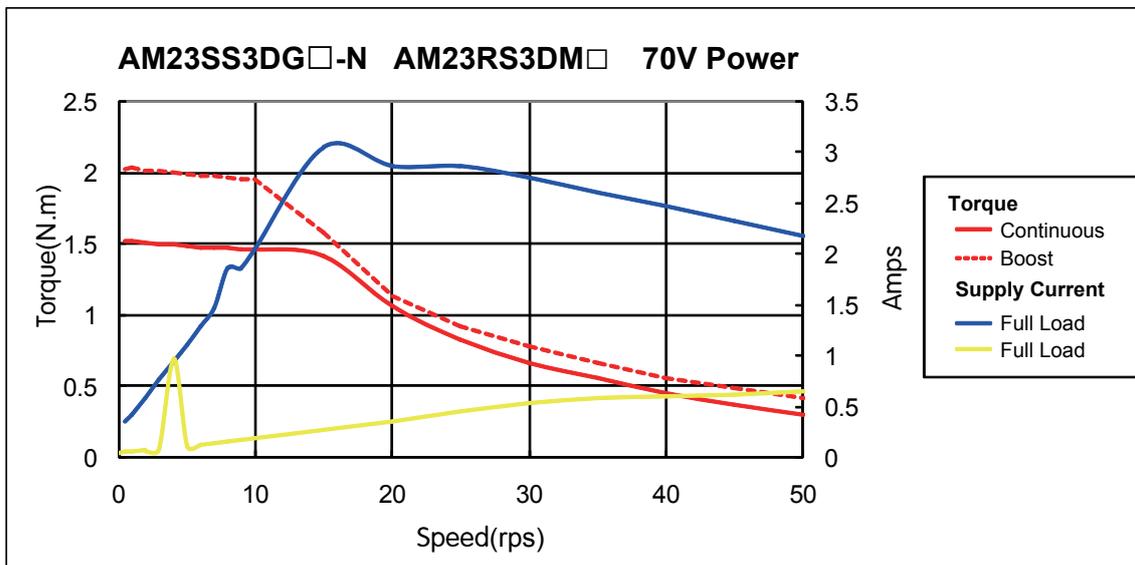
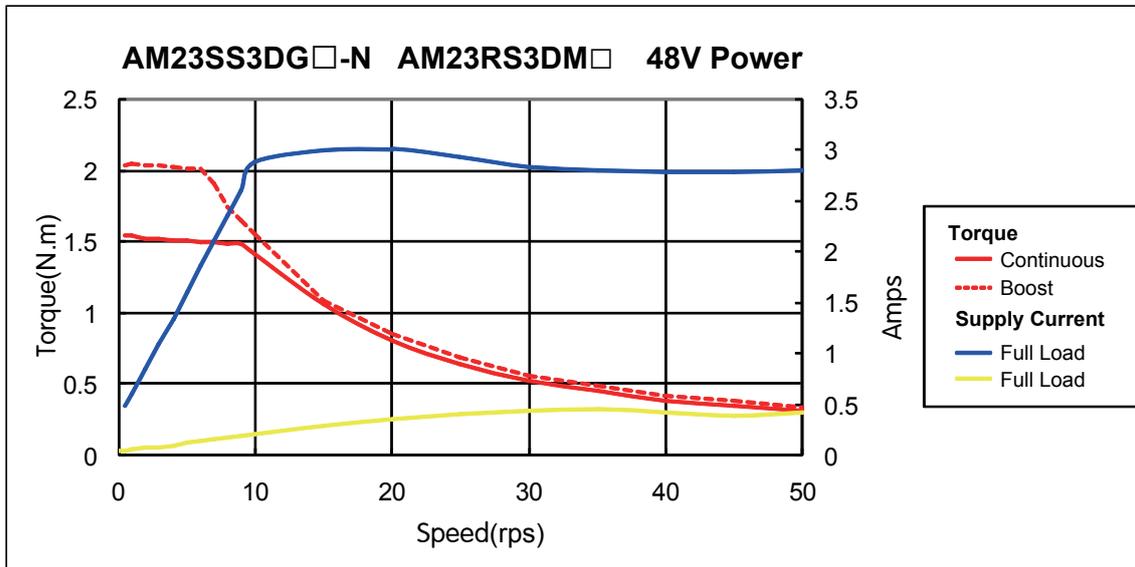


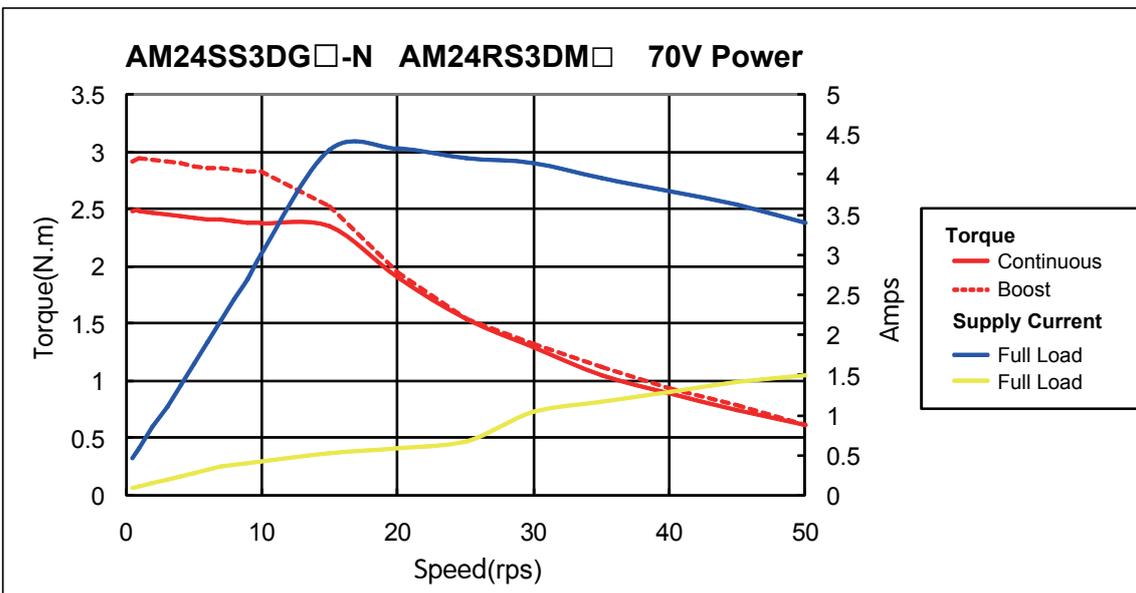
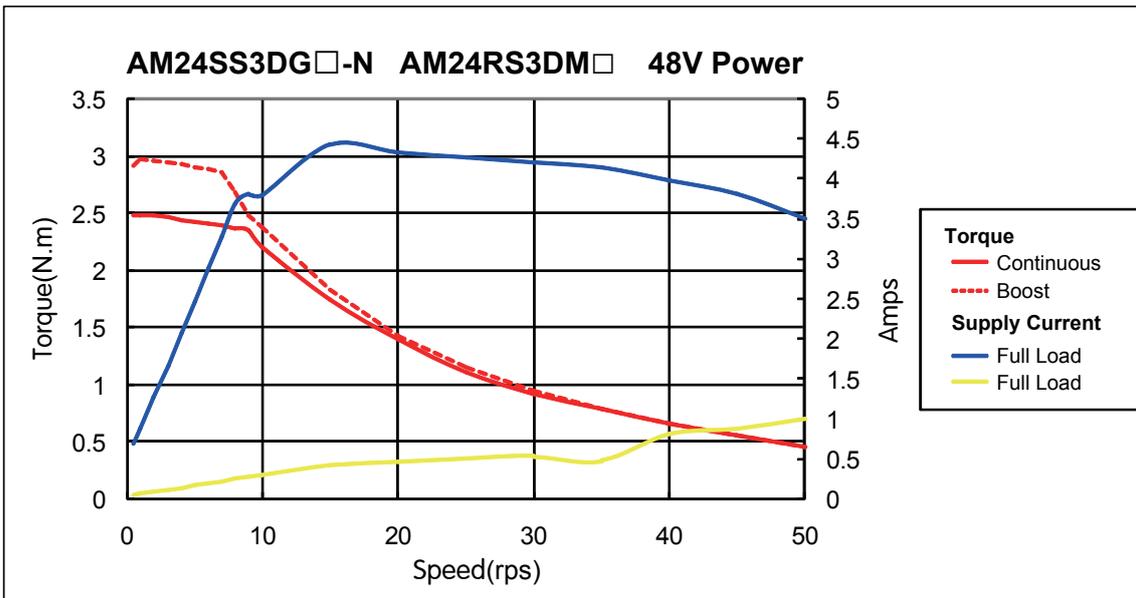
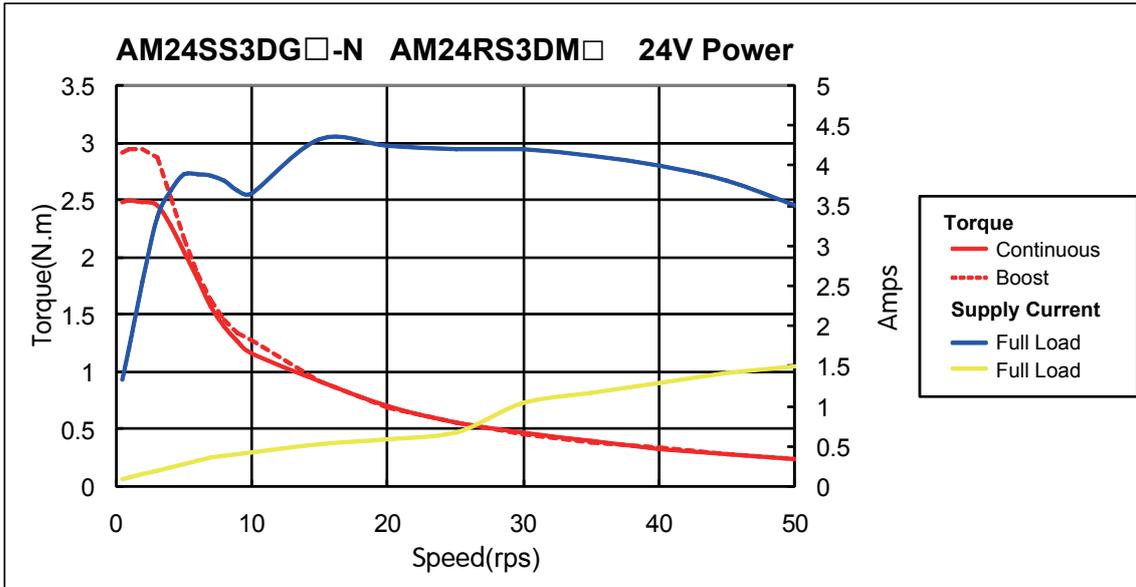


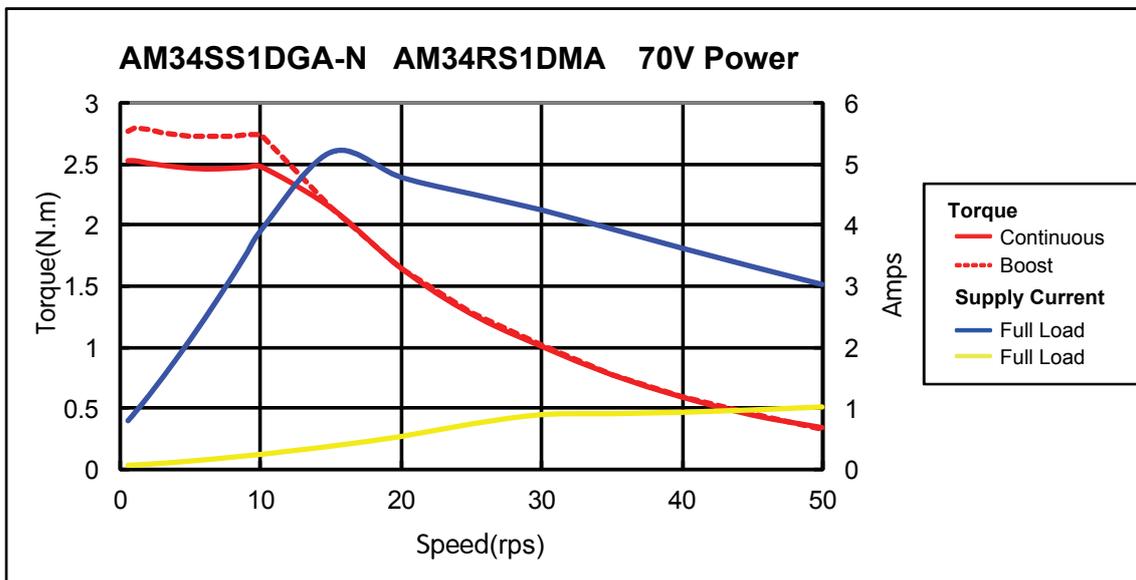
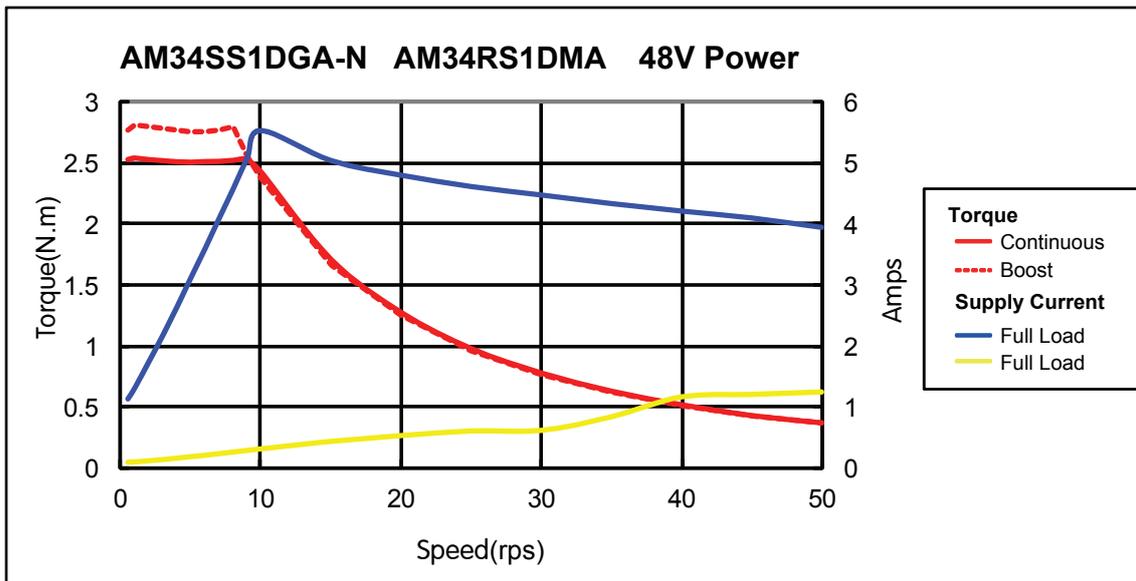
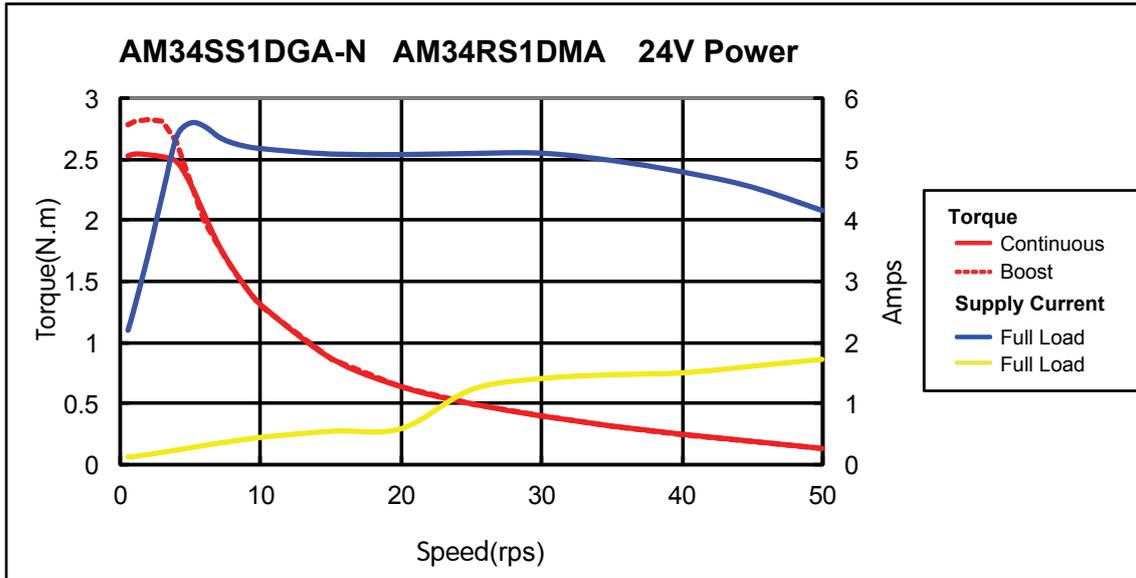


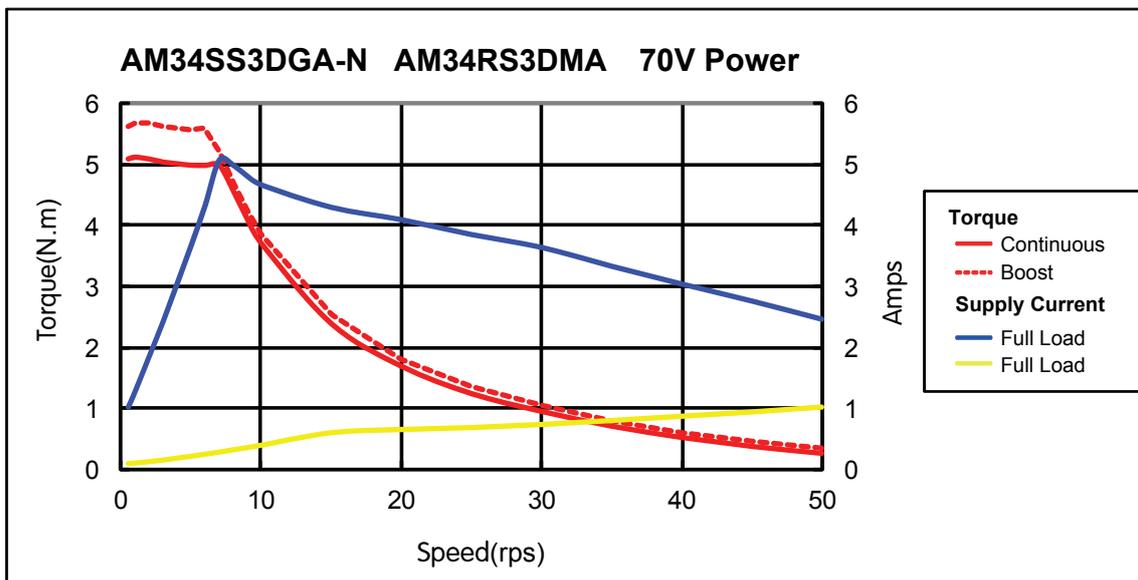
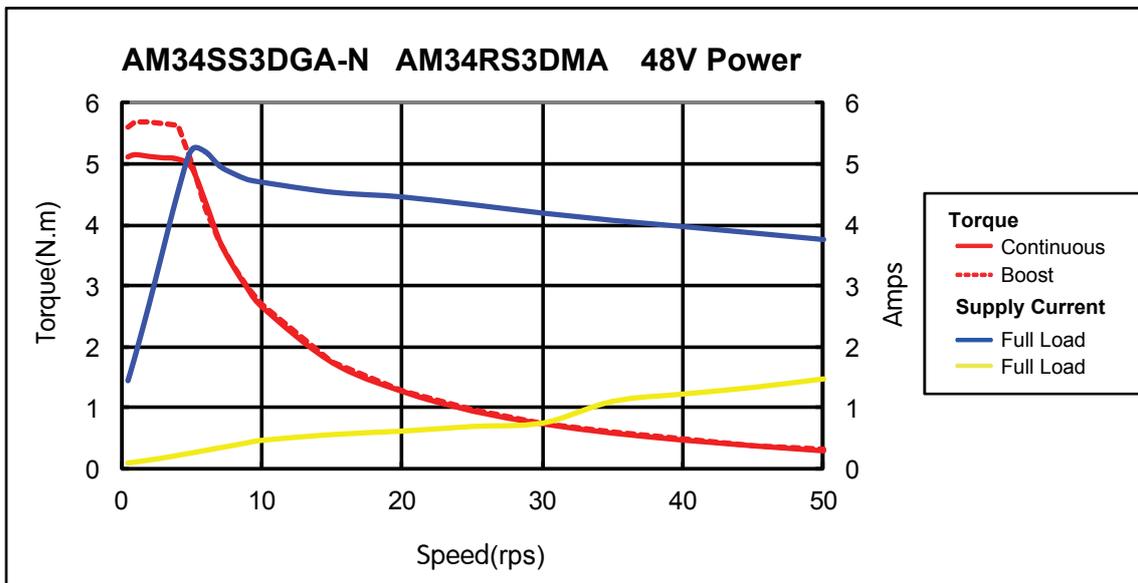
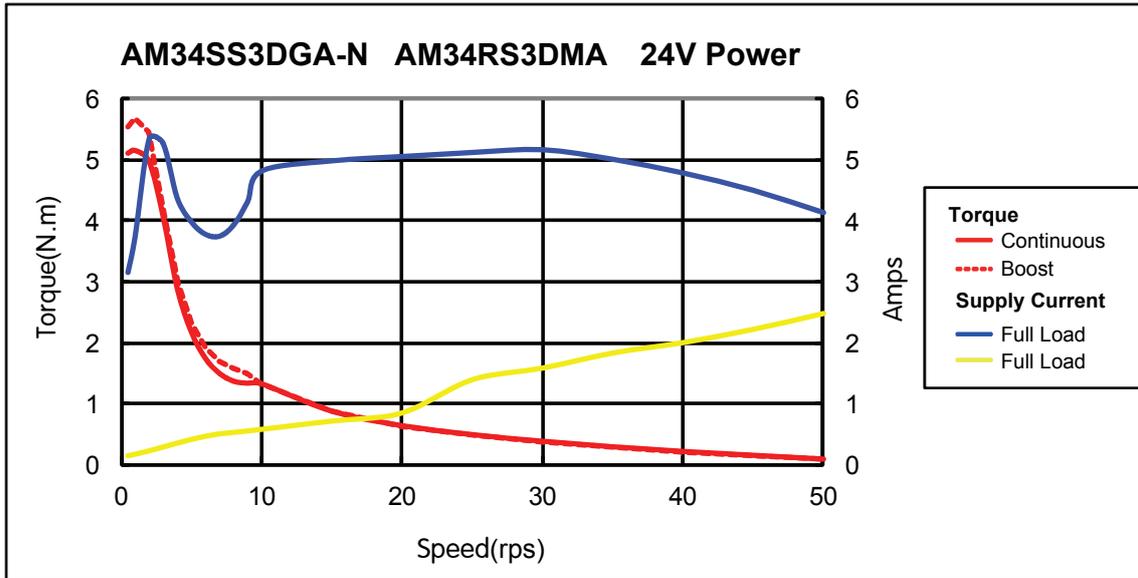


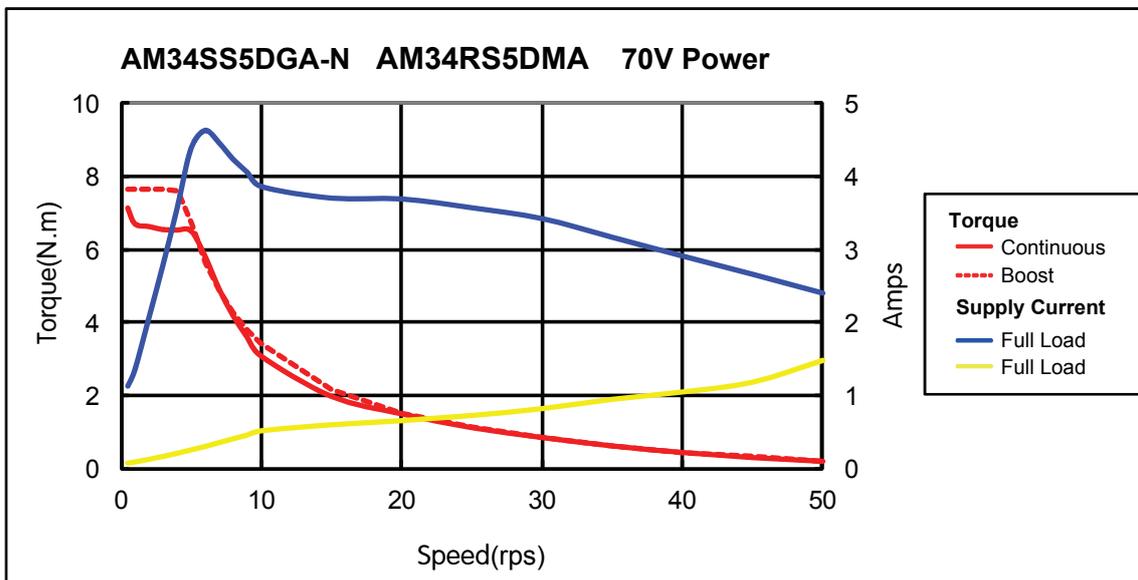
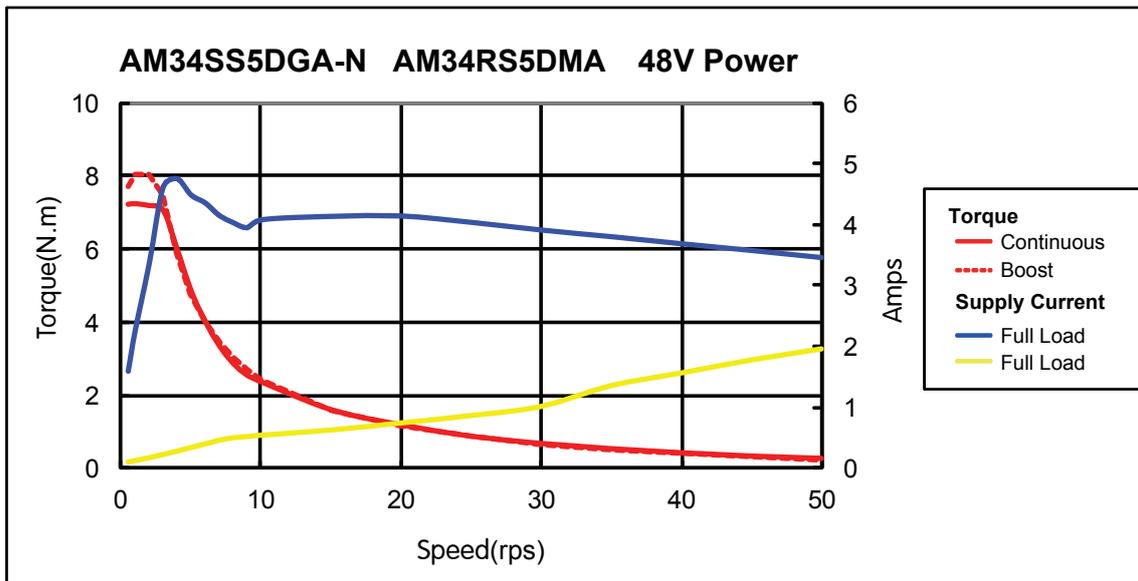
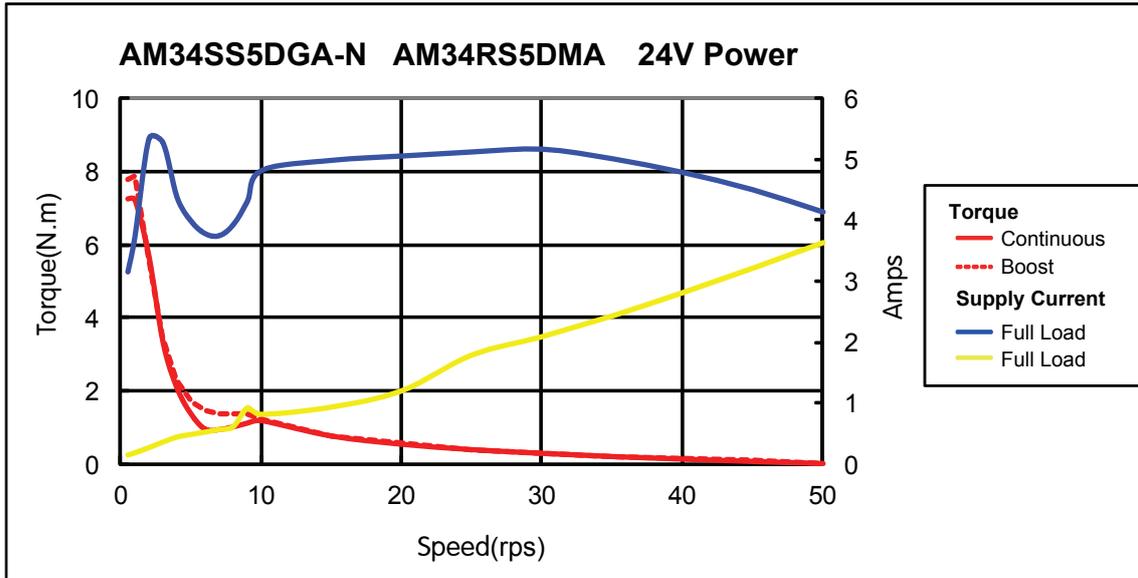








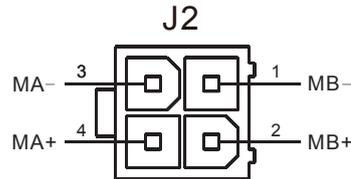




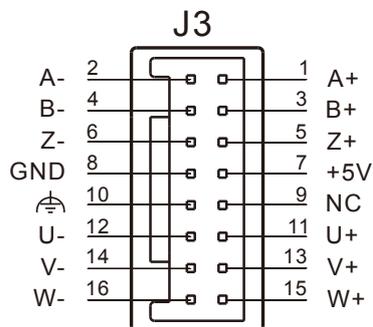
2.6 Connecting the Motor

The SS/RS motors have two cables. One is the motor power cable, the other one is the encoder feedback cable. Plug the motor power cable into the motor connector on the drive and plug the encoder feedback cable into the encoder feedback connector on the drive.

NOTE: Do not damage or drag the cables on the motor.



Motor connector on the driver



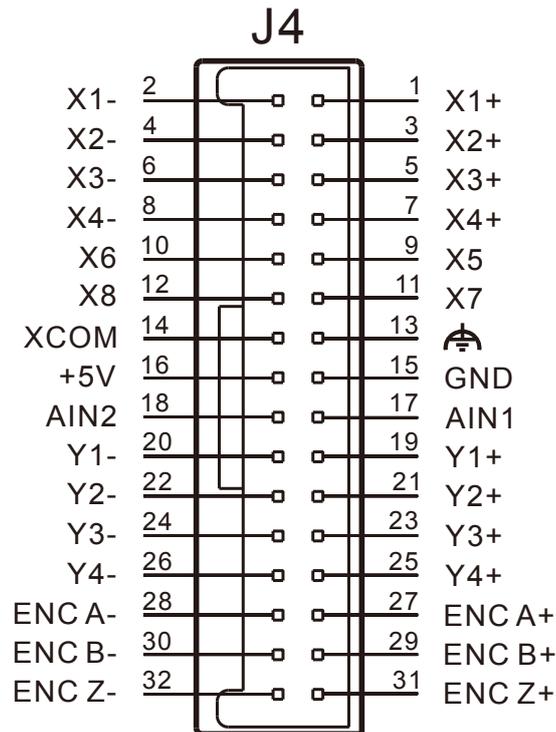
Encoder connector on the driver

Please check the information of mating connectors, extended motor cable and extended encoder cable in below section " Optional Accessories (Sold separately)" .

3 Inputs and Outputs

SSDC inputs and outputs include:

- 8 optically isolated digital inputs, 5 - 24VDC logic
- 4 Optically isolated, Open Collector, 30V/100 mA max,
- 2 analog inputs can be configured to 0-5V, 0-10V, $\pm 5V$ or $\pm 10V$ signal ranges
- Differential encoder outputs (A \pm , B \pm , Z \pm), 26C31 line driver, 20 mA sink or source max
- Secondary encoder signal input(single-ended or differential) for full closed-loop control



I/O Connector Diagram

3.1 Digital Inputs

3.1.1 X1, X2, X3 and X4 Digital Inputs

X1, X2: Optically isolated, differential, 5-24VDC; Minimum pulse width = 250ns, Maximum pulse frequency = 2MHz;

X3, X4: Optically isolated, differential, 5-24VDC; Minimum pulse width = 100 μ s, Maximum pulse frequency = 5KHz

X1 can be configured as general purpose input

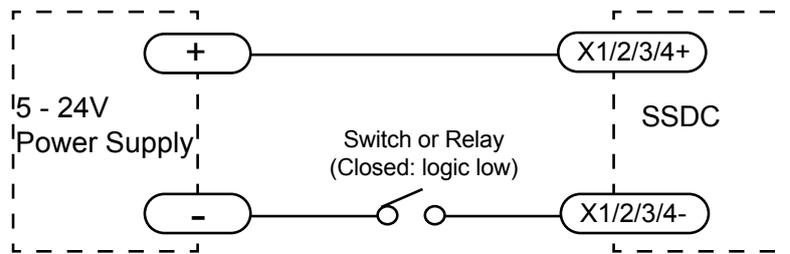
X2 can be configured as general purpose input

X3 can be configured as CW limit sensor input or general purpose input

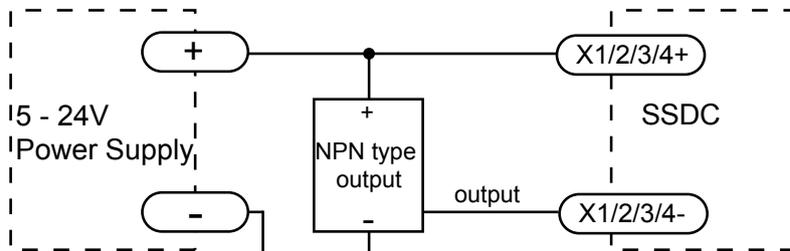
X4 can be configured as CCW limit sensor input or general purpose input

Please use **Step-Servo Quick Tuner** software to configure the function of X1, X2, X3 and X4.

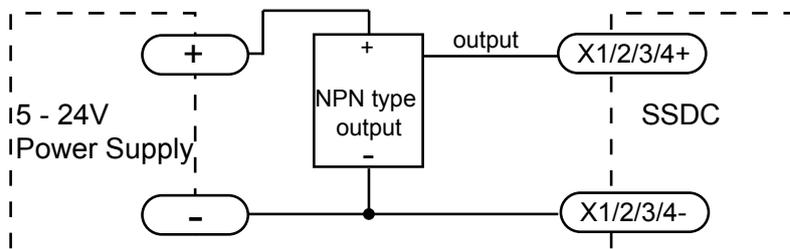
The diagrams below show how to connect the X1, X2, X3 and X4 to various commonly used devices.



Connecting a switch or relay to an input



Connecting a NPN type output to an input



Connecting a PNP type output to an input

3.1.2 X5, X6, X7 and X8 digital Inputs

X5 ~ X8: Optically isolated, differential, 5-24VDC; Minimum pulse width = 100 μ s, Maximum pulse frequency = 5KHz; X5可作为使能信号输入或通用输入。

X5 can be configured as servo on input or general purpose input

X6 can be configured as alarm reset signal input or general purpose input

X7 can be configured as Touch Probe 1 trigger input or general purpose input

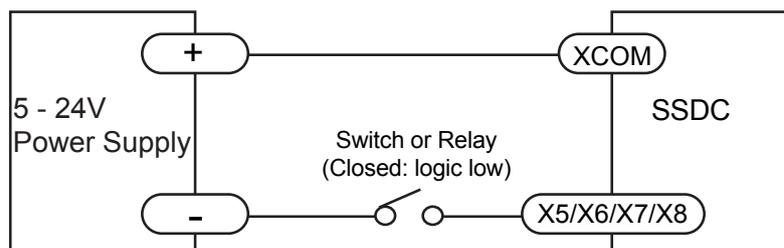
X8 can be configured as Touch Probe 2 trigger input or general purpose input

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.

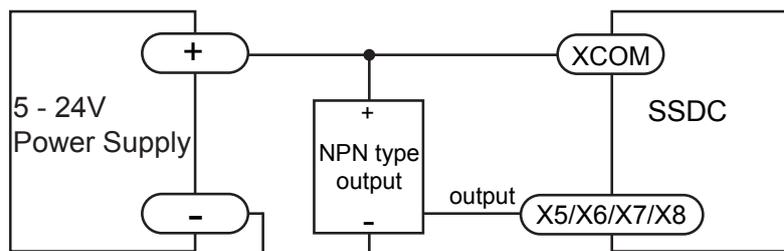
XCOM is an electronics term for a single-ended signal connection to a common voltage. In the case of SS series, if you are using a sourcing(PNP) input signals, you need to connect XCOM to the ground(power supply -), if you are using a sinking(NPN) input signals, the XCOM need to connect to the power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

Please use **Step-Servo Quick Tuner** software to configure the function of X5, X6, X7 and X8.

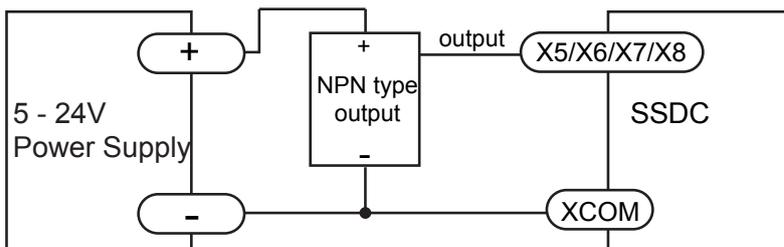
The diagrams below show how to connect the X5, X6, X7 and X8 to various commonly used devices.



Connecting a switch or relay to an input



Connecting a NPN type output to an input



Connecting a PNP type output to an input

3.2 Digital Outputs

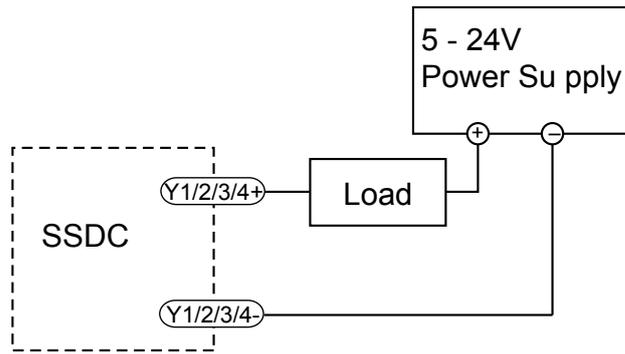
Y1, Y2, Y3 and Y4 Digital Outputs

- Y1 can be configured as alarm signal output. It can also be configured as static in position signal output(static, checking in position when motor is stopped) ,or as dynamic in position signal output (dynamic, checking in position all the time.)
- Y2 can be configured as Tach signal output, tach output produce pulsed relative to the motor position with configurable resolution. It can also be configured as static in position signal output(static, checking in position when motor is stopped) ,or as dynamic in position signal output (dynamic, checking in position all the time.),or as Timing signal output(50 pulses per rotation)
- Y3 can be configured as signal output to release brake. It can also be configured as static in position signal output(static, checking in position when motor is stopped) ,or as dynamic in position signal output (dynamic, checking in position all the time.)
- Y4 can be configured as static in position signal output(static, checking in position when motor is stopped) ,or as dynamic in position signal output (dynamic, checking in position all the time.)

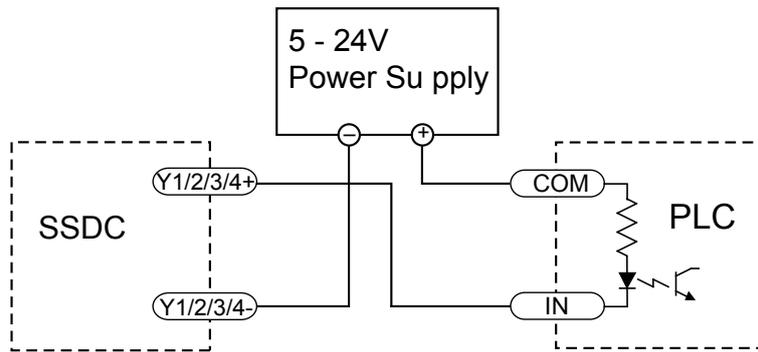
Y1, Y2, Y3 and Y4 can be configured by Step-Servo Quick Tuner.

The chats below show how to connect to the output:

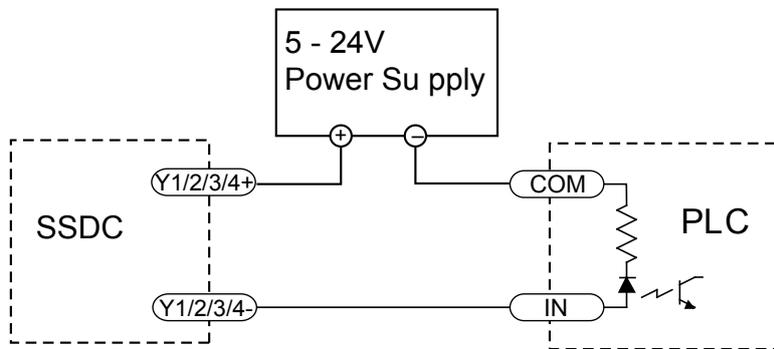
**NOTE: Do not connect the outputs to more than 30VDC power supply.
And the current of each output terminal must not exceed 100mA.**



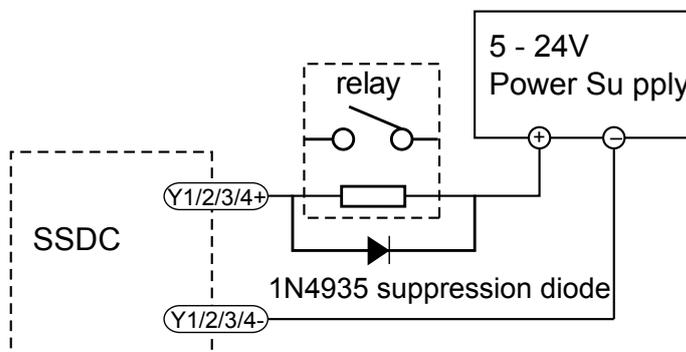
Connecting a sourcing output to load



Connecting a sinking output to PLC's input



Connecting a sourcing output to PLC's input



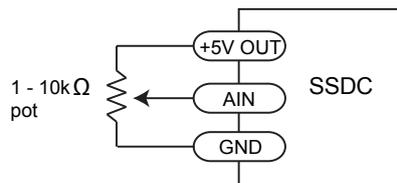
Driving a relay

3.3 Analog Inputs

SSDC series drive has two analog signal inputs which can accept signal range of 0-5V, 0-10V, $\pm 5V$ and $\pm 10V$. The drive can be configured to operate at velocity mode or position mode that is proportional to the analog input.

Use the **Step-Servo Quick Tuner** to configure the input range, offset, deadband and noisy filter frequency.

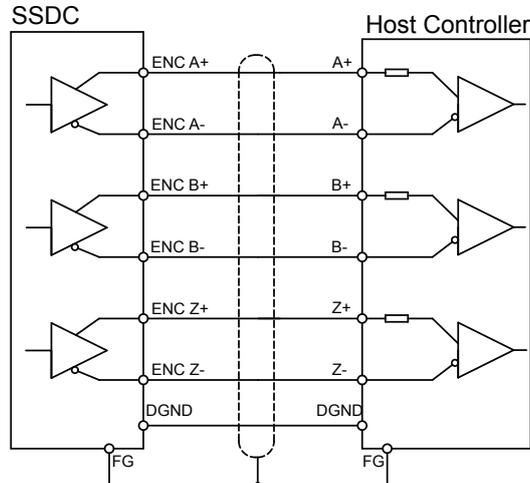
SSDC series provides a +5V/100mA limit power supply that can be used to power external devices such as potentiometer. It is not the most accurate supply for reference, for more precise readings use an external supply that can provide the desired accuracy.



Connecting a potentiometer to an analog input

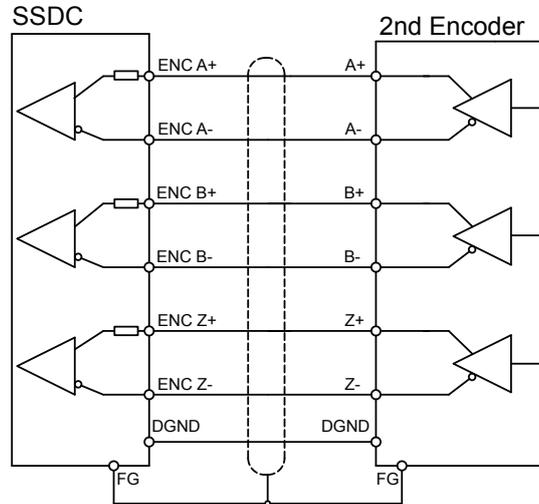
3.4 Encoder output

SSDC has differential encoder outputs (ENC A+/-, ENC B+/-, ENC Z+/-), with 26C31 line driver, 20 mA sink or source current in max. These signals can be connected to the motion controller to be a feedback of the motor position.



3.5 Secondary Encoder Input

SSDC series supports 2-way encoder feedback, one way connect to the motor encoder position feedback, the other way connect to the load side position feedback such as scale, connect to the ENC A+/-, ENC B+/-, ENC Z+/-.



4 Mounting the Drive

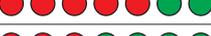
Use the M3 or M4 screw to mount the SSDC series drive. The drive should be securely fastened to a smooth, flat metal surface will help conduct heat away from the chassis. If this is not possible, forced airflow from a fan maybe required to prevent the drive from overheating.



- 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 SSDC drives near each other, maintain at least 2cm of space between drives.

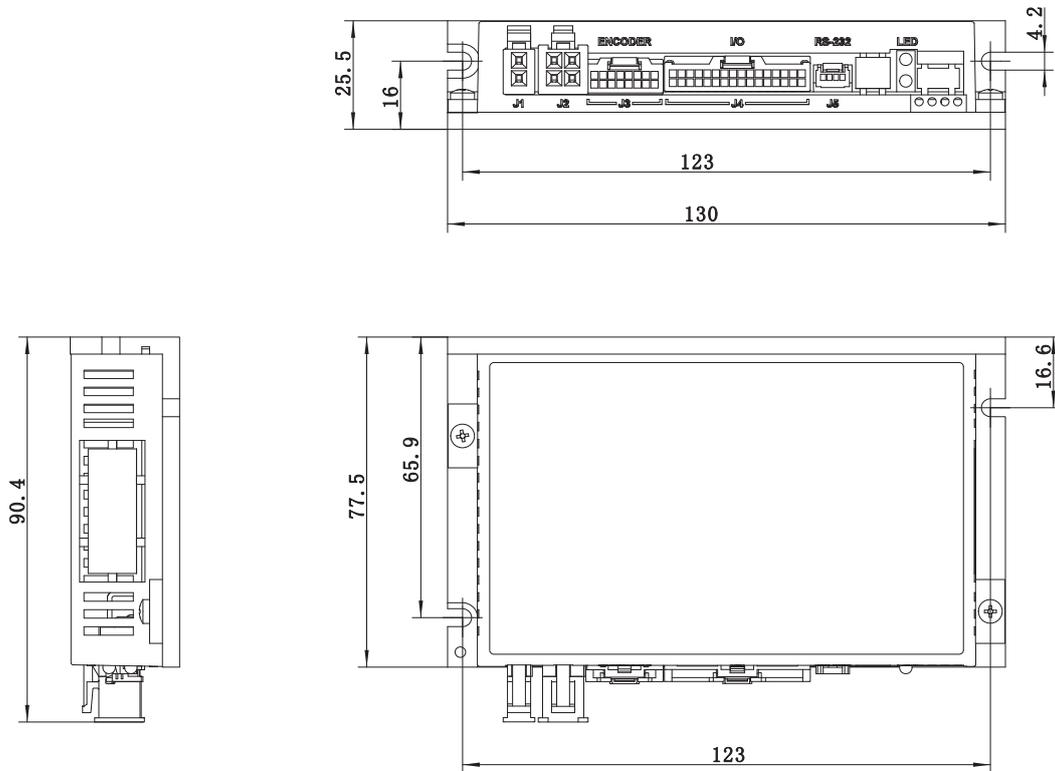
5 LED Error Codes

The SSDC series step-servo package 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.

Code	Error
	MOTOR_DISABLED
	MOTOR_ENABLED
	POSITION_LIMIT
	MOVE WHILE DISABLED
	XML_READ_FAILED
	VOLTAGE_HIGH_WARNING
	CCW_LIMIT_TRIP
	CW_LIMIT_TRIP
	INITIAL_POWERUP_ERROR
	ECAT_FAULTS
	OVER_TEMPERATURE
	INTERNAL_VOLTAGE
	Q_PROGRAM_BLANK
	FH_CONFIG_NG
	EMERGENCY_STOP
	VOLTAGE_HIGH
	VOLTAGE_LOW
	OVER_CURRENT
	CURRENT_LIMIT
	COMM OFF LINE
	OPEN_WINDING
	HALL_ENCODER_BAD
	SAFE_TORQUE_OFF & FC POSITION LIMIT
	FC_ENCODER_BAD
	COMM_ERROR
	SAVE_FAILED

6 Reference Materials

6.1 Drive Mechanical Outlines



Unit:mm

Model		
SSDC03-A	SSDC06-A	SSDC10-A
SSDC03-A-FC	SSDC06-A-FC	SSDC10-A-FC

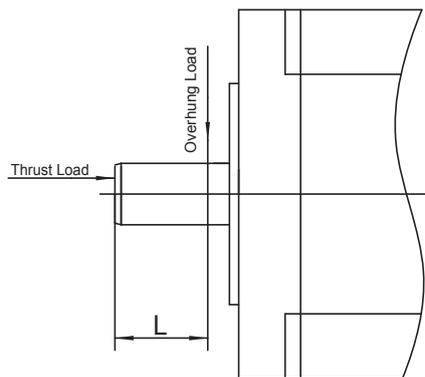
6.2 Technical Specifications

Power Amplifier	
Amplifier Type	Dual H-Bridge, 4 Quadrant
Current Control	4 state PWM at 20 KHz
Output Current	SSDC03: Continuous Current 3A max, Boost Current 4A max (1.5s), current limitation auto set-up by attached motor
	SSDC06: Continuous Current 6A max, Boost Current 7.5A max (1.5s), current limitation auto set-up by attached motor
	SSDC10: Continuous Current 10A max, Boost Current 15A max (1.5s), current limitation auto set-up by attached motor
Power Supply	SSDC03: External nominal 12 - 48 volt DC power supply required, Absolute maximum input voltage range 10 - 53 VDC
	SSDC06: External nominal 24 - 70 volt DC power supply required, Absolute maximum input voltage range 18 - 75 VDC
	SSDC10: External nominal 24 - 70 volt DC power supply required, Absolute maximum input voltage range 18 - 75 VDC
Protection	Over-voltage, under-voltage, over-temp, motor/winding 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(for AM17/23/24/34SS-N motors)
	4096 counts/rev(for AM11/17/23/24/34RS motors)
Speed Range	Up to 3000rpm
Filters	Digital input noise filter, Analog input noise filter, Smoothing filter, PID filter, Notch filter
Non-Volatile Storage	Configurations are saved in FLASH memory on-board the DSP
Modes of Operation	SCL, Q, Modbus
Digital Inputs	8 digital inputs
	X1, X2: Optically isolated, differential, 5-24VDC; Minimum pulse width = 250ns, Maximum pulse frequency = 2MHz;
	X3, X4: Optically isolated, differential, 5-24VDC; Minimum pulse width = 100 μ s, Maximum pulse frequency = 5KHz;
	X5 ~ X8: Optically isolated, differential, 5-24VDC; Minimum pulse width = 100 μ s, Maximum pulse frequency = 5KHz;
Digital Outputs	4 digital outputs
	Y1 ~ Y4; Optically isolated, Open Collector, 30V/100 mA max, Maximum pulse frequency = 10KHz
Analog Inputs	Two analog inputs
	Analog resolution: 12bit Each input can accept a signal range of 0 to 5 VDC, \pm 5 VDC, 0 to 10 VDC or \pm 10 VDC
Encoder Outputs	Differential encoder outputs (A \pm , B \pm , Z \pm), 26C31 line driver, 20 mA sink or source max
+5V Output	4.8~5V, 100 mA max
Communication	RS-232(crimp type connector)
Physical	
Ambient Temperature	0 to 40° C (32 to 104° F) when mounted to a suitable heatsink
Ambient Humidity	90% Max., non-condensing

6.3 Recommended Motors

Model	Drive P/N	Torque		Rotor Inertia	Encoder Resolution	Maximum Speed	Mass	Frame Size	Permissible Overhung Load(N)					Permissible Thrust Load	
		Nm	gcm ²						Distance(L) from Shaft End(mm)						
									0	5	10	15	20		
AM11RS1DMA	SSDC03	0.065	9	4096			118	28	20	25	34	52	-	Less than the motor mass	
AM11RS2DMA		0.08	12												168
AM11RS3DMA		0.125	18												218
AM17RS1DM□	SSDC03 or SSDC06	0.26	38	20000	3600	390	42	35	44	58	85	-			
AM17RS2DM□		0.42	57										440		
AM17RS3DM□		0.52	82										520		
AM17RS4DM□		0.7	123										760		
AM17SS1DG□-N		0.26	38										390		
AM17SS2DG□-N		0.42	57										440		
AM17SS3DG□-N	0.52	82	520												
AM17SS4DG□-N	0.7	123	760												
AM23RS2DM□	SSDC06 or SSDC10	0.95	260	4096	3600	850	56	63	75	95	130	190			
AM23RS3DM□		1.5	460										1250		
AM23RS4DMA		2.4	365										1090		
AM23SS2DG□-N		0.95	260	850											
AM23SS3DG□-N		1.5	460	1250											
AM23SS4DGA-N		2.4	365	1090											
AM24RS3DM□	SSDC10	2.5	900	4096	3600	1650	60	90	100	130	180	270			
AM24SS3DG□-N		2.5	900	20000									1650		
AM34RS1DMA		2.7	915	2000											
AM34RS3DMA	SSDC10	5.2	1480	4096	3600	3100	86	260	290	340	390	480			
AM34RS5DMA		7.0	2200										4200		
AM34SS1DGA-N		2.7	915										2000		
AM34SS3DGA-N		5.2	1480	3100											
AM34SS5DGA-N		7.0	2200	4200											

□: A or B, refer to motor part numbering system



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