

MSSTAC5

Hardware Manual

- MSSTAC5-C-N-2V
- MSSTAC5-C-E-2V



Rev. 1.0

AMP & MOONS' Automation

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Introduction

Thank you for selecting a MOONS' motor control product. We hope our dedication to performance, quality and economy will make your motion control successful.

If there's anything we can do to improve our products or help you use them better, please call or fax. We'd like to hear from you. Our phone number is (021) 52634688, or you can reach us by fax at (021) 62968682. You can also email to info@moons.com.cn

Features

- Programmable, microstepping digital step motor driver in compact package
- MSSTAC5-2V models operate from 94-265VAC
- Accepts analog signals, digital signals
- Accept incremental encoder feedback signal. Single-ended or Differential. (Optional)
- MSSTAC5-2V provides motor current up to 2.55 amps/phase (peak of sine)
- Communications:
CANopen & RS-232
- ± 10 volt analog input for speed and position control. Can also be configured for 0 to 10V, ± 5 V or 0 to 5V signal ranges.
- Digital I/O
Four optically isolated digital inputs, two optically isolated digital outputs
- Support CiA301 and CiA402

List of MSSTAC5 Model Numbers

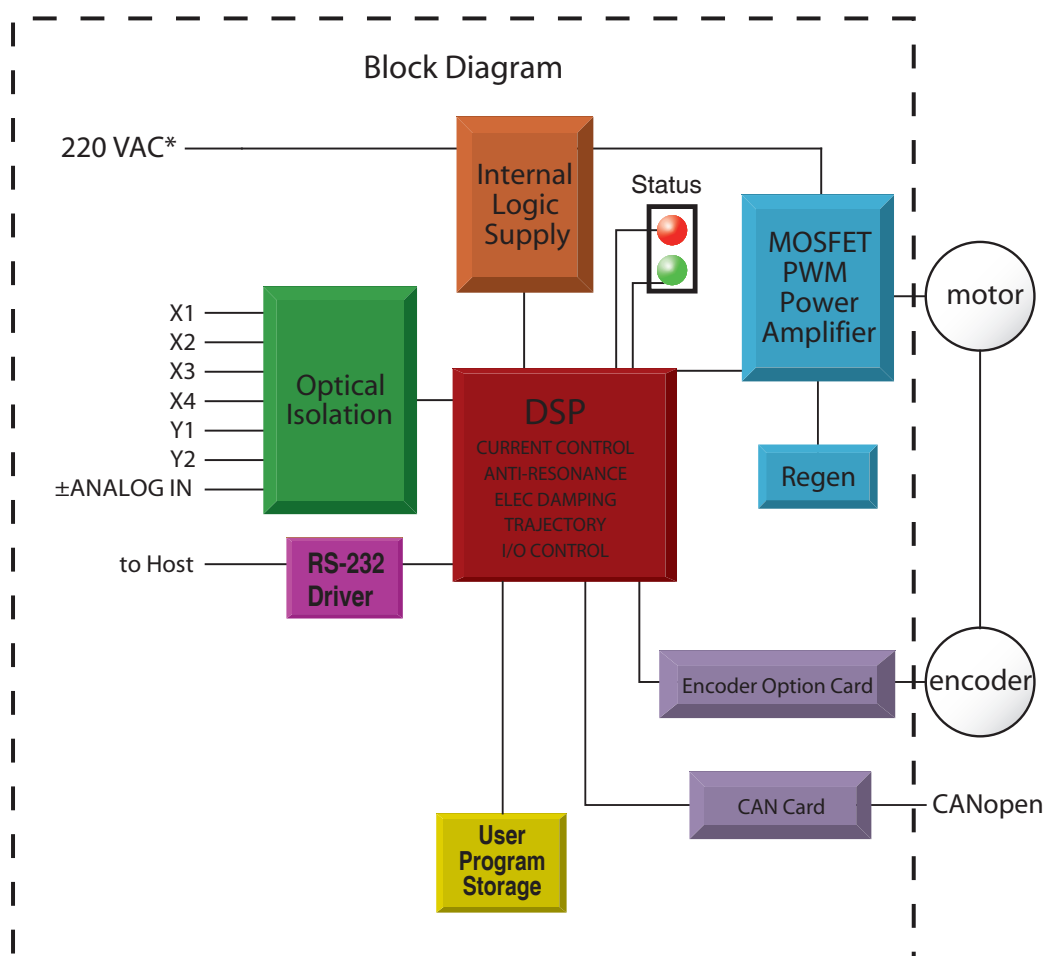
Model	Control	Current	Voltage	Encoder	CANopen
MSSTAC5-C-N-2V	CANopen	0.5-2.55A	94-265VAC		√
MSSTAC5-C-E-2V				√	√

An "E" in the model number indicates the inclusion of the models operate Encoder Feedback connector.

An "N" in the model number indicates no encoder feedback connector on the drive.

Block Diagram

MSSTAC5 CANopen Step Motor Drive



Getting Started

This manual describes the use of all different drive models. What you need to know and what you must have depends on the drive model. For all models, you'll need the following:

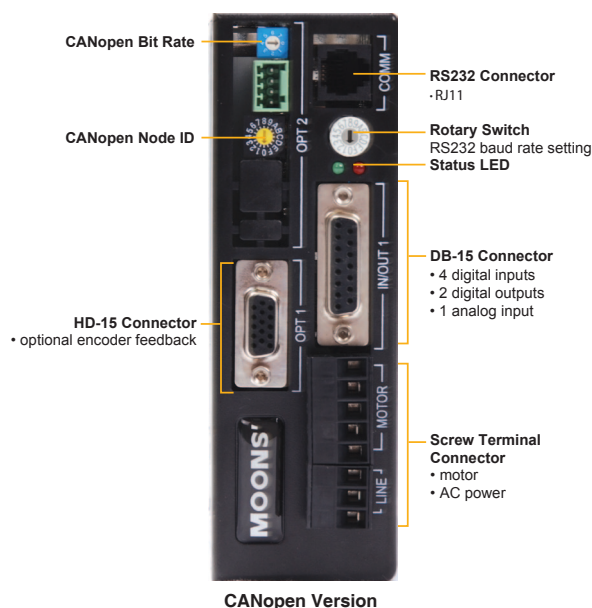
- 94-265VAC power.
- a compatible step motor
- a small flat blade screwdriver for tightening the connectors (included).
- a personal computer running Microsoft Windows XP, or windows 7

Installing Software

If you've never used a MSSTAC5 drive before you'll need to get familiar with the drive and the set up software before you try to deploy the system in your application. We strongly recommend the following:

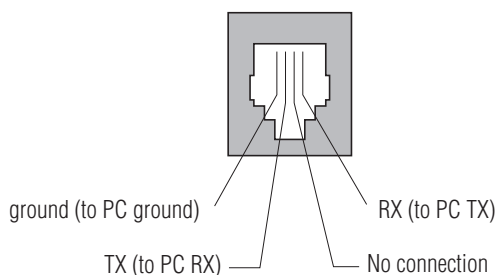
1. For -C drives, download and install the **ST Configurator** software
you may also need to download and install the Q Programmer software
2. Launch the software by clicking Start...Programs...MOONS'...ST Configurator.
3. Connect the drive to the PC using the programming cable.
4. Connect the drive to the motor (see Connecting the Motor).
5. Connect the drive to the AC power (see Connecting AC Power).
6. Apply power to the drive.
7. 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. Depending on your drive model and application, you'll need to make connections to various parts of the drive. These are detailed later in the manual.



Connecting to the PC using RS-232

A special cable designed to work with the serial port for configuration is included. The MSSTAC5-C is configured using a combination of rotary switches and an RS-232 serial link, and then may be deployed on a distributed CANopen network. The RS-232 interface is used for configuration, tuning, node ID setting and Q programmer downloading. Locate the MSSTAC5 C within 2.5 meters of the PC. Plug the DB9 connector of the communication cable that came with the drive into the serial port of the PC. Plug the small end into the PC jack on the MSSTAC5 C . Secure the cable to the PC with the screws on the DB9 connector.



Pin Assignments of the PC Port
(RJ11 connector)

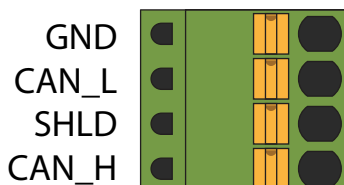
Never connect a drive to a telephone circuit. It uses the same connectors and cords as telephones and modems, but the voltages are not compatible.

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

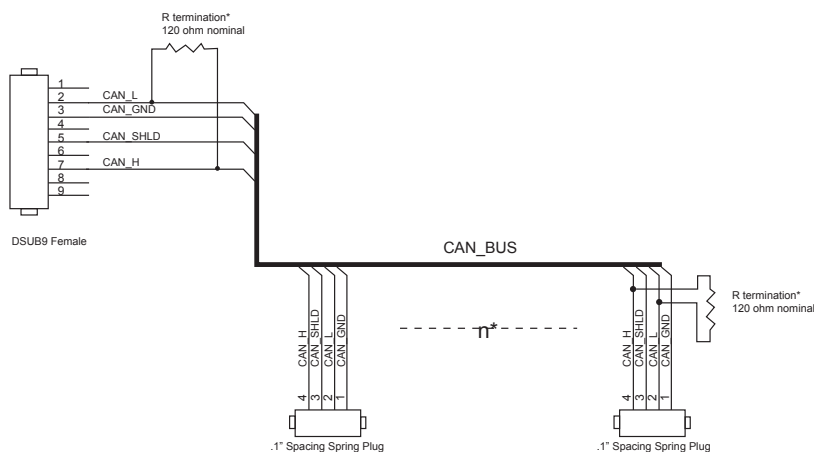
The RS-232 circuitry does not have any extra electrical "hardening" and care should be taken when connecting to the RS-232 port as hot plugging could result in circuit failure.

Connecting the CANopen Communications

MOONS' MSSTAC5-C drive uses a four-pin spring connector, shown in Figure below, and conforms to DR303 specification. The connector should be wired in a daisy-chain configuration, as shown in Figure below, with a 120 ohm resistor used to terminate each end. Other wiring topologies, such as star networks, are not recommended due to wave reflection problems. Please reference specific hardware manuals for your drive's wiring configuration.



The CANopen network should be connected in a daisy-chain fashion, with a 120 ohm terminating resistor at each end of network.

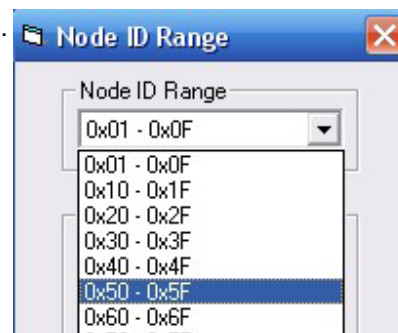


R termination:
Network must be terminated at each end with a 120 ohm resistor.

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

Node ID

Each node ID on a CANopen network must have a unique Node ID. The Node ID is configured using a sixteen position switch to set the lower four bits of the Node ID while the upper three bits are configured by using ST Configurator. CANopen Node IDs are seven bits long, with a range of 1 - 127, or 0x01 - 0x7F in hexadecimal notation. Node ID 0x00 is reserved in accordance with the CiA 301 specification.



Setting the Bit Rate

The CANopen network bitrate is set by the octal rotary switch on the front of the drive. The bit rate must be the same for all nodes on the CANopen network. Any changes to the bit rate require either a power cycle or a CANopen reset command to take effect.

Switch Setting	Resultant Bit Rate
0	1 Mbps
1	800 kbps
2	500 kbps
3	250 kbps
4	125 kbps
5	50 kbps
6	20 kbps
7	12.5 kbps

Connecting AC Power

Using the connector supplied connect to the AC supply per the diagram below. Use 16 AWG wire for Line (L) and Neutral (N). Use 14 AWG for Earth Ground (⊕).

Care should always be taken when working with high voltages.

In regions where the single-phase supply is higher, an auto transformer can be used to drop the voltage to the correct level.

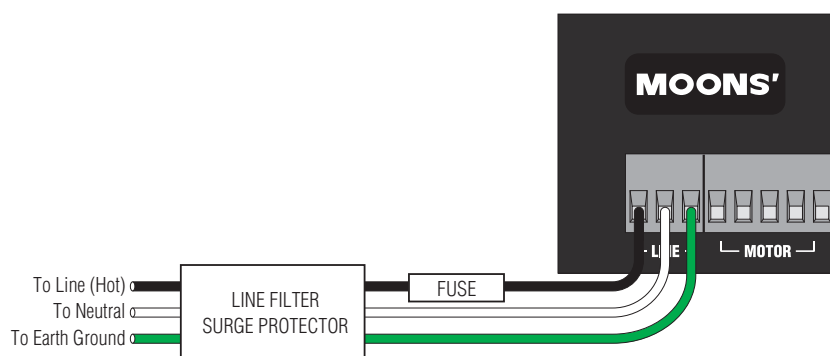
Fusing

The MSSTAC5-2V contains an internal 6.3A fast acting fuse. If an external fuse is desired, we recommend a 3A fast acting fuse for the MSSTAC5 .

Line Filter

For applications requiring CE EMC compliance, a line filter is required in series with the AC input. Here are two choices.

1. Vendor: Tyco Electronics Corcom Part Number: 6ET1
2. Vendor: LCR Electronics, inc. Part Number: 092.00721.00



Connecting the Motor

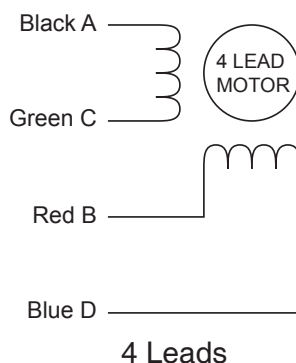
Never connect or disconnect the motor while the power is on.

Note: it is highly recommended that you use a motor with a shielded cable with the MSSTAC5. Always connect the cable drain wire to the drive's \oplus terminal (next to the A+ Terminal)

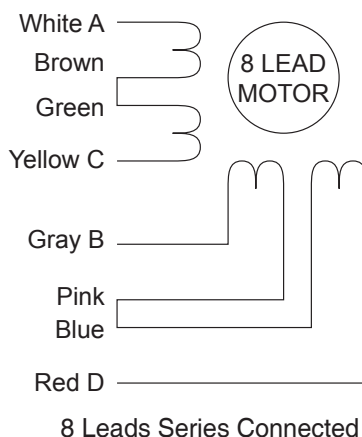
The recommended MOONS' motors for the MSSTAC5 include shielded cables. See the Recommended Motors section for a list of part numbers.

We can't stress enough the wisdom in using one of the recommended motors. We're not just trying to make money here, we want your application to be successful and the odds of that are highest when you have a high quality motor whose torque, rotor inertia and harmonic waveform content are precisely known. If you do want to connect other motors, here is some information that will help

Four lead motors can only be connected one way. Please follow the sketch at the below.



Eight leads motors can also be connected in series. As with eight leads motor, series operation gives you less torque at high speeds, but may result in lower motor losses and less heating. Parallel operation is not recommend for 220VAC power.



Eight leads motors can also be connected in parallel. As with eight leads motor, parallel operation gives you much more torque at high speeds, but may also result in much more heat generated that can cause danger to both motor and drive. You should contact us for more technical details of using parallel operation, make sure it will be safe in your application.

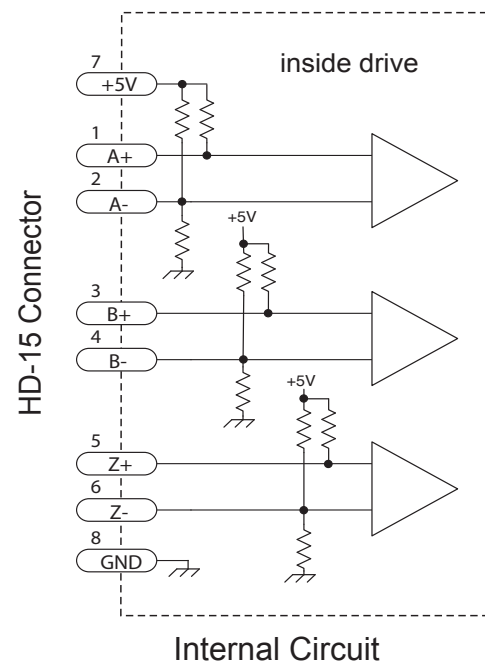
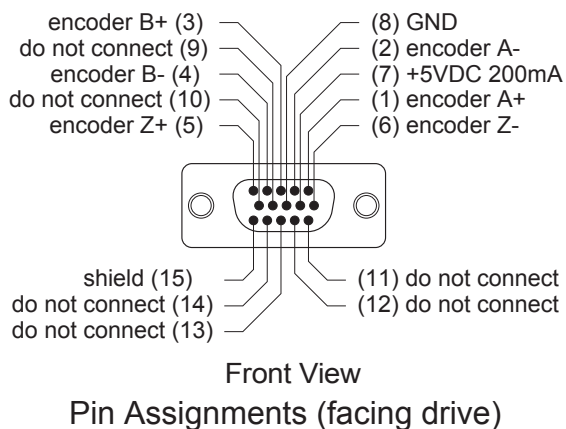
Connecting an Encoder (Requires the Encoder Feedback option)

The motors recommended for use with MSSTAC5 drives are available with rear-shaft mounted encoders.

Note: remember to always order a double-shaft motor if you need an encoder option. The mating cables available for these encoders come with an HD-15 connector on one end that connects directly to the optional encoder connector on the MSSTAC5, and a mating connector on the other end that connects directly to the encoder. Simply connect the cable between the encoder and the drive and you're done. For applications where you might use your own encoder, you'll need to connect to the MSSTAC5 drive's encoder connector using the pin assignments below.

If you are using an encoder with single ended outputs, shame on you. Differential connections are far less sensitive to electrical interference and life is too short to waste time deciphering the bizarre problems that can occur with a poor quality encoder. That said, single ended encoders should be connected to the A+ and B+ terminals. Leave A- and B- unconnected. They are internally biased to the proper voltage for best results. You'll also need to select the "single ended" box in the encoder button of ST Configurator or the drive will think you have a broken encoder wire. That's another good reason to use a differential encoder, the MSSTAC5 can detect a broken wire or bad signal and alert you to the problem.

The encoder connections use a HD-15 connector, which you must connect to your encoder as shown below. Recommended mating connectors are listed at the back of the manual.



IO Functions

Basic I/O details:

Standard IN/OUT1 Connector						
	X1	X2	X3	X4	Y1	Y2
Voltage range	5 - 24V	5 - 24V	5 - 24V	5 - 24V	30V max	30V max
Speed range	2MHz	2MHz	2MHz	2MHz	5KHz	5KHz
Digital filter option	Yes	Yes	Yes	Yes	N/A	N/A

Notes:

I/O functions are configured using ST Configurator software and/or SCL commands.

Connecting Input Signals

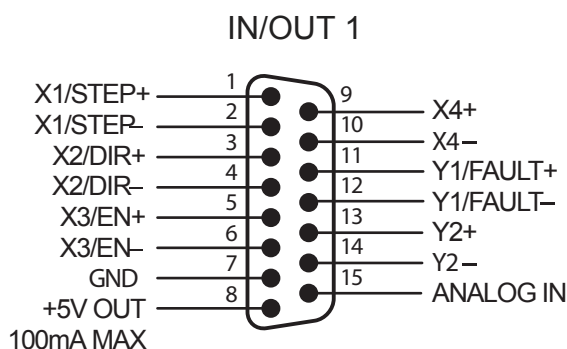
The MSSTAC5 drives have two types of inputs: High speed digital input and Analog input.

- High speed digital inputs, 5-24 volt logic. These inputs, X1/STEP and X2/DIR are available on all models. They can also be used to connect sensors and other types of devices. The connection can be sourcing, sinking or differential.

High speed digital inputs for enable motor or alarm reset or high speed capture, 5-24 volt logic. These inputs, X3/EN/AR and X4/Capture are available on all models. They can also be used to connect sensors and other types of devices. The connection can be sourcing, sinking or differential.

- Analog input for analog speed and positioning modes, included on all drives. Can be configured for 0-10V, 0-5V, $\pm 10V$ or $\pm 5V$, with or without offset.

Connector Pin Diagrams



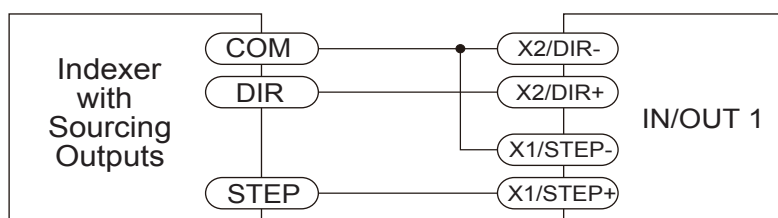
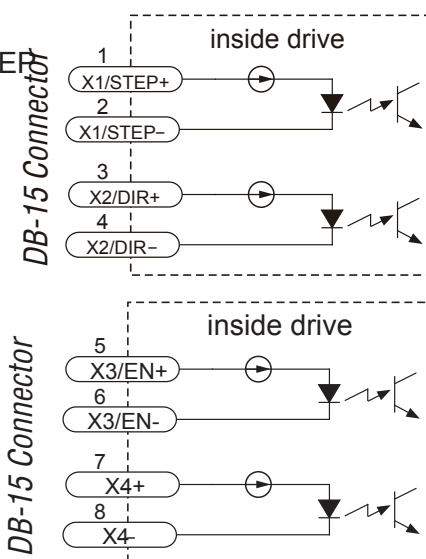
This connector is included
on all models.

High Speed Digital Inputs

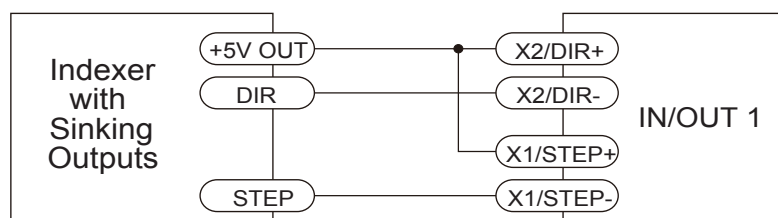
All MSSTAC5 drives include two high speed inputs called X1/STEP and X2/DIR. They accept 5-24 volt single-ended or differential signals, up to 2 MHz. Or you can use these inputs with Wait Input, If Input, Feed to Sensor, Seek Home and other such commands.

All MSSTAC5 drives include two high speed inputs called X3/EN/AR and X4/Capture. They accept 5-24 volt single-ended or differential signals, You can use these inputs with Wait Input, If Input, Feed to Sensor, Seek Home and other such commands.

Connection diagrams follow.



Connecting to indexer with Sourcing Outputs

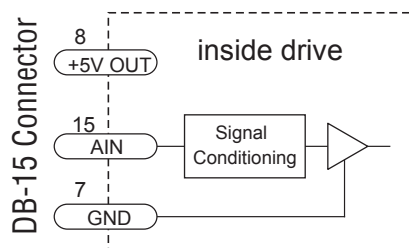


Connecting to Indexer with Sinking Outputs

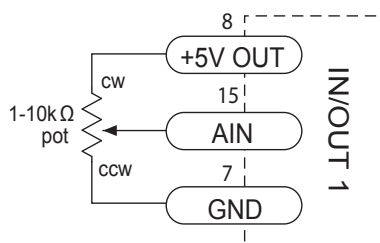
Analog Input

The MSSTAC5 drives feature one analog input. It can accept a signal range of 0 to 5 VDC, ± 5 VDC, 0 to 10 VDC or ± 10 VDC. The drive can be configured to operate at a speed or position that is proportional to the analog signal.

Use the ST Configurator software to set the signal range, offset, deadband and filter frequency.



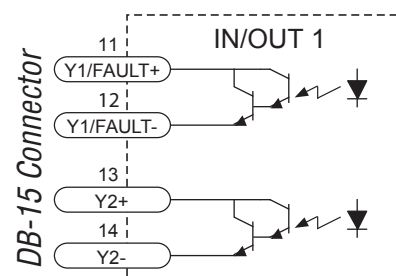
Connecting a Potentiometer to the Analog Input



Connecting a Potentiometer to the Analog Input

Programmable Outputs

The MSSTAC5-Cdrives feature two digital outputs. These outputs can be set to automatically control a motor brake, to signal a fault condition, to indicate when the motor is moving or to provide an output frequency proportional to motor speed (tach out). Or the outputs can be turned on and off by program instructions like Set Output. MSSTAC5-C drives include four additional programmable outputs.

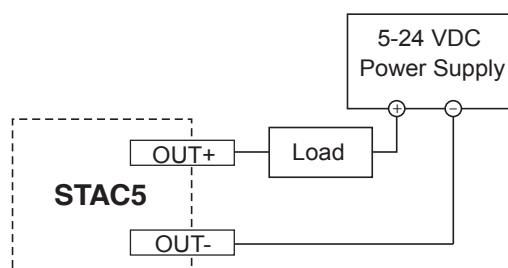


The outputs can be used to drive LEDs, relays and the inputs of other electronic devices like PLCs and counters. For Y1 and Y2, the "+" (collector) and "-" (emitter) terminals of each transistor are available at the connector. This allows you to configure each output for current sourcing or sinking.

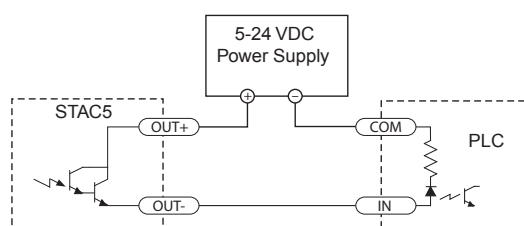
Diagrams of each type of connection follow.

Do not connect the outputs to more than 30VDC.

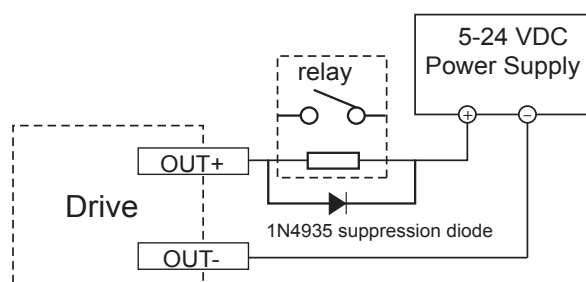
The current through each output terminal must not exceed 100 mA.



Sinking Output Using Y1, Y2



Sourcing Output Using Y1, Y2



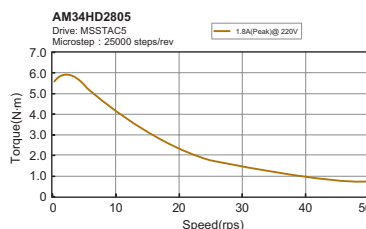
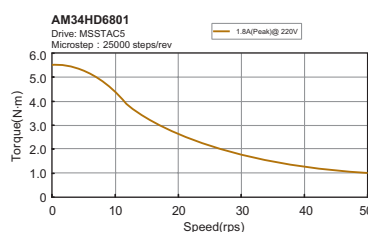
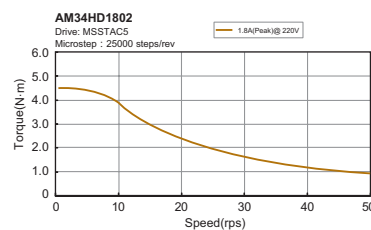
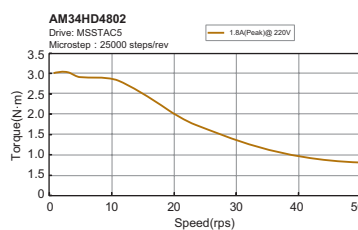
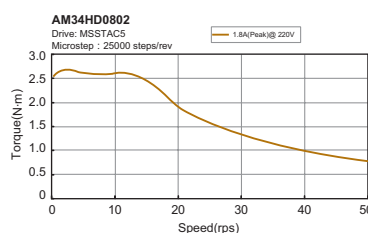
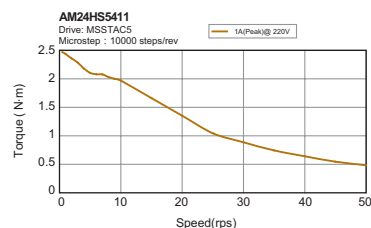
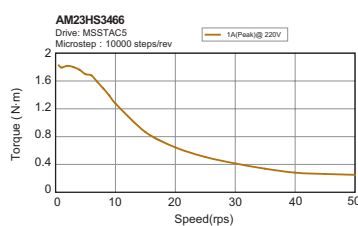
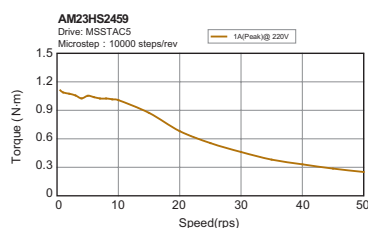
Driving a Relay Using Y1, Y2

Recommended Motors

Model	Shaft	Wiring	Length“L”	Holding Torque	Current	Resistance	Rotor Inertia	Motor Mass	Dielectric Strength		
			mm	N·m	A/Phase	Ω/Phase	g·cm ²	Kg			
AM23HS2459-01	Single Shaft	4 Leads	54	1.1	1	16.6	260	0.6	1500V AC 1 minute		
AM23HS3466-01			76	1.8		25.4	460	1.0			
AM24HS5411-01N	Single Shaft		85	2.5		15.4	900	1.4			
AM34HD0802-01	Single Shaft	8 Leads Series Connected	66.5	3	1.8	3.4	1100	1.6			
AM34HD0802-02	Double Shaft		75	3.5		3.6	1350	1.9			
AM34HD4802-01	Single Shaft										
AM34HD1802-01	Single Shaft		96	5		3.6	1850	2.7			
AM34HD1802-03	Double Shaft		115	6.5		4	2400	3.5			
AM34HD6801-01	Single Shaft										
AM34HD2805-01	Single Shaft										
AM34HD2805-03	Double Shaft		125.5	7.1		4.2	2750	3.8			

Note: The “Drive Current Setting” shown here differs from the rated current of each motor because the rated current is RMS and the drive current setting is peak sine. If you are using a motor not listed here, for best results set the drive current at the motor’s rated current x 1.2.

Torque-Speed Curves

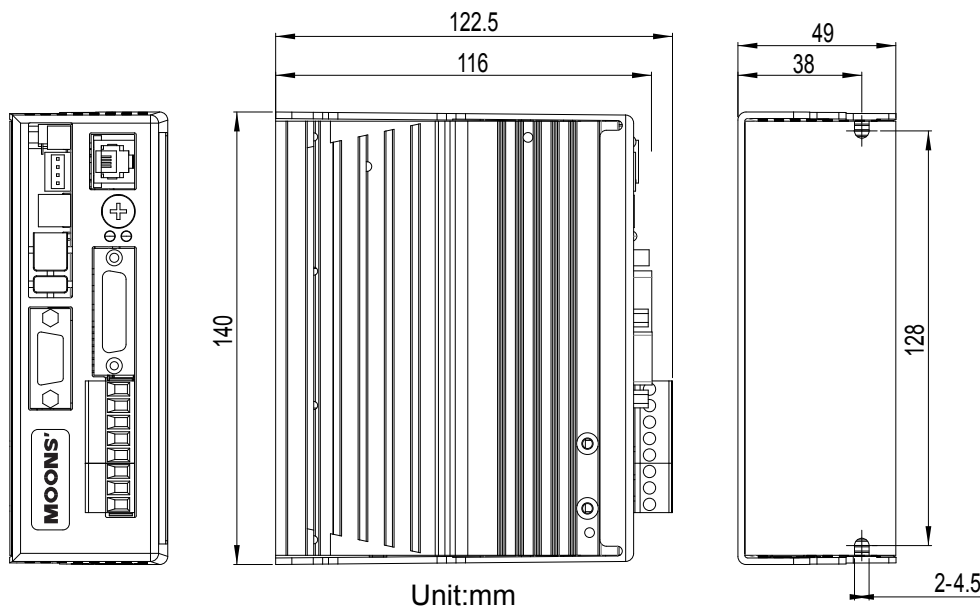


Mounting the Drive

Use M4 screws to mount your drive. If possible, 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, then forced airflow from a fan may be required to prevent the drive from overheating.

- Never use your drive in a space where there is no air flow or where other devices cause the surrounding air to be more than 40°C.
- Never put the drive where it can get wet or where metal or other electrically conductive particles can get on the circuitry.
- Always provide air flow around the drive. When mounting multiple MSSTAC5 drives near each other, maintain at least one half inch of space between drives.

Mechanical Outline



Technical Specifications

AMPLIFIER TYPE	Digital MOSFET, dual H-bridge, 4 quadrant
CURRENT CONTROL	4 state PWM at 16 KHz
OUTPUT CURRENT	MSSTAC5-2V: 0.5-2.55 amps/phase (peak of sine) in 0.01 amp increments
POWER SUPPLY	MSSTAC5-2V: 94-265 VAC, 50/60Hz
PROTECTION	Over-voltage, under-voltage, over-temp, motor/wiring shorts (phase-to-phase, phase-to-ground), internal amplifier shorts
MOTOR REGENERATION	Built-in regeneration circuit, 10 watts max.
IDLE CURRENT REDUCTION	Reduction range of 0-90% of running current after delay selectable in milliseconds
MICROSTEP RESOLUTION	Software selectable from 200 to 51200 steps/rev in increments of 2 steps/rev
ANTI-RESONANCE (Electronic Damping)	Raises the system damping ratio to eliminate midrange instability and allow stable operation throughout the speed range and improves settling time.
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.
ENCODER INTERFACE	For connecting to motor-mounted encoder. Used to provide stall detection and stall prevention with static position maintenance. Differential line receivers, up to 2 MHz.
INPUTS/OUTPUTS	<p>X1, X2 inputs: Optically isolated, differential, 5-24 VDC logic (2.5V switching threshold), minimum pulse width = 250 nsec, maximum pulse frequency = 2 MHz, maximum current = 10 mA.</p> <p>X3, X4 inputs: Optically isolated, differential, 5-24 VDC logic (2.5V switching threshold), minimum pulse width = 250 nsec, maximum pulse frequency = 2 MHz, maximum current = 10 mA.</p> <p>Y1, Y2 outputs: Optical darlington, sinking or sourcing, 30 VDC max, 100 mA max, voltage drop = 1.2V max at 100 mA.</p> <p>Analog input: Single-ended. Range is software selectable 0-5, +/-5, 0-10, or +/-10 VDC. Software configurable offset, deadband, and filtering. Resolution is 12 bits (+/- 10 volt range), 11 bits (+/-5 or 0-10 volt range), or 10 bits (0-5 volt range). 100 kohms internal impedance.</p>
NON-VOLATILE STORAGE	Drive configuration and Q program are stored in FLASH memory onboard the DSP.
AGENCY APPROVALS	“RoHS CE EN61800-3:2004 UL 508c”
HUMIDITY	90% max, non-condensing
AMBIENT TEMPERATURE	0 to 40 °C (32 to 104 °F) with adequate ventilation
DIMENSIONS	122.5 x 128 x 49mm
WEIGHT	22.4 oz (630 g)

Mating Connectors and Accessories

Mating Connectors

Power supply: Weidmuller P/N 1526510000

Motor: Weidmuller P/N 1526710000

















IN/OUT1: DB-15 male. OUPIIN P/N 7907-15MTBC00A. Shell Kit OUPIIN P/N DP-15CP. Included.

Optional encoder feedback: DB-15 male. OUPIIN P/N 7917-15MTBC00A. Shell Kit OUPIIN P/N DP-09CP. Included.

CANopen card: Phoenix P/N 1881341

Alarm Codes

In the event of an error, the green LED on the main board will flash one or two times, followed by a series of red flashes. The pattern repeats until the alarm is cleared.

	Code	Error
	Solid green	no alarm,motor disabled
	Flashing green	no alarm,motor enabled
	1 red,1 green	motor stall (optional encoder only)
	2 red,1 green	ccw limit
	2 red,2 green	cw limit
	3 red,1 green	drive overheating
	3 red,2 green	internal voltage out of range
	3 red,3 green	blank Q segment
	4 red,1 green	power supply overvoltage or excess regen
	4 red,2 green	power supply undervoltage
	4 red,3 green	flash memory backup error
	5 red,1 green	Over current/short circuit
	6 red,1 green	Open motor winding
	6 red,2 green	bad encoder signal (optional encoder only)
	7 red,1 green	communication error
	7 red,2 green	flash memory error

Contacting MOONS'



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