MDC200-024051
110VAC Input Brushless Controller

User's Guide

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MDC200-024051 Driver Features

- Fixed Current Limit Setting at 5 Amps Peak up to 50W Power Output
- 0.5V to 5V External Voltage Speed Control
- 24VDC Motor Voltage Bus
- 2-Quadrant Operation
- Hall Sensor Feedback
- Constant Velocity Mode
- Short Circuit Protection
- Requires 85 - 135 VAC Power Input
- PG Out
- Run/Stop, Freewheel and Direction Inputs
- Optically Isolated Inputs and Output
- Compact Size
- Dual Mounting Option
- Detachable, Screw type Terminal Blocks

General Description

The MDC200-024051 driver is a velocity control driver designed to drive DC Brushless Motors from a supply of 120VAC. The driver has a motor bus voltage of 24V, a fixed peak phase current level of 5A and power output of 50W. Using hall sensor feedback, a constant velocity mode is present. The driver is protected against over current (cycle-by-cycle), hall sensor error and under voltage. When an error occurs, a fault light is turned on to notify the user. When an over current occurs the driver will shutoff. An isolated 5V input is needed to power the user inputs. A 0.5V - 5V analog signal is needed to control the speed of the motor.

Pin Descriptions

The inputs on the MDC200-024051 are optically isolated with an anode (+) and cathode (-) where only the cathode is brought to the user. The anode (+) is tied to the external isolated 5V internally. With no current going through the Direction, Freewheel, and Run/Stop opto-diodes, the input is considered high. To enable the motor to Run, current must go through the Run/Stop input opto-diode. To Freewheel (remove energy from the motor) the motor, current must go through the Freewheel input opto-diode. This is done simply by grounding the cathode input of the opto-diode. The PG Out on the MDC200-024051 is an opto-decoupled open collector and open emitter output. When normal operation occurs, this output will conduct current into the emitter. Care must be taken not to pass more than 50mA through this transistor.

Optically Isolated Inputs and Output

The following inputs and output to the MDC200-024051 are Optically Isolated:

Item	Pin #
PG Out	1 & 2
Direction	3
Freewheel	4
Run Stop	5
VSPD*	7

To enable an input, you must ground the cathode inputs.
*0.5 - 5V signal referenced to ISO GND.

Absolute Maximum Ratings

Output Current Rating:

Fixed 5.0 amperes per phase operating peak current.

Power Requirements: (TB3, Pins 1 and 2)

85VAC (min) - 135VAC (max)

Operating Temperature:

Heat Sink: 0° - 70° C

Hall Sensor Power Input @ ISO 5V:

5V @ 30mA maximum. Typical current draw from hall sensors is 20mA.
All three Hall Sensor inputs are pulled up through 10K ohm resistors.

Closed Loop (Constant Velocity Mode)

The driver is intended for Closed Loop applications. Closed Loop operation is used for applications where speed regulation is needed. Under closed loop operation, the speed is regulated despite changes to the load and the power supply voltage.

The Closed Loop adjustments are needed for faster and slower motor operation, within the restrictions of the motor rated speed. The adjustments provide a direct duty cycle to the driver with respect to the required motor speed. To obtain the necessary changes, the jumper will vary between pins 1, 2 and 3.

The following tables show Closed Loop potentiometer and jumper settings for each motor. These adjustments will set the maximum setting of the external voltage input to the motors maximum running speed. If operation at slower speeds is needed for the application, CL ADJ POT can be adjusted toward 0% or 100% until desired motor speed is achieved. The motor speed can be monitored by measuring the pulse rate of PG OUT (TB1 - pin 1 & 2)

Anaheim Automation Motor Closed Loop Settings

4-Pole Motors

Motor	JP1	CL POT	MAX SPD (RPM)
BLWR092S-24V-4600	1-2	75%	4600
BLWR110S-15V-8000	1-2	75%	8000
BLWR111S-12V-15000	1-2	75%	15000
BLWR111S-24V-10000	1-2	75%	10000
BLWR112S-24V-3700	1-2	25%	3700
BLWR112S-36V-10000*	1-2	75%	7500
BLWR132S-24V-4000	1-2	25%	4000
BLWR231S-36V-4000*	1-2	25%	3000
BLWR231S-24V-11000	1-2	75%	11000
BLWS231S-24V-2000	2-3	75%	2000
BLWS232S-24V-1350	2-3	75%	1350
BLWS231S-24V-4000	1-2	65%	4000
BLWS232S-24V-4000	1-2	65%	4000

8-Pole Motors

Motor	JP1	CL POT	MAX SPD (RPM)
BLY171S-17V-8000	1-2	75%	8000
BLY172S-17V-9500	1-2	75%	9500
BLY171D-24V-4000 BLY171S-24V-4000	1-2	75%	4000
BLY172D-24V-4000 BLY172S-24V-4000	1-2	75%	4000
BLY171S-12V-200	2-3	25%	200
BLY171S-15V-8000	1-2	75%	8000
BLY171S-17V-8000	1-2	75%	8000
BLY172D-12V-230	2-3	25%	230
BLY172S-12V-500	2-3	100%	500

***Note: 36V motors ran at 24VDC. Speed is set to run at 75% of rated value.**

Commutation Sequence

	Step					
	1	2	3	4	5	6
Phase A	+	Z	-	-	Z	+
Phase B	Z	+	+	Z	-	-
Phase C	-	-	Z	+	+	Z
Hall A	1	1	0	0	0	1
Hall B	0	1	1	1	0	0
Hall C	0	0	0	1	1	1

120° Hall Spacing Sequence Forward

	Step					
	1	2	3	4	5	6
Phase A	-	Z	+	+	Z	-
Phase B	Z	-	-	Z	+	+
Phase C	+	+	Z	-	-	Z
Hall A	1	1	0	0	0	1
Hall B	0	1	1	1	0	0
Hall C	0	0	0	1	1	1

120° Hall Spacing Sequence Reverse

	Step					
	1	2	3	4	5	6
Phase A	+	Z	-	-	Z	+
Phase B	Z	+	+	Z	-	-
Phase C	-	-	Z	+	+	Z
Hall A	1	1	1	0	0	0
Hall B	0	1	1	1	0	0
Hall C	0	0	1	1	1	0

60° Hall Spacing Sequence Forward

	Step					
	1	2	3	4	5	6
Phase A	-	Z	+	+	Z	-
Phase B	Z	-	-	Z	+	+
Phase C	+	+	Z	-	-	Z
Hall A	1	1	1	0	0	0
Hall B	0	1	1	1	0	0
Hall C	0	0	1	1	1	0

60° Hall Spacing Sequence Reverse

+ = Top Transistor ON, Bottom Transistor OFF, Current Flows into this wire
- = Top Transistor OFF, Bottom Transistor ON, Current Flows out of this wire
Z = Top Transistor OFF, Bottom Transistor OFF, No current into or out of this wire (High Impedance)

Motor Connection

Refer to the hookup diagram for typical driver applications. When connecting a motor for the first time, connect the hall sensor wires (5 of them) to the driver. **DO NOT CONNECT THE PHASES YET.** Turn on power and rotate the motor by hand. If the RED FAULT LED comes on, the hall phases are incorrectly wired. If the RED FAULT LED does not come on then the hall wires are connected correctly. Power the unit down and proceed to connect the motor phases. If the motor does not run or runs erratically, power down and check the speed potentiometer and make sure the phases are connected correctly. There are six different ways to connect the phase wires, and normally only two will allow the motor to rotate, but only one is correct. If the direction of the motor is changed and the no-load current of the motor is approximately the same and the motor runs smoothly in both directions then the phase wires are correct.

The wiring of the motor phases should be separated from the hall and input connections to not allow a possible source of interference.

Hall Sensor Spacing

JP2	Description
1-2	120°
2-3	60°

Terminal Descriptions

Pin #	Description
1	PG OUT (collector)
2	PG OUT (emitter)
3	Direction
4	Freewheel
5	Run/Stop
6	ISO 5V
7	VSPD
8	ISO GND

TB1: Opto-isolated Control Inputs, Outputs and Speed Control

Pin #	Description
1	Hall Sensor Power
2	Hall Sensor A
3	Hall Sensor B
4	Hall Sensor C
5	Hall Sensor Ground

TB2: Motor Hall Terminals

Pin #	Description
1	AC Hot
2	AC Neutral
3	EARTH GND (must be connected)

TB3: AC Voltage In Terminals

Pin #	Description
1	Phase A
2	Phase B
3	Phase C

TB4: Motor Phase Terminals

Motor Freewheel

The motor freewheel feature allows the de-energizing of the motor phases. A low at this input causes the motor to coast to a stop, while a high (open) input causes the motor to run at the given speed.

Motor Run/Stop

The motor run/stop feature allows the stopping of a motor by shorting out the bottom drives of the three phases. A low at this input allows the motor to run, while a high (open) input does not allow motor operation and if operating, causes rapid deceleration.

Motor Direction

The motor direction feature allows the changing of the rotation of the motor. This input should not be changed while motion is in progress. A low at this input causes the motor to turn in the CW direction, while a high (open) input causes the motor to turn in the CCW direction.

Speed Adjust, ISO 5V, and ISO GND

To adjust the motor speed, the external voltage input can be varied from 0V to 5V. An external +5VDC supply needs to be provided to power the inputs.

Fault Protection

Over current protection can is provided by means of an over current latch function. If a motor current level exceeding the fixed current limit is produced, an over current latch is activated, shutting off the output. This driver is equipped with a FAULT LED to alert the user of the following conditions.

1. Invalid Sensor Input Code
2. Over Current. The driver is equipped with cycle-by-cycle current limiting or over current latch.
3. Under-voltage Lockout activation at 9.1VDC for the input voltage and 4.5VDC for Hall Sensor voltage.

Speed Output

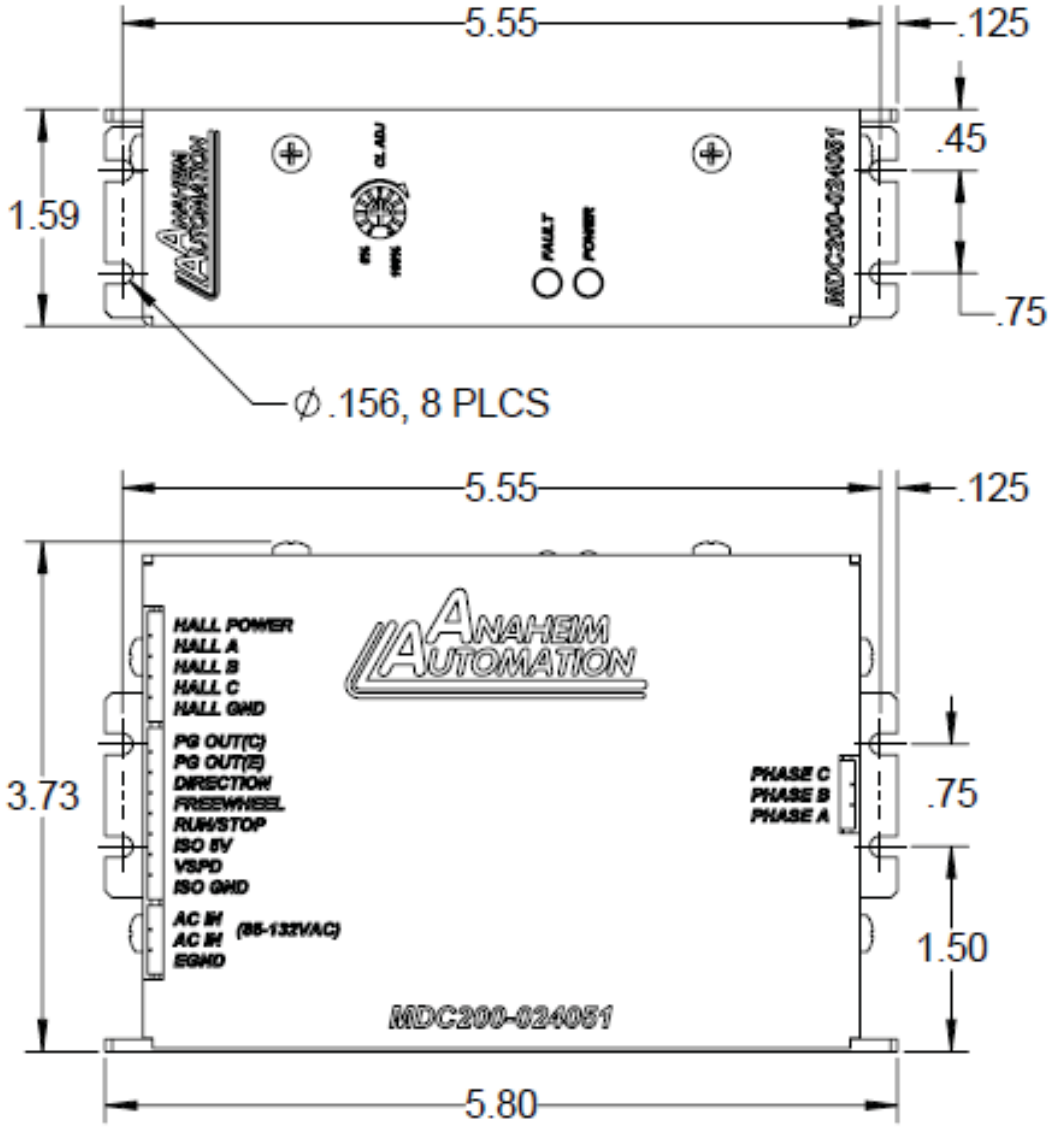
The PG OUT terminal (TB1 - pin 1 and 2) is used to determine the speed of the motor shaft. An opto-decoupled open collector output is shown at a rate of 4 pulses for 1 revolution of an 8-pole motor, 3 pulses for 1 revolution of a 6-pole motor, and 2 pulses for 1 revolution of a 4-pole motor. Care must be taken not to pass more than 50mA through this transistor.

# Poles	RPM
8	15 * PG OUT (in Hz)
6	20 * PG OUT (in Hz)
4	30 * PG OUT (in Hz)

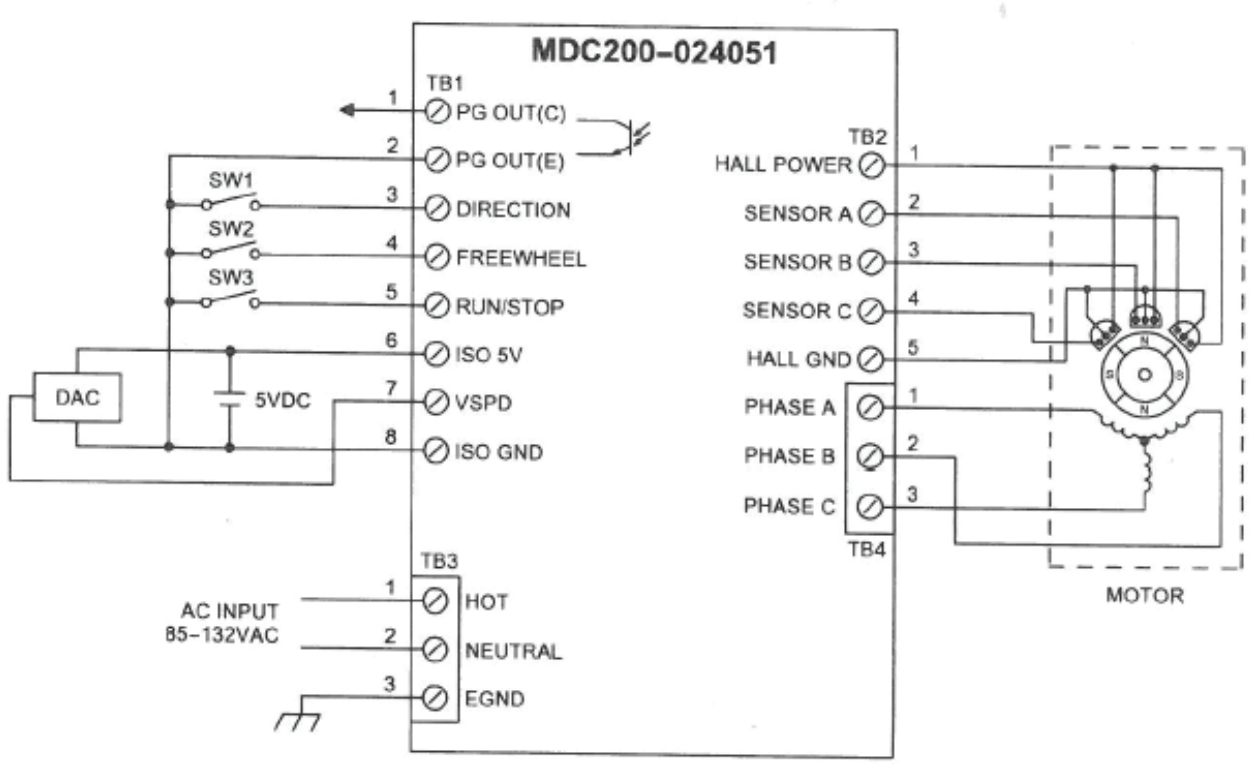
Heating Considerations

The temperature of the heat sink should never be allowed to rise above 70° Celsius. If necessary, mount the unit to an additional heat sink or air should be blown across the heat sink to maintain suitable temperatures.

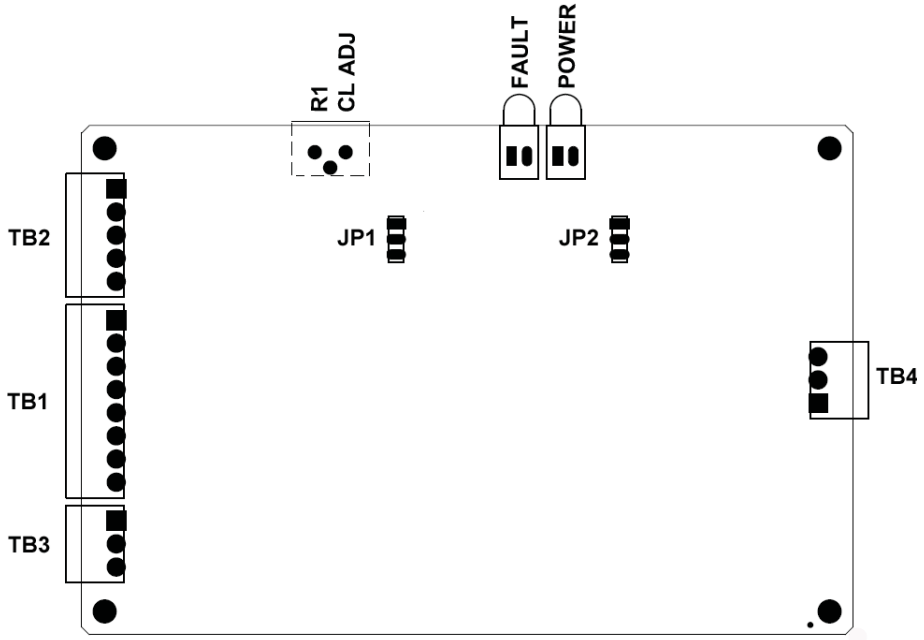
Dimensions



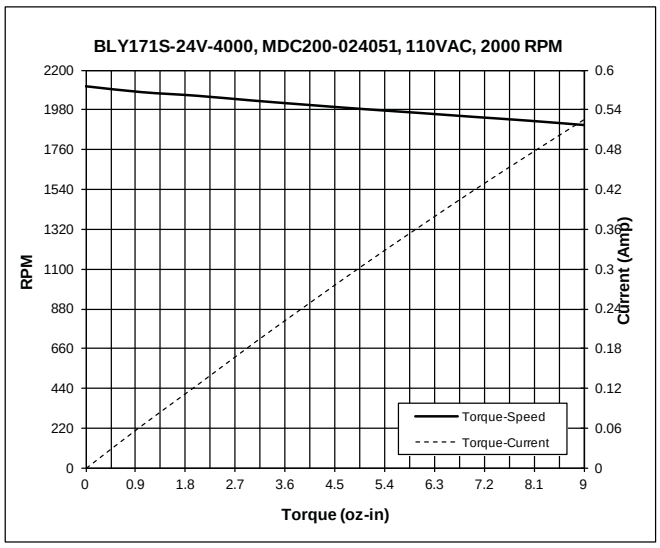
Typical Wiring Diagram

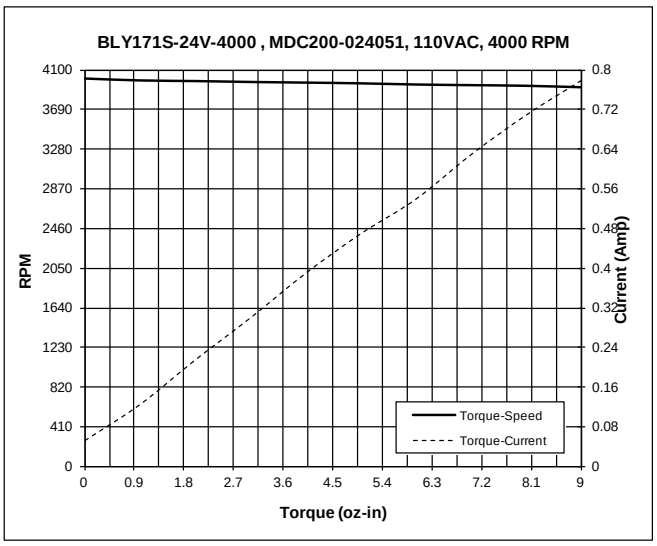


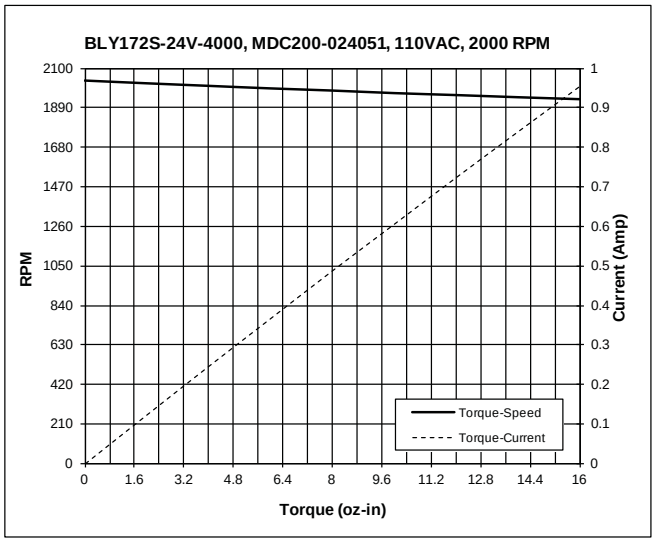
Jumper Locations

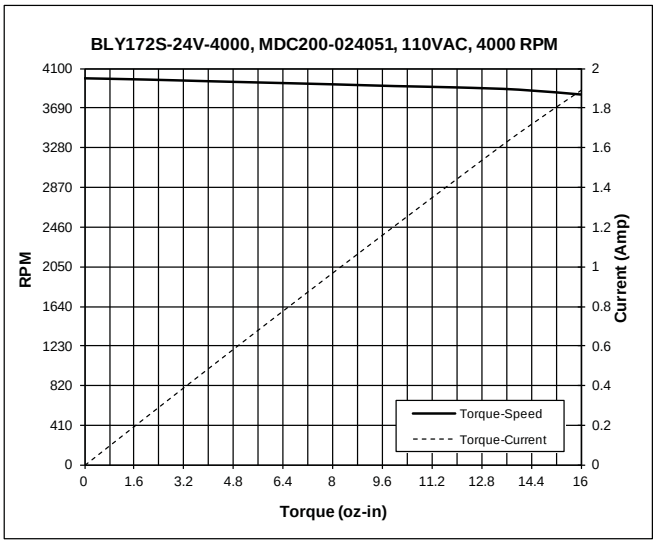


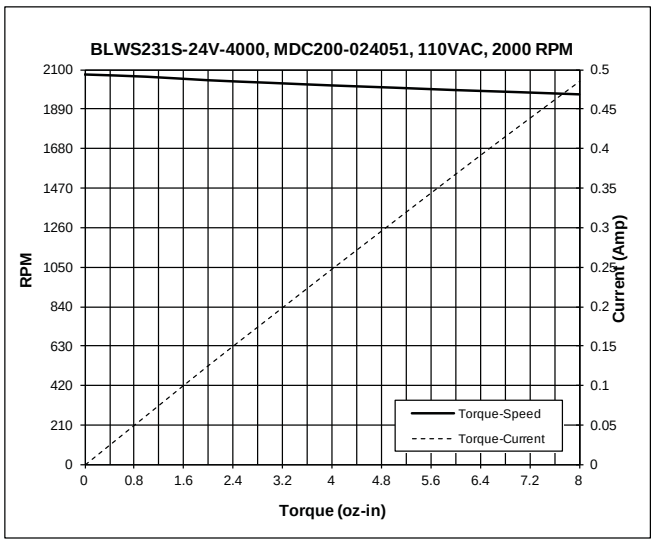
Torque Curves

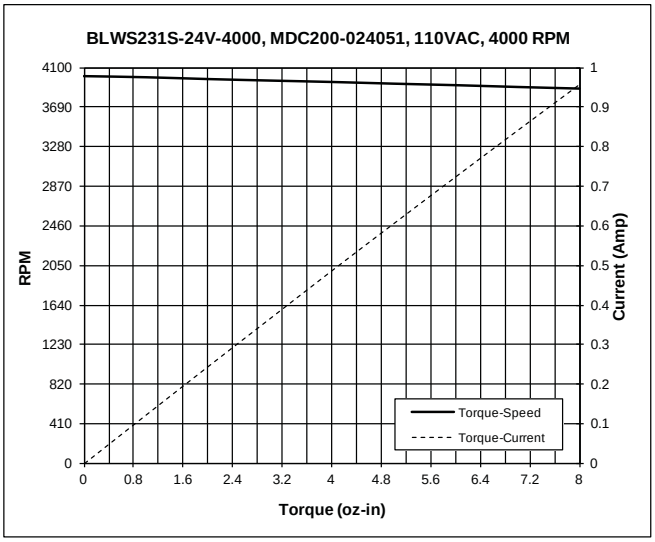












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Anaheim Automation will repair or replace at its' option, any product which has been found to be defective and is within the warranty period, provided that the item is shipped freight prepaid, with previous authorization (RMA#) to Anaheim Automation's plant in Anaheim, California.

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