DMX-A2-DRV

Integrated Advanced
Step Motor Driver

First edition, May 2008

Revision History:

2.2– 1st Release
2.5– 2nd Release
2.6 – 3rd Release
2.8 – 4th Release
2.9 – 5th Release
3.0 – 6th Release
3.1 – 7th Release

Firmware Compatibility:

†V104

†If your module's firmware version number is less than the listed value, contact Arcus for the appropriate documentation. Arcus reserves the right to change the firmware without notice.

Table of Contents

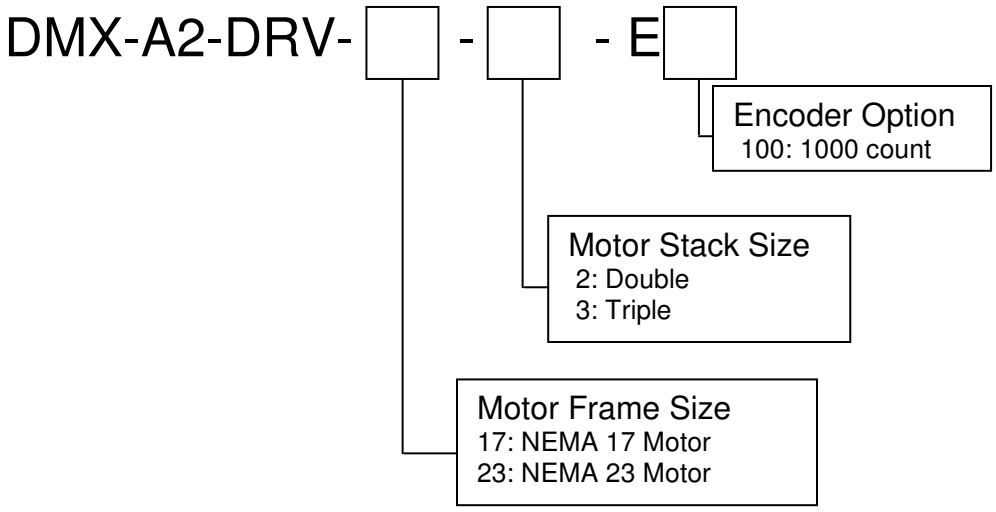
1. Introduction

DMX-A2-DRV is an integrated step motor and driver product.

1.1. Features

- 12-48VDC voltage input
- 100mA to 3.0A peak current setting
- Configurable microstep setting of any value from 2 to 500
- One clock (Pulse/Dir) or Two clock (CW/CCW) support
- 1M maximum pulse rate support
- Opto-isolated single ended Pulse/Dir (CW/CCW) inputs
- Opto-isolated driver enable input
- Opto-isolated over-temperature alarm output
- Available in NEMA 17 and 23 motors in various stack sizes.
- Optional 1000 count encoder option (single ended A,B,Z output)

1.2. Part Numbering Scheme



Contacting Support

For technical support contact: support@arcus-technology.com.
Or, contact your local distributor for technical support.

2. Electrical and Thermal Specifications

Parameter	Min	Max	Units
Main Power Input [1]	+12	+48	V
	-	3.0	A
Forward Diode Current (PUL/DIR)	-	25	mA
Forward Diode Current (ENABLE)	-	40	mA
Operating Temperature [2]	-20	85	℃
Storage Temperature [2]	-55	150	℃

Table 2.0

[1]The supply current should match the driver current setting.
[2] Based on component ratings.

3. Dimensions

3.1. DMX-A2-DRV-17

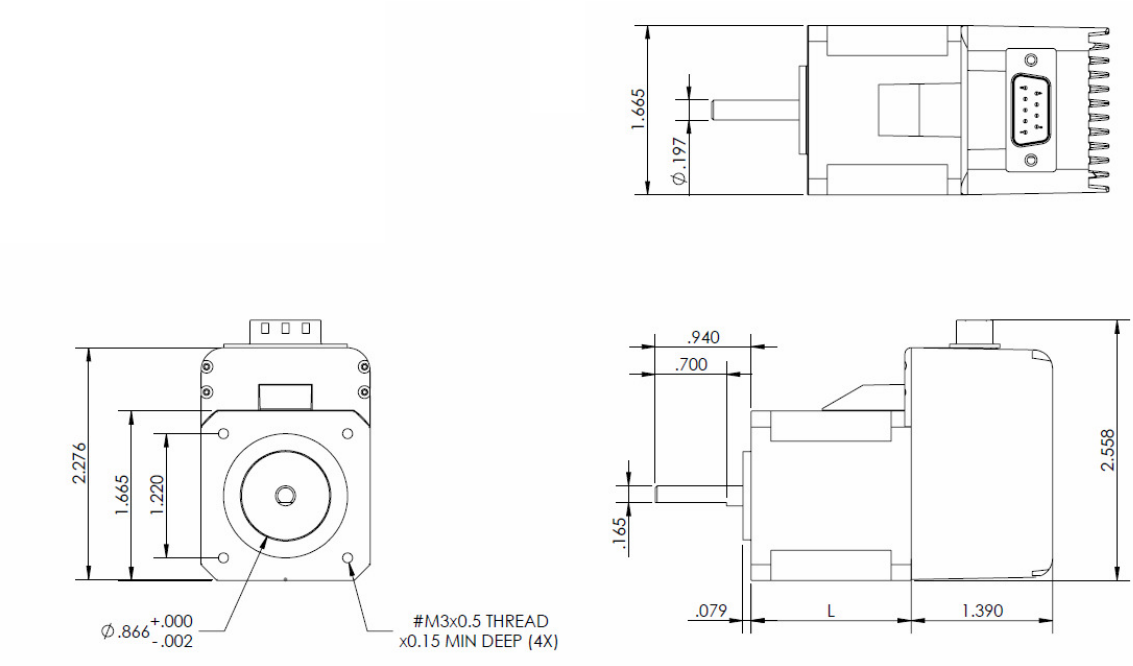


Figure 3.0

NEMA 17 Models	L (inches)
DMX-A2-DRV-17-2 (double stack)	1.58
DMX-A2-DRV-17-3 (triple stack)	1.89

Table 3.0

3.2. DMX-A2-DRV-23

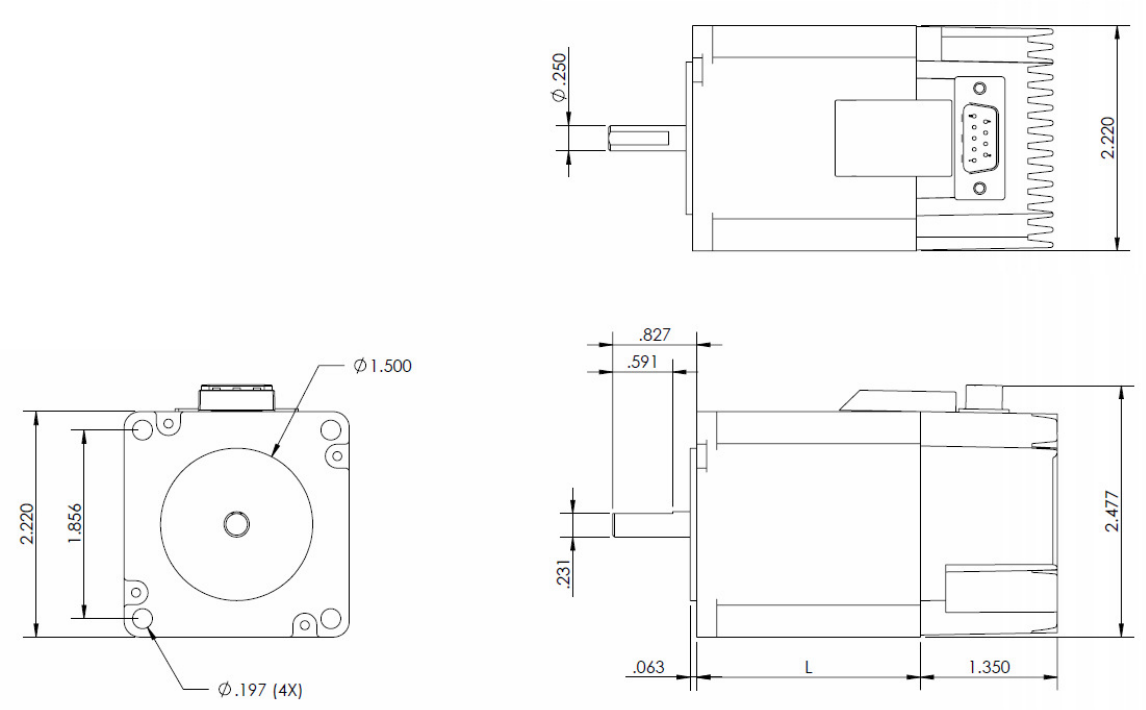


Figure 3.1

NEMA 23 Models	L (inches)
DMX-A2-DRV-23-2 (double stack)	2.20
DMX-A2-DRV-23-3 (triple stack)	2.99

Table 3.1

4. Connectivity

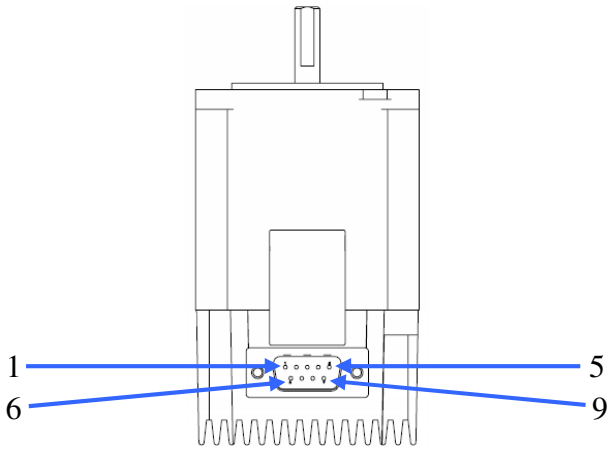


Figure 4.0

4.1. DB9 Connector Information

Pin #	In/Out	Name	Description
1	I	V+	Power
2	I	PUL (CW)	Pulse input / Clockwise input
3	I	ENABLE	Enable motor input
4	O	ALARM	Alarm output
5	O	+5V	5V output
6	I	GND	Power Ground
7	I	DIR(CCW)	Direction input / Counter-clockwise input
8	NC	NC	Reserved. Do not connect
9	I	OPTO	Opto-supply for enable input

Table 4.0

4.2. Optional Encoder Color Code

An integrated encoder is optional for the DMX-A2-DRV. Standard encoder resolution is 1000 count/rev.

Color	In/Out	Name	Description
Black	I	GND	Power Input Ground
Yellow	O	Z	Index Z channel
White	O	A	Encoder A channel
Red	I	5V	+5V input required to power the encoder
Green	O	B	Encoder B channel

Table 4.1

4.3. DMX-A2-DRV Interface Circuit

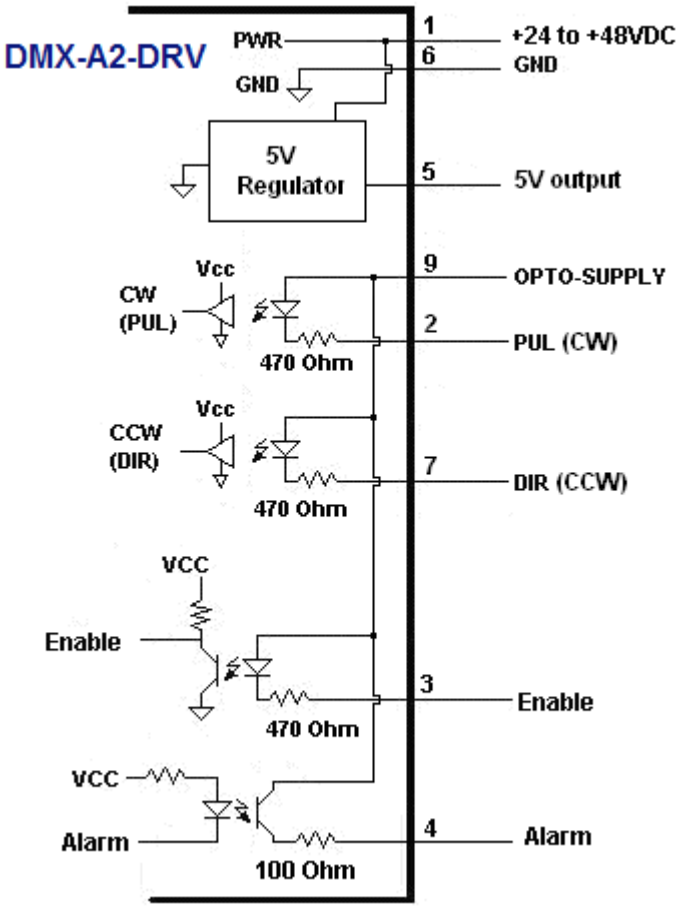


Figure 4.1

4.3.1. Pulse/Dir (CW/CCW) Inputs

DMX-A2-DRV supports both one-clock (PULSE/DIR) and two-clock (CW/CCW) inputs.

One-clock uses the PUL signal as the pulse train input position control and the DIR signal as the direction input signal for direction control.

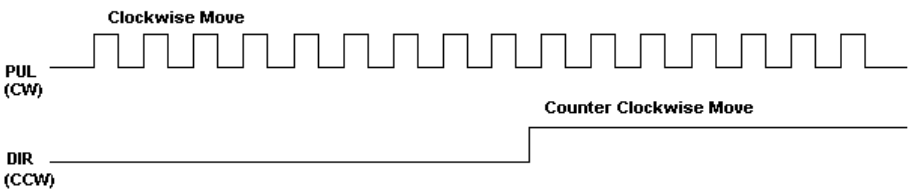


Figure 4.2

Two-clock uses CW as the clockwise pulse input and CCW as the counter clockwise pulse input for position control.

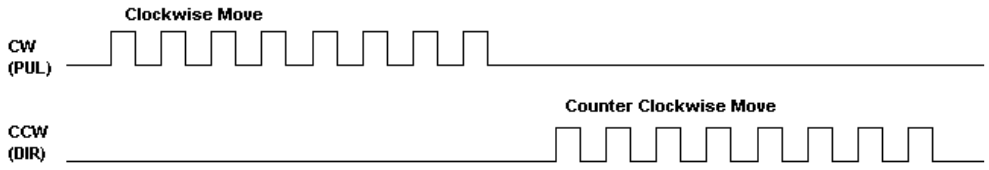


Figure 4.3

Depending on the direction polarity setting, actual direction of the rotation can be configured for the application.

Figure 4.4 shows an example of wiring the pulse and direction inputs with an open-collector output.

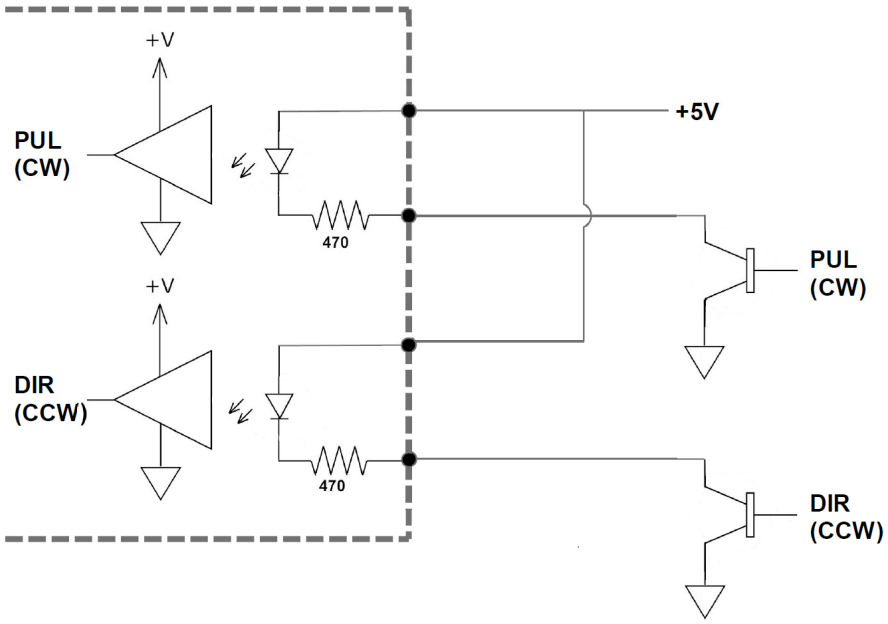


Figure 4.4

Important Note: The recommended voltage between the differential inputs is 5V. An additional current limiting resistor is required to support larger voltages.

4.3.2. Enable Input

The enable input is an opto-isolated input with a 470 Ohm resistor and diode. If there is no connection to enable signal, the driver is enabled by default. Only when the enable signal is connected to the ground of the opto-supply input is the driver disabled and motor free. The maximum sink current of the enable signal is 40mA.

Figure 4.5 shows the detailed schematic of the opto-isolated enable input.

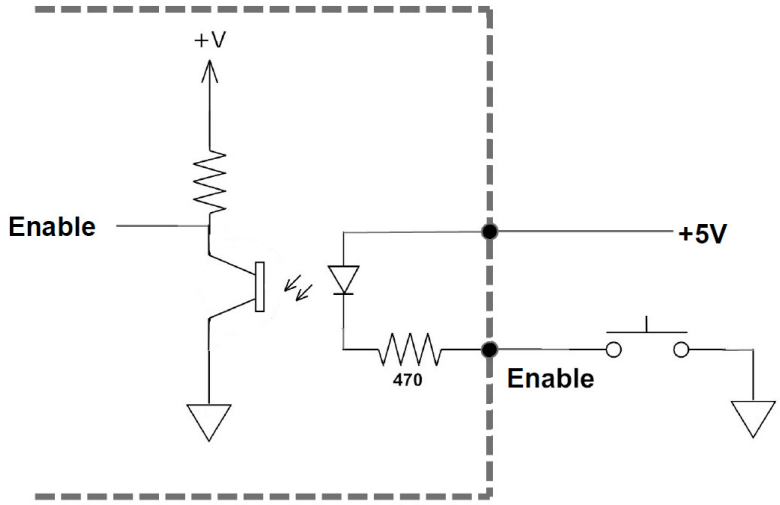


Figure 4.5

4.3.3. Alarm Output

The alarm output is an opto-isolated output with a 100 Ohm resistor. Figure 4.6 shows a wiring example of the opto-isolated alarm output.

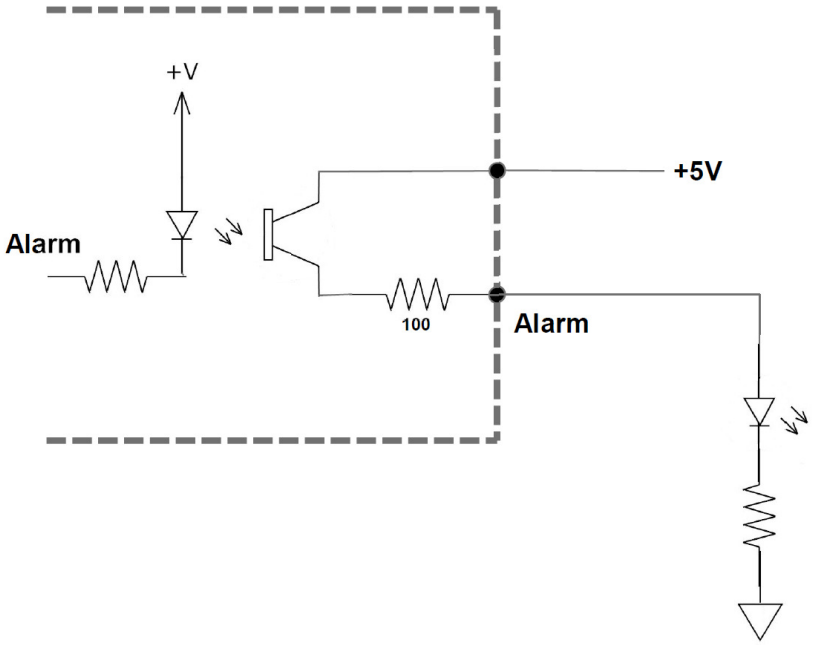


Figure 4.6

5. Stepper Motor Specifications

5.1. Operating Temperature

Electronic components used in the DMX-A2-DRV have a maximum ambient operating temperature of **85 C˚**. DMX-A2-DRV electronics are potted with heat-conductive compound to the housing to evenly distribute the heat and reduce any hot spots in the driver. The housing also has integrated fins to better dissipate the heat.

DMX-A2-DRV should be mounted securely to a metallic bracket that can also act as a heat-sink. During operation, the step motor section typically becomes hotter than the driver section. Having the step motor mounted to a heat sink will help dissipate the heat generated by the step motor.

DMX-A2-DRV mounting orientation should be such that the fins are oriented vertically for better convection and heat dissipation. See Figure 5.0 below.

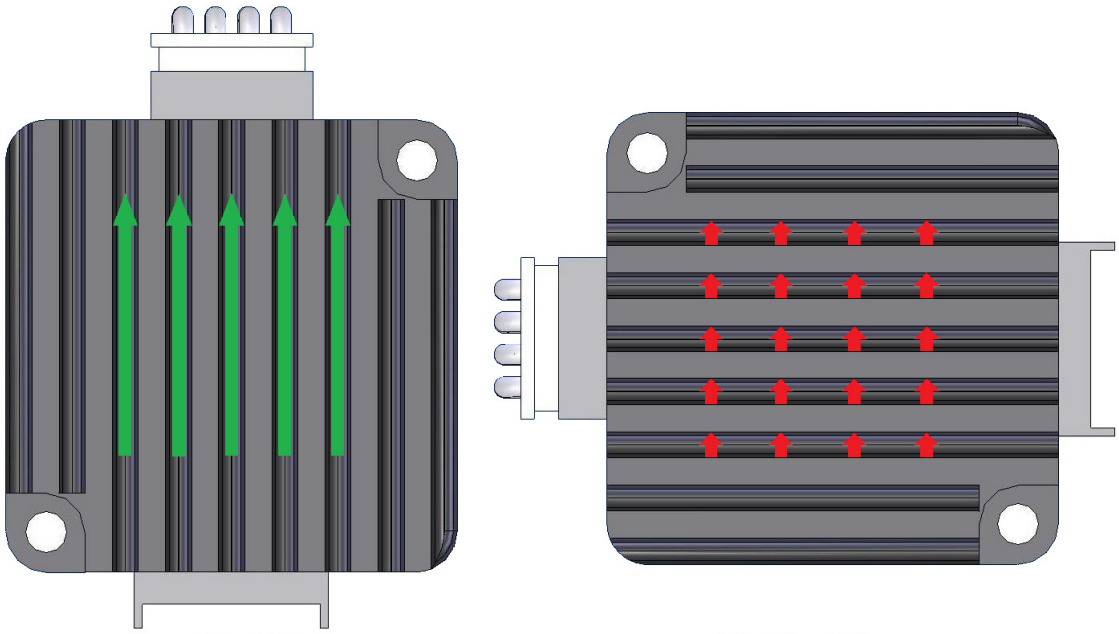


Figure 5.0

5.2. General Stepper Motor Specifications

Following chart shows the specifications of standard step motors used for DMX-A2-DRV products. All standard DMX-A2-DRV step motors are 1.8 degree bi-polar step motors.

NEMA Size	Stack Size	Max Amp / Phase	Resistance / Phase	Inductance / Phase	Inertia
17	Double	1.7A	1.5 Ohm	3.0 mH	0.28 oz-in^2
	Triple	2.0A	1.4 Ohm	2.7 mH	0.37 oz-in^2
23	Double	3.0A	0.9 Ohm	2.5 mH	1.64 oz-in^2
	Triple	3.0A	1.13 Ohm	3.6 mH	2.62 oz-in^2

Table 5.0

NEMA Size	Stack Size	Max Axial Force	Max Radial Force
17	Double	15N	10N
	Triple	15N	10N
23	Double	15N	75N
	Triple	15N	75N

Table 5.1

5.3. Stepper Motor Torque

The torque output of the DMX-A2-DRV will vary depending on the supply voltage, driver current, motor type, and target speed of the motor.

Increasing the drive current will increase the torque output, however the operating temperature will also increase. While decreasing the drive current will reduce the torque output, it will help reduce the operating temperature as well. Each application will need to adjust this setting to find the desired driver output.

Using a higher voltage to power the DMX-A2-DRV will allow the motor to run at faster speeds. Note that increasing the voltage will not increase the maximum holding torque of the motor.

Stepper motors in general will drop off in torque as the target speed of the motor is increased. The following torque curve shows the expected torque output based on the motor speed of the DMX-A2-DRV.

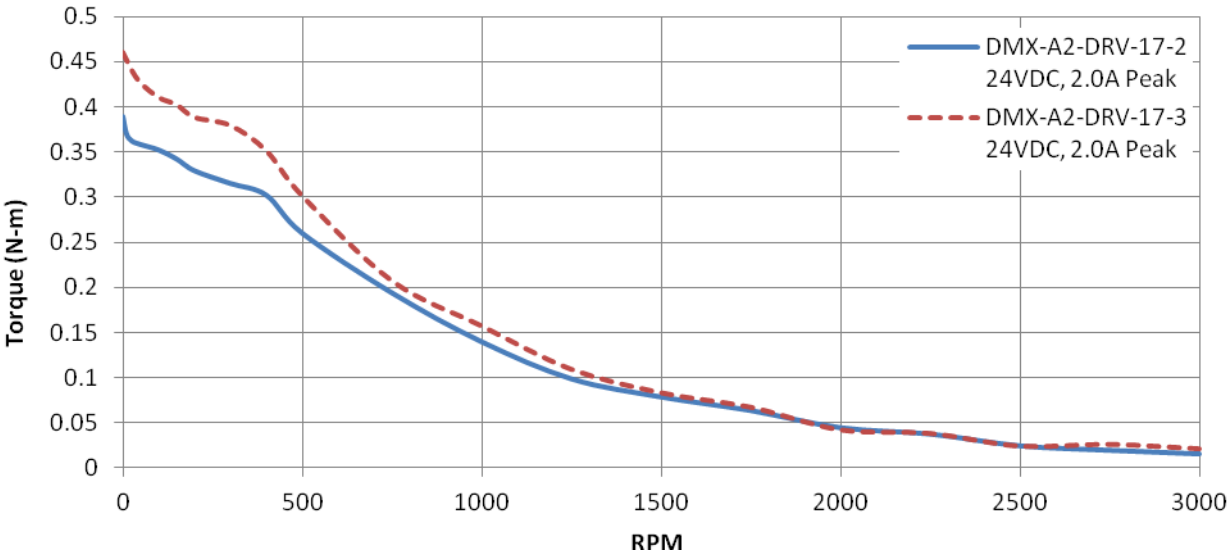


Figure 5.1

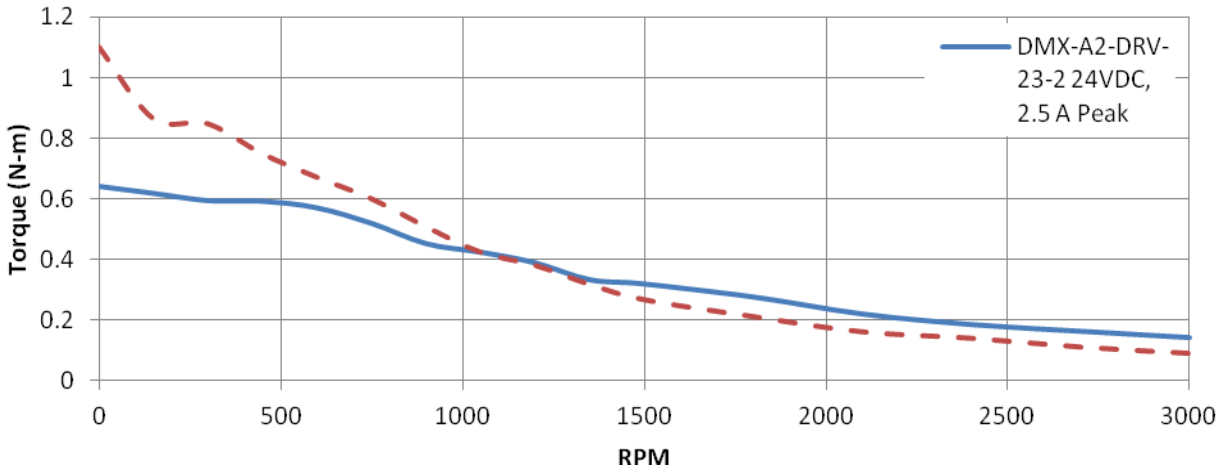


Figure 5.2

6. Stepper Motor Driver Specifications

6.1. Microstep

The standard DMX-A2-DRV motor is a 1.8 degree motor, which translates to 200 full steps per revolution. These steps can be divided with microstepping to increase position resolution. DMX-A2-DRV comes with bipolar step motor and has configurable microstep setting range from 2 to 500 microsteps.

6.2. Current Control

The DMX-A2-DRV will have a maximum rated driver current that is dependent on the stack size of the motor. See table 6.0 for details.

Setting the driver current higher than the maximum rated current will overheat the motor and driver and potentially damage the unit. It is recommended to use a current setting that is in the range of 60-80% of the maximum rated current for the motor.

DMX-A2-DRV has configurable current setting from 100mA to 3.0A. Driver current is set to the "Run Current" setting whenever the motor is moving. Similarly, the driver current is set to the "Idle Current" setting when the motor is idle for a period of time longer than the "Idle Time" setting. See section 7.2 for more details regarding the available driver settings.

The Run Current and the Idle Current should not go over the maximum rated current for each motor size. Use table 6.0 as a reference on maximum rated current setting.

Product	Maximum Peak Rated Driver Current Setting (Amp)
DMX-A2-DRV-17-2	1.7
DMX-A2-DRV-17-3	2.0
DMX-A2-DRV-23-2	3.0
DMX-A2-DRV-23-3	3.0

Table 6.0

6.3. Over Temperature Alarm

DMX-A2-DRV has a temperature sensor to detect over heating of the driver. Temperature sensing is done only when the driver is enabled. When the temperature goes over the over-temperature alarm value 70 C˚, the Alarm Output is turned on. If the temperature goes below the 68 C˚, the alarm output is turned off. If the temperature goes over 75 C˚, the driver is automatically turned off and remained off until the temperature goes below 68 C˚.

For additional information regarding temperature precautions, see section 5.1.

For details on the over temperature alarm, see Figure 6.0.

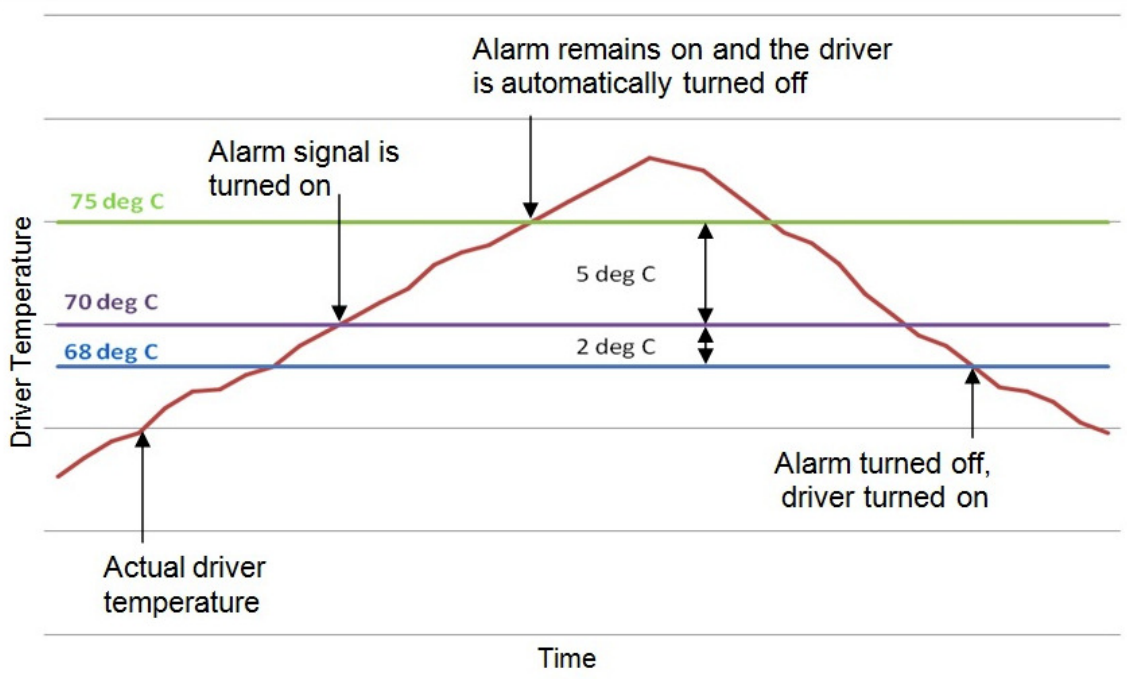


Figure 6.0

7. Driver Configuration

DMX-A2-DRV uses patented Dynamic Configuration Method to read and write the driver parameters using the control signals (Pulse, Dir, Enable, and Alarm) of the driver. Dynamic Configuration eliminates the need for jumpers, switches, resistors, potentiometers and communication port for reading and setting the driver parameters. This results in a simple and cost-effective device.

7.1. Connections

The DMX-CFG-USB-A2 cable is used to configure the DMX-A2-DRV. See Figure 7.0 to see how the configuration cables are connected to the DMX-A2-DRV.

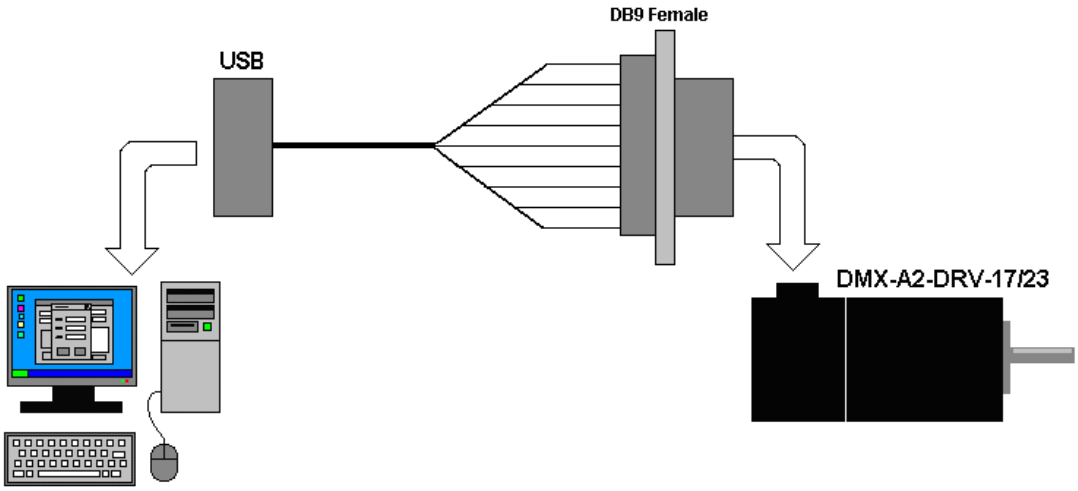


Figure 7.0

7.2. Software

Make sure that the USB device is installed properly before running the configuration software.

See the DMX-CFG-USB Cables manual for details on configuration. Figure 7.1 shows the configuration interface.

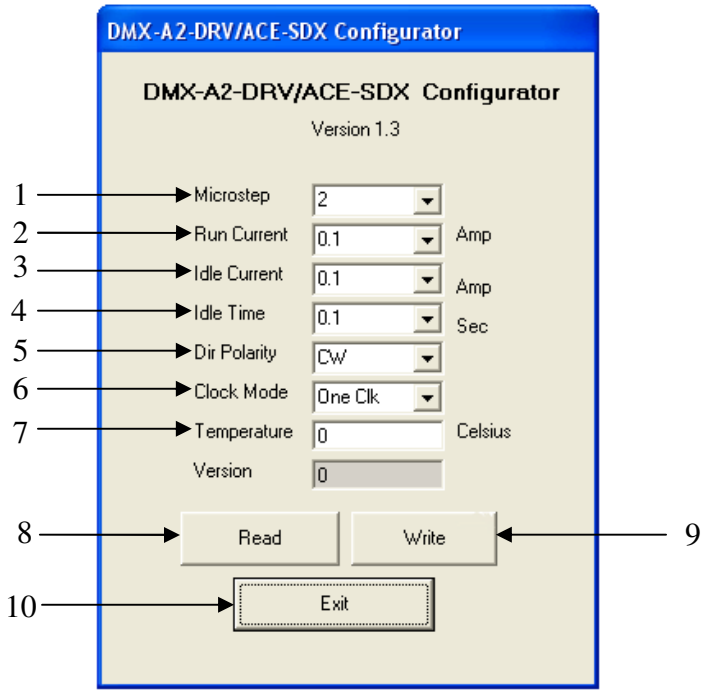


Figure 7.1

1) **Microstep Setting**: 2 to 500 microstepping.
2) **Run Current**: 100mA to 3.0A peak current.
3) **Idle Current**: 100mA to 3.0A peak current.
4) **Idle Time**: 100 msec to 10 sec.
5) **Direction Polarity**: Toggles direction polarity.
6) **One-clock or Two-clock mode**: One-clock or Two-clock mode.
7) **Over Temperature Shutdown**: Determines whether or not the DMX-A2-DRV disables when the temperature rises above a specified threshold. See Figure 6.0 for details.
8) **Read**: Reads settings from the device and displays them.
9) **Write**: Writes the displayed settings to the device.
10) **Close**: Exit the configurator.

7.3. Default Settings

Product	µStep	Run Current (A)	Idle Current (A)	Idle Time (ms)	Dir	Clock
DMX-A2-DRV-17-2	50	1.6	0.5	500	CCW	One
DMX-A2-DRV-17-3	50	1.6	0.5	500	CCW	One
DMX-A2-DRV-23-2	50	2.4	1	500	CCW	One
DMX-A2-DRV-23-3	50	2.4	1	500	CCW	One

Table 7.0

When setting the run and idle current, make sure to keep the current value below the maximum allowed current that each motor can handle. See Table 6.0 for the maximum current that each product can handle.

Contact Information

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