

NMS Series User's Manual

Stepper Motors



Disclaimer

Zaber's products are not intended for use in any critical medical, aviation, or military applications or situations where a product's use or failure could cause personal injury, death, or damage to property. Zaber disclaims any warranty of fitness for a particular purpose. The user of this product agrees to [Zaber's general terms and conditions of sale](#).

Precautions

Zaber's autodetect peripheral axes are designed to be used effortlessly with Zaber's line of autodetect controllers. The NMS includes onboard memory that allows Zaber's controllers to autodetect the model and set reasonable parameters. See the [Protocol Manual](#) for more information on how to modify the settings. Damage to the axis may result if the settings are not correct. To use your Zaber peripheral with a third-party controller, review the motor, sensor, and encoder specifications and pin-outs carefully.

⚠ Caution: The motor in this device can exceed 60° C during normal operation and become hot enough to cause burns. Take precautions to prevent contact with the motor.

Conventions used throughout this document

- Fixed width type indicates communication to and from a device. The `␣` symbol indicates a carriage return, which can be achieved by pressing enter when using a terminal program.
- An [ASCII command](#) followed by (T:xx) indicates a legacy T-Series [Binary Protocol](#) command that achieves the same result. For example, `move abs 10000 (T:20:10000)` shows that a move abs ASCII command can also be achieved with Binary command number 20.

Not all ASCII commands have an equivalent Binary counterpart.

Device Overview

AutoDetect

Your NMS peripheral is equipped with AutoDetect, a feature that allows a Zaber controller to automatically configure its settings for the peripheral when it is connected.

💡 Important: The controller should always be powered down before disconnecting or connecting your NMS peripheral.

To connect the peripheral to a controller:

- Power off the controller.
- Connect the NMS peripheral.
- Power on the controller.
- The controller will activate the peripheral shortly after it is powered on.

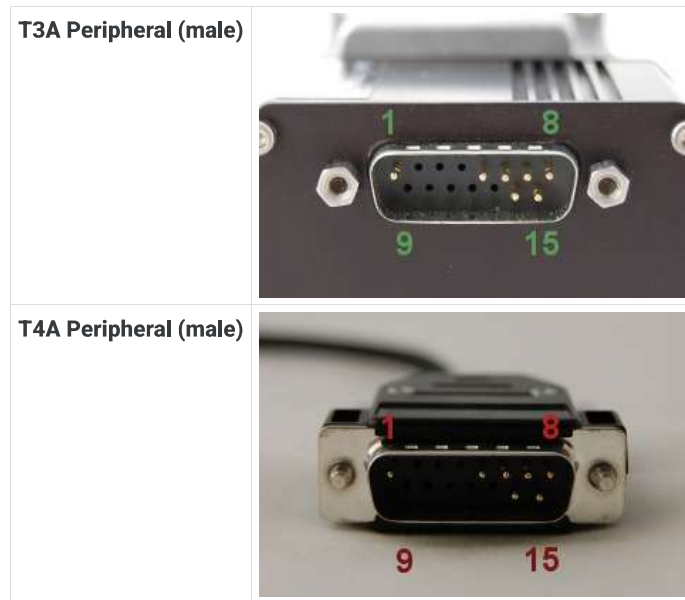
See the Zaber controller user manual for more details on peripheral activation and control.

Connectors

Recommended controller(s) for your NMS peripheral are provided in the product specifications. Zaber's controllers and peripherals are designed for ease of use when used together. Optimal settings for each peripheral are automatically detected by Zaber's controllers when the device is connected.

For reference, the pinout for the peripheral cable connectors is shown below:

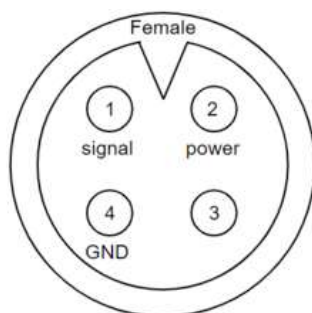
Pinout for D-sub 15 Connectors (peripherals)



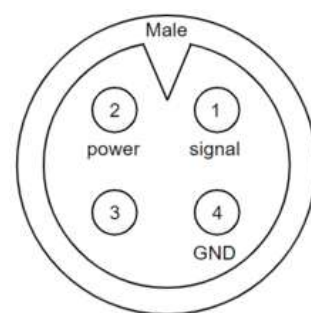
Pin #	Function
1	+5V for Limits & Encoder
2	AutoDetect Data
3	N.C.
4	Away Sensor
5	Home Sensor
6	Ground
7	Motor B1
8	Motor A1
9	AutoDetect Clock
10	Encoder A
11	Encoder B
12	Encoder Index
13	Ground
14	Motor B2
15	Motor A2

Not all pins are used for all models

External Hall Sensor



Device Connector



Sensor Connector

Pin	Description
1	Signal
2	+5V
3	Reserved
4	Ground

NOTE: The signal is pulled up to the internal supply rail and is designed to be pulled low by an open collector.

NOTE: Sensor inputs are non-isolated 5V TTL lines.

Alternate Controllers

The NMS can be controlled by any 2-phase stepper motor controller with limit sensor input. **We do not recommend using your own controller unless you are familiar with how to control a stepper motor with hall sensor limit switches.** Damage to the device due to incorrect wiring is not covered by warranty.

Motors

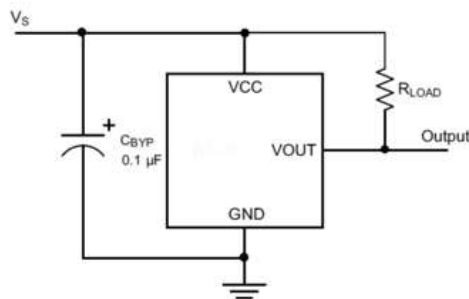
For motor information see the [NMS product page](#)

Limit Sensors

Hall effect sensors are used in the NMS as home sensors. The Hall sensors used are part number A1120LLHLT-T made by Allegro. [Click here for data sheet](#). Your controller should be configured so the stage stops immediately (quick deceleration) when the sensors are triggered.

- PCB wire colour code:
 - 5 Vdc input - red
 - Home signal - yellow
 - Away signal - white
 - Ground - black

The Hall sensor has an open-collector output. The default output is high impedance when the Hall sensor is not active. When the sensor detects a magnet, the Hall sensor pulls the output low to ground.



If you are not using a Zaber controller, ensure that your controller has a pull-up resistor on the output line of each Hall sensor as shown in the diagram. The bypass capacitor is optional, but may help to eliminate false triggering in noisy environments. The typical value for the pull-up resistor (R_{LOAD}) is 10 k Ω and for the bypass capacitor is 0.1 μ F to 1 μ F. The larger the capacitance, the better the noise filtering but the slower the response time.

Installation

Physical Installation

The provided Hall Effect limit sensors are compatible with a T-slot (see dimensions below). To install a sensor, slide it down the T-slot from the slot's end to the desired position and tighten the M3 set screw until sensor is just secure. Over-tightening may cause threads to strip in the sensor. A small boss on the top side of the sensor indicates the approximate centre of the sensing area on the underside. If possible, nest the cable within the slot to avoid catching or pulling the cable.



To mount the provided magnet, use a strong adhesive to fix the magnet in a position that allows it to trigger the sensor (see below). Ensure the south pole (black side) of the magnet faces the sensor. The Hall Effect sensor only triggers on a south pole with a magnetic field intensity of approximately 35 G or more. Use a stronger magnet to trigger the sensor from a great distance. The triggering distance will vary depending upon the magnet's strength, the direction from which it approaches the sensor, its orientation relative to the sensor, and surrounding magnetic material. Standard mounting configurations and triggering distances are shown below.



Also see [Home or Away Sensor Installation Sheet](#).

Trajectory Control and Behaviour

This section describes the behaviour of the axis trajectory when a movement command is issued.

Software Position Limits

The travel range of the axis is limited by the Minimum Position and Maximum Position settings. The factory settings for the axis are configured to match the physical travel range. If a customized range is desired, it can be changed by configuring the [limit.min \(T:106\)](#) and [limit.max \(T:44\)](#) settings to appropriate values. For the Current Position, query [pos \(T:60\)](#).

Minimum Position

When the Current Position is less than the Minimum Position value, the axis cannot move in the negative direction (towards the motor).

Maximum Position

When the Current Position is greater than the Maximum Position value, the axis cannot move in the positive direction (away from the motor).

Movement Speed

The movement speed of the axis depends on axis status and various speed settings. If the axis has not been initialized by the [home \(T:1\)](#) command or by moving towards the home end of the axis, movement speed will be constrained to fail-safe values. The home status of the axis can be determined by reading the [limit.home.triggered \(T:53:103\)](#) setting.

Movement speed of the axis is specified below:

[move vel \(T:22\)](#)

The axis will move at the specified speed regardless of home status.

Knob movement in Velocity Mode

The axis will move at the specified speed regardless of home status.

The speed is specified by the [knob.speedprofile \(T:112\)](#) and [knob.maxspeed \(T:111\)](#) settings.

Other movement commands - when the axis has not been homed

The axis will move at the slower of the [maxspeed \(T:42\)](#) and [limit.approach.maxspeed \(T:41\)](#) settings.

Other movement commands - when the axis has been homed

The axis will move at the speed specified by the [maxspeed \(T:42\)](#) setting.

Warranty and Repair

For Zaber's policies on warranty and repair, please refer to the [Ordering Policies](#).

Standard products

Standard products are any part numbers that do not contain the suffix ENG followed by a 4 digit number. Most, but not all, standard products are listed for sale on our website. All standard Zaber products are backed by a one-month satisfaction guarantee. If you are not satisfied with your purchase, we will refund your payment minus any shipping charges. Goods must be in brand new saleable condition with no marks. Zaber products are guaranteed for one year. During this period Zaber will repair any products with faults due to manufacturing defects, free of charge.

Custom products

Custom products are any part numbers containing the suffix ENG followed by a 4 digit number. Each of these products has been designed for a custom application for a particular customer. Custom products are guaranteed for one year, unless explicitly stated otherwise. During this period Zaber will repair any products with faults due to manufacturing defects, free of charge.

How to return products

Customers with devices in need of return or repair should contact Zaber to obtain an RMA form which must be filled out and sent back to us to receive an RMA number. The RMA form contains instructions for packing and returning the device. The specified RMA number must be included on the shipment to ensure timely processing.

Email Updates

If you would like to receive our periodic email newsletter including product updates and promotions.

Contact Information

Contact Zaber Technologies Inc by any of the following methods:

Phone	1-604-569-3780 (direct) 1-888-276-8033 (toll free in North America)
Fax	1-604-648-8033
Mail	#2 - 605 West Kent Ave. N., Vancouver, British Columbia, Canada, V6P 6T7
Web	www.zaber.com
Email	Please visit our website for up to date email contact information.

The original instructions for this product are available at <https://www.zaber.com/manuals/NMS>.

Appendix A: Default Settings

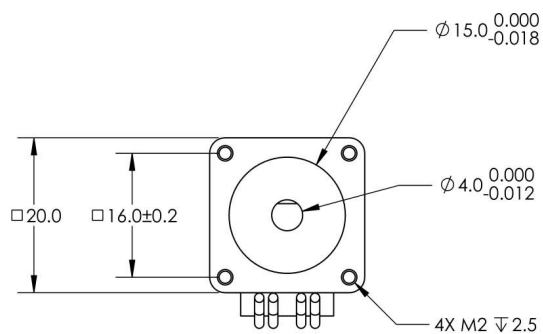
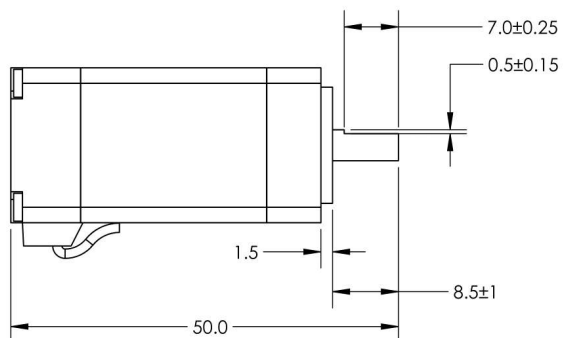
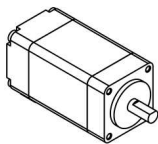
Please see [the Zaber Support Page](#) for default settings for this device.

Product Drawings

ZABER

NMS08

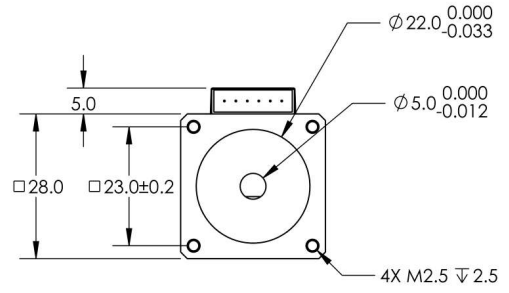
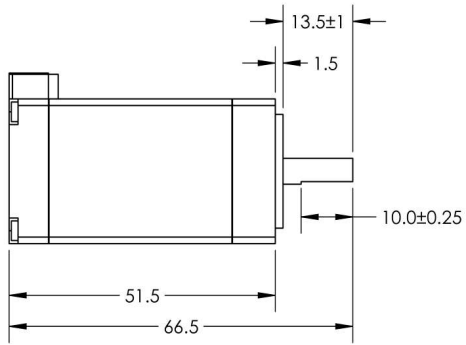
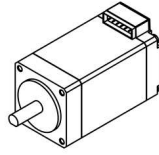
dimensions in mm



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NMS11

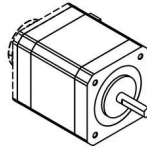
dimensions in mm



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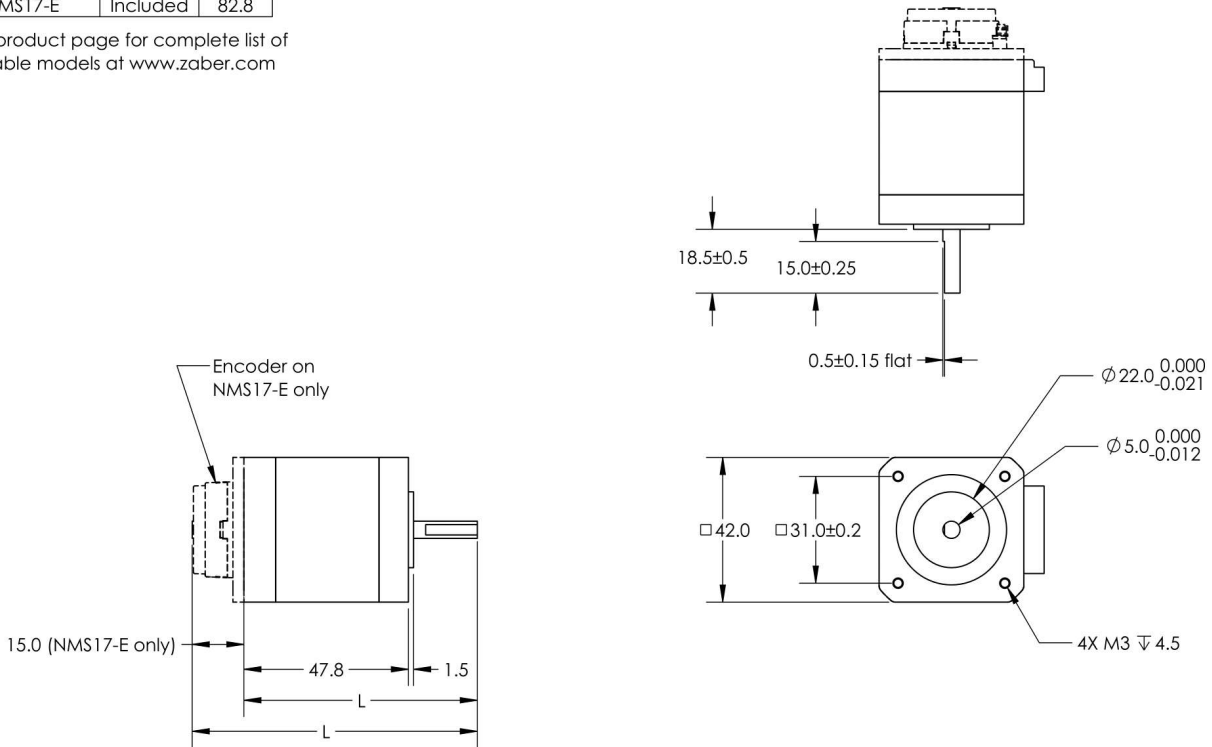
NMS17(-E)

dimensions in mm



Model Number*	Encoder	L
NMS17	-	67.8
NMS17-E	Included	82.8

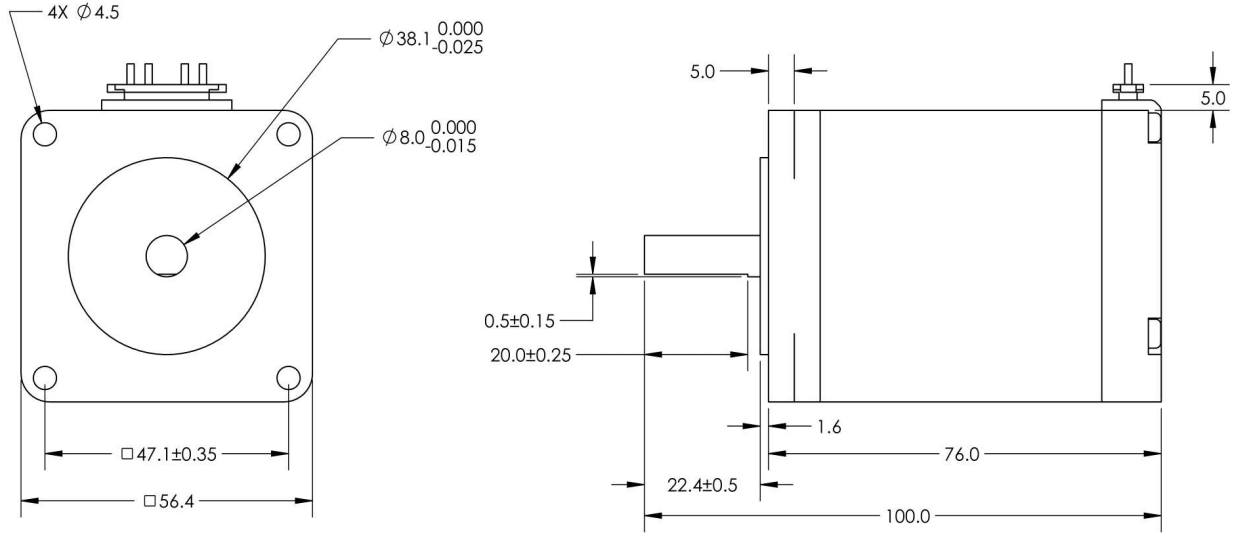
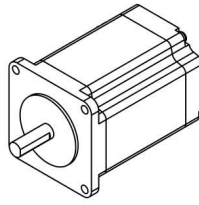
*See product page for complete list of available models at www.zaber.com



ZABER

NMS23

dimensions in mm



DWG-3173-001

Specifications

Specification	Value	Alternate Unit
Microstep Size (Default Resolution)	0.028125°	490.866 µrad
Built-in Controller	No	
Recommended Controller	MCC (48 V) Recommended	
AutoDetect	Yes	
Maximum Speed	18000°/s	3000 rpm
Minimum Speed	0.017172°/s	299.703 µrad/s
Speed Resolution	0.017172°/s	299.703 µrad/s
Motor Steps Per Rev	200	
Motor Type	Stepper (2 phase)	
Motor Connection	D-sub 15	
Limit or Home Sensing	Magnetic home sensor	
Operating Temperature Range	0 to 50 °C	
CE Compliant	Yes	
Vacuum Compatible	No	

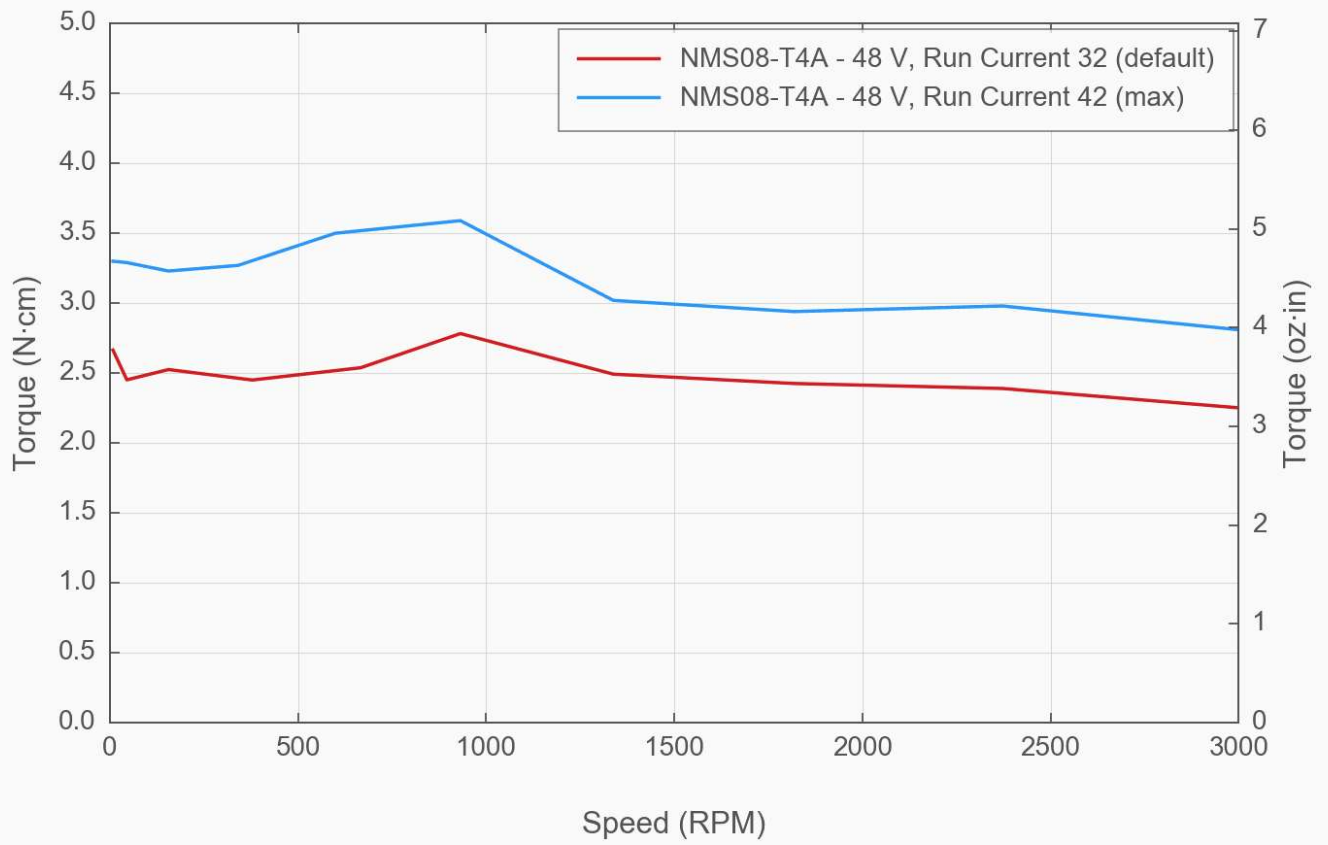
Comparison

Part Number	Maximum Torque	Motor Rated Current	Motor Winding Resistance	Inductance
NMS08-T4A	3.5 N·cm (5.0 oz·in)	600 mA/phase	6.5 ohms/phase	3.5 mH/phase

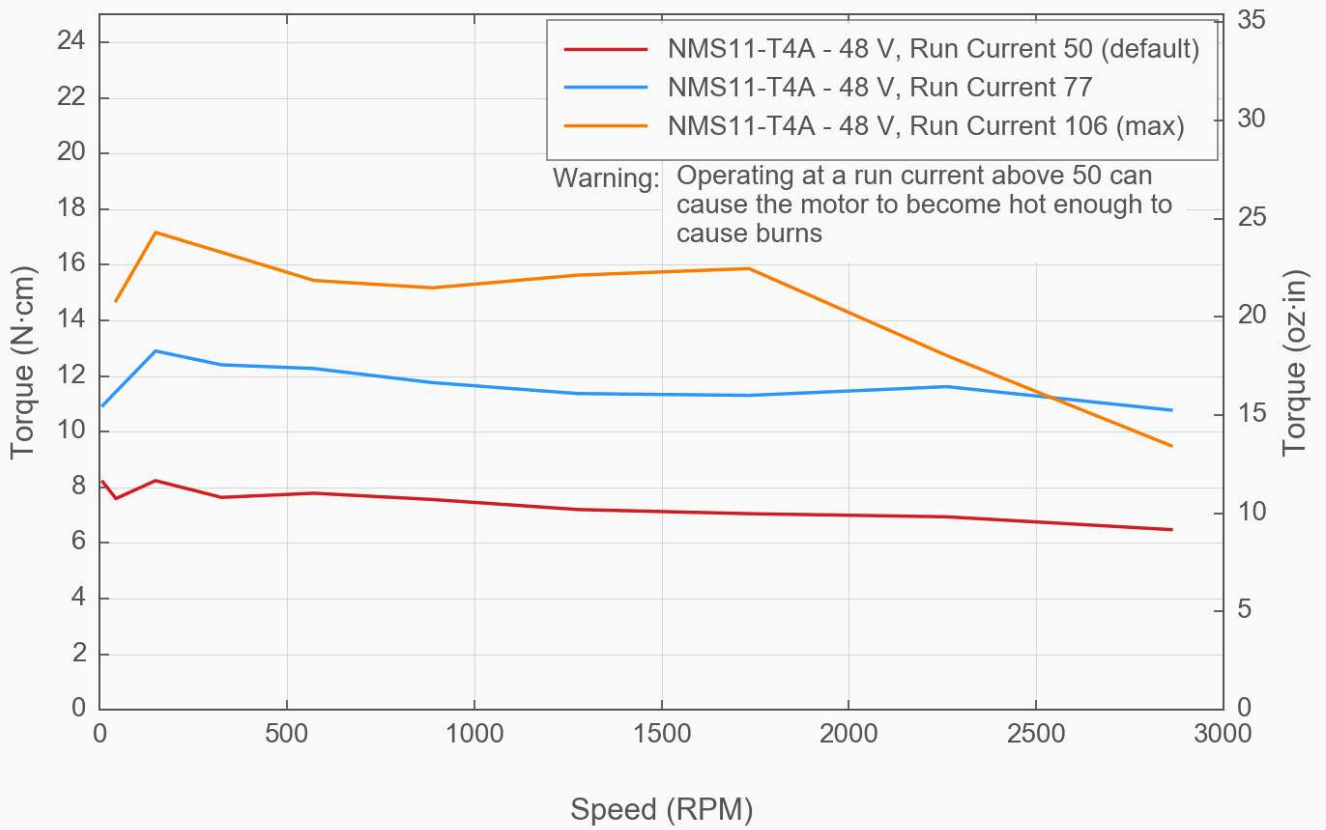
Part Number	Maximum Torque	Motor Rated Current	Motor Winding Resistance	Inductance
NMS11-T4A	17 N·cm (24.1 oz·in)	1500 mA/phase	2.05 ohms/phase	1 mH/phase
NMS17-T4A	58 N·cm (82.1 oz·in)	2300 mA/phase	1 ohms/phase	2.2 mH/phase
NMS23-T4A	180 N·cm (254.9 oz·in)	3000 mA/phase	0.53 ohms/phase	2 mH/phase

Part Number	Motor Frame Size	Weight
NMS08-T4A	NEMA 8	0.07 kg (0.154 lb)
NMS11-T4A	NEMA 11	0.21 kg (0.463 lb)
NMS17-T4A	NEMA 17	0.36 kg (0.794 lb)
NMS23-T4A	NEMA 23	1.01 kg (2.227 lb)

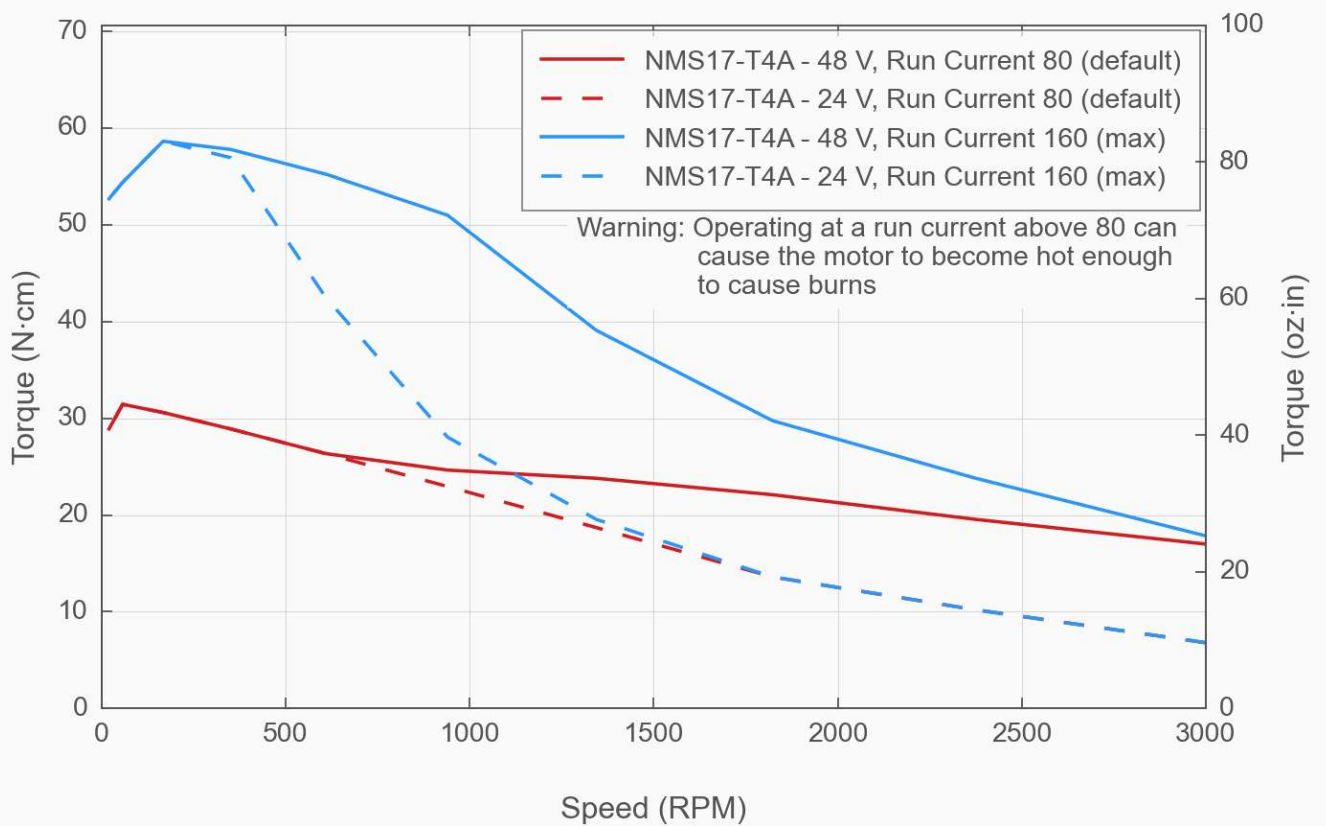
Torque Speed Performance



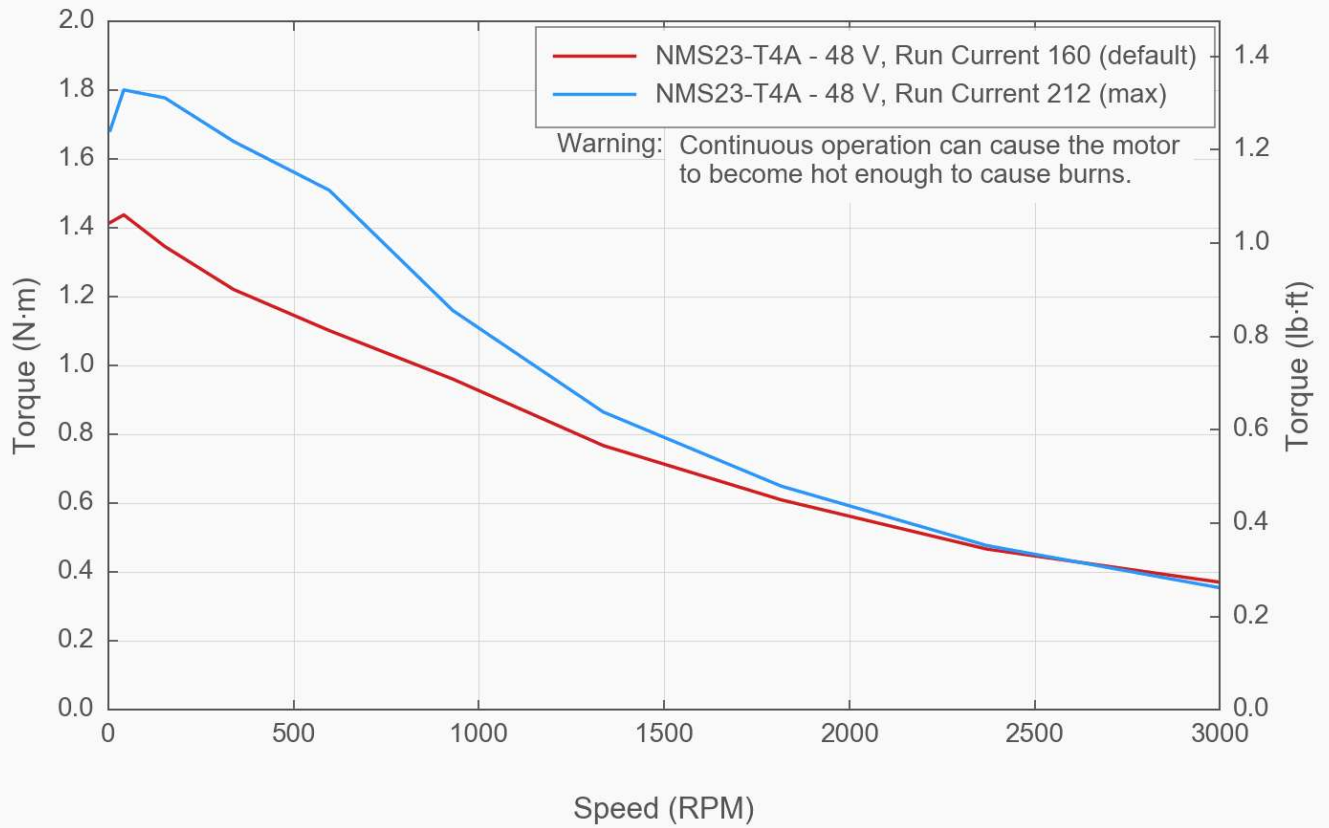
Torque Speed Performance



Torque Speed Performance



Torque Speed Performance



Product Change Notices

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