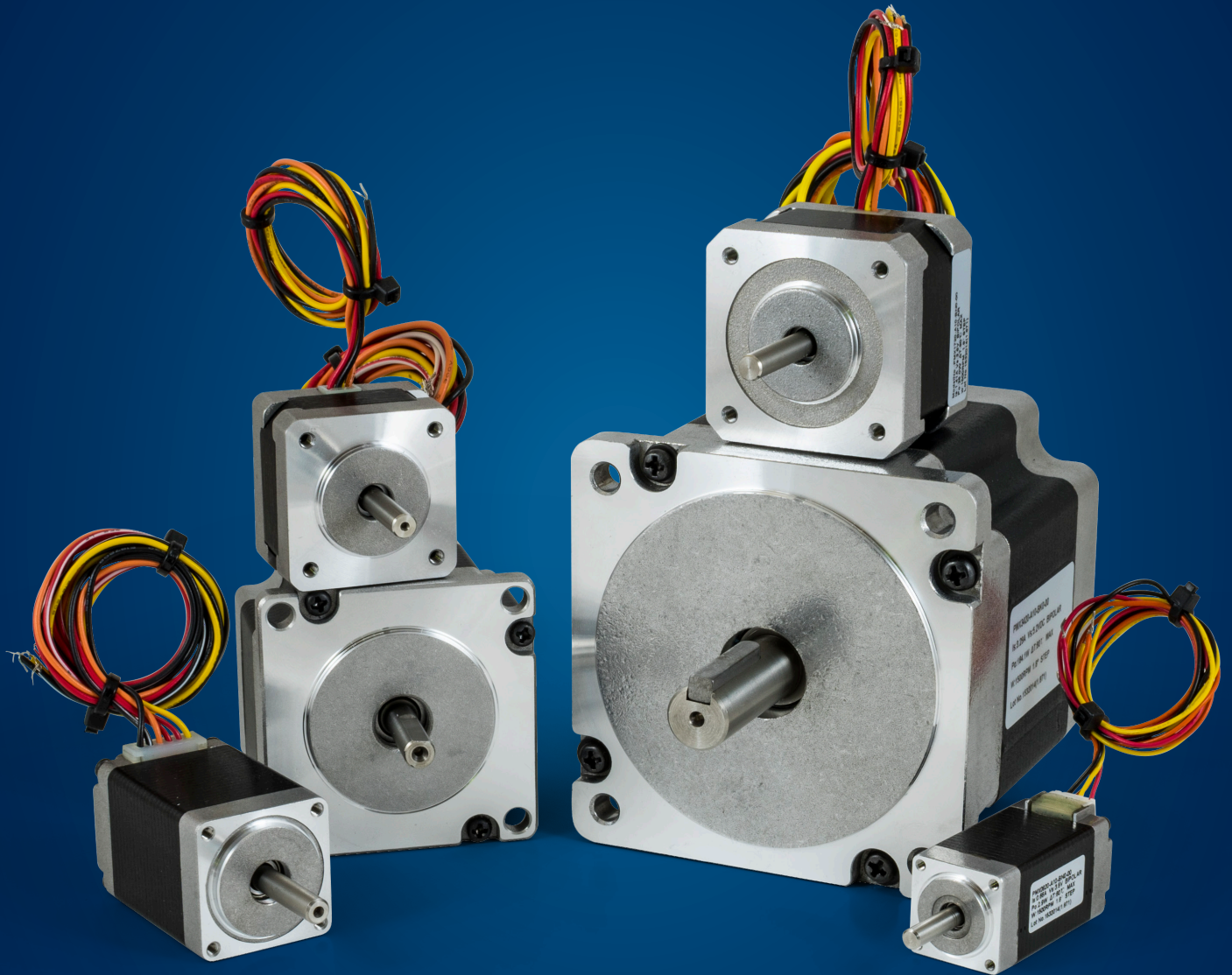


# PMX™ Series Stepper Motor

## Selection Guide



**KOLLMORGEN**

A REGAL REYNOLD BRAND

# Kollmorgen: Your Partner, In Motion.

Every solution comes from a real understanding of the challenges facing machine designers and users.

Innovators consistently rate Kollmorgen as one of their best motion systems manufacturing partners. Whether you are looking for classic servo motors, direct-drive servo motors, stepper motors, drives & amplifiers, gearing, actuation, or multi-axis motion controllers, Kollmorgen is one of the few companies in the world that actually designs and manufactures all of these products.

Our customers are leaders in many industries such as Aerospace & Defense, Printing, Packaging & Converting, Food & Beverage Processing, Medical Imaging, In Vitro Diagnostics & Laboratory Automation, Pharmaceutical Manufacturing, Material Forming and Cutting, Oil & Gas, and Robotics. Kollmorgen is also a leader in Warehouse Automation, including complete AGV systems, software, awareness and autonomy.

Our Automation Solutions can be found on Mars and in space, ships and submarines, O&G drilling and metrology, surgical robots and laser eye surgery, even inside artificial hearts. These are just a few applications that demand high-performance and high-quality while satisfying their specific needs.

Because motion matters, it's our focus: Motion can distinctly differentiate a specific machine and deliver a marketplace advantage by increasing its performance and dramatically improving Overall Equipment Effectiveness (OEE).

High-performance motion can make your customer's machine more reliable and energy-efficient, enhance accuracy and improve operator safety. Motion also represents endless possibilities for innovation.

We've always understood this potential, and thus have kept motion at our core and in our Vision, Mission & Values, relentlessly developing products that offer precise control of torque, velocity and position accuracy in machines that rely on complex motion.

### How To Use This Selection Guide:

This guide covers the technical information required to select and order PMX Series hybrid step motors. Select the proper motor using one of the following procedures:

- » If you're already familiar with these motors and the available options, refer to the Model Nomenclature on pg. 10 to verify the part number and corresponding motor options prior to order.
- » If you're not familiar with PMX motors and available options: first refer to the Frame Size Overview, pg. 7, and Technical Overview, pg. 8. To further evaluate individual winding specifications refer to the Drawings and Performance Data, using the table of contents above as a reference for each frame size. After all the technical parameters and options are determined, construct a part number using the Model Nomenclature (pg. 10).

### Where To Order:

Kollmorgen utilizes an experienced channel of Authorized High-Tech Distributors (AHTDs) to assist our customers with applications, sizing and selection, ordering, and technical support. Visit our Distributor Locator to find locally available distributors. [www.kollmorgen.com/enus/where-to-buy/](http://www.kollmorgen.com/enus/where-to-buy/)

Kollmorgen Customer Service Representatives are also available by phone or e-mail and can assist in selecting and contacting local distributors.

- » North America: 1-540-633-3545, [support@kollmorgen.com](mailto:support@kollmorgen.com)
- » Europe/Middle East/Africa: +49 (0) 2102 9394 0, [think@kollmorgen.com](mailto:think@kollmorgen.com)
- » Asia: +86-400 661 2802, [sales.china@kollmorgen.com](mailto:sales.china@kollmorgen.com)

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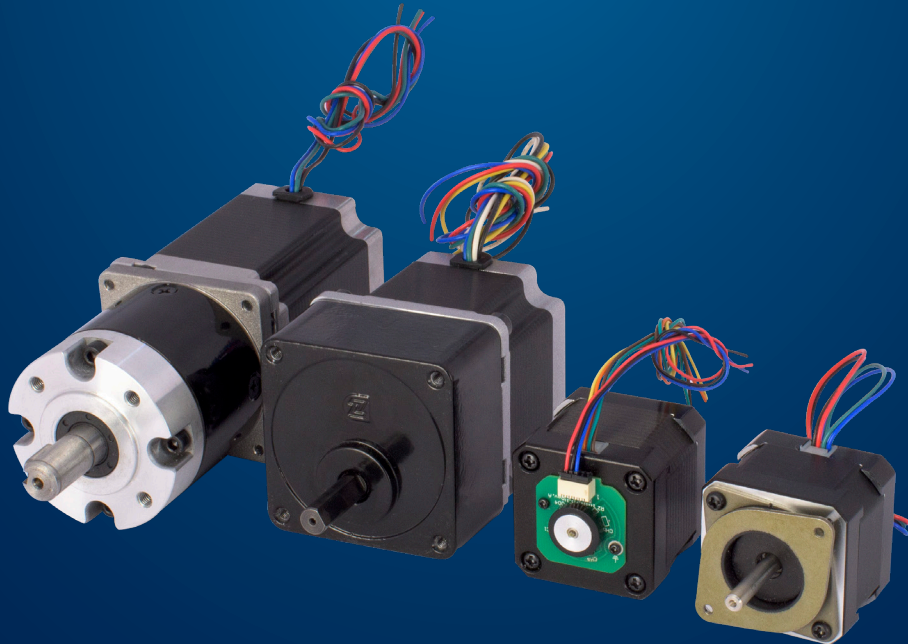


## ▶ PMX™ Series Stepper Motor

**Kollmorgen's stepper motors are designed with versatility, ease-of-use, and cost-effectiveness in mind.** They provide high torque in a small package and come in a wide range of standard sizes, constructions, windings and options.

Our high-performance, brushless, maintenance-free stepper motors provide very precise, extremely cost-effective motion control. These hybrid stepper motors inherently move in small, very precise,  $0.9^\circ$ , or  $1.8^\circ$  increments (400 or 200 steps/revolution). This stepping action is simple to control and does not require complicated, expensive feedback devices.

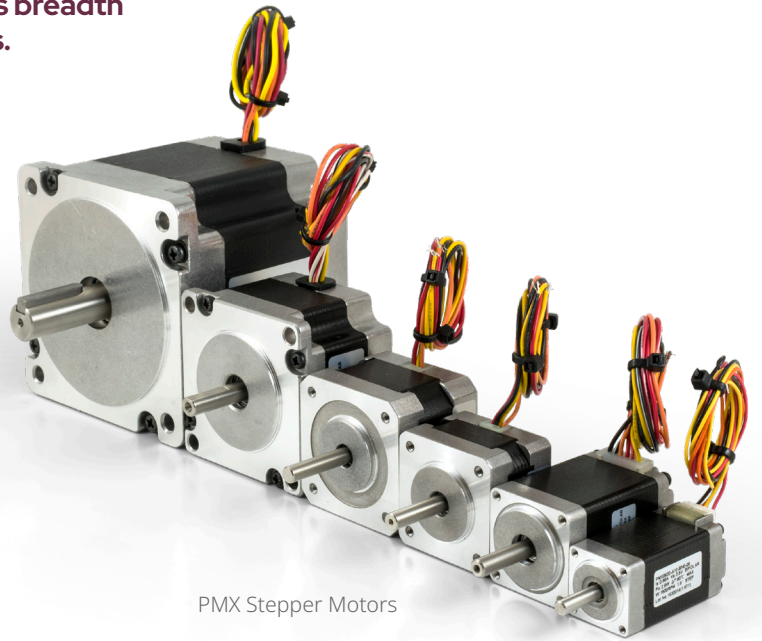
PMX Series motors are commonly built with special modification and value-added features. Custom leads, shafts, and connectors are routinely provided to effectively solve your application needs.



## Kollmorgen's PMX™ stepper motor line delivers breadth and design flexibility at competitive lead times.

Kollmorgen is excited to continue its winning heritage in hybrid stepper motors with the PMX family. Leveraging the best practices from customer preferred products in the POWERMAX and POWERPAC families, the PMX lines will deliver breadth and design flexibility at a very competitive lead time. Look no further for that hybrid stepper motor family with local support that gives you the flexibility you need to succeed.

PMX Series motors include smaller Nema 08, 11, and 14 frame sizes in addition to the traditional Nema 17, 23, and 34 frame sizes. Each frame size is built with high quality construction in an affordable, market competitive solution. Numerous co-engineering options are also available including: customizing shafts, encoders, and mounted spur and planetary gearboxes.



PMX Stepper Motors

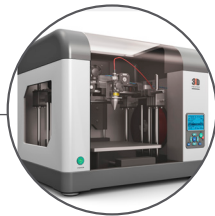
- » **Increased Design Flexibility** – six frame sizes (08, 11, 14, 17, 23, 34) each with several stack length and winding options available
- » **Minimal Drive Adjustments** – options for 1.8 and 0.9 degree step angles
- » **Lower Unit Cost** – PMX motors are priced competitively in today's current stepper market and are the lowest of all Kollmorgen stepper products
- » **Quality Construction** translates to reliability in the field and a long service life
- » **Localized Support** gives you the delivery terms and immediate technical support you need, meaning quicker time to market and less downtime
- » **Flexible Manufacturing** enables Kollmorgen to immediately evaluate modifications and co-engineered solutions for rapid prototyping
- » **Easy to Apply Worldwide** – CE, RoHS, REACH

### Many Applications

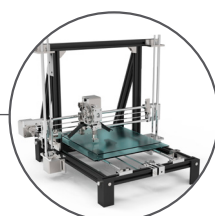
PMX motors allow Kollmorgen customers to fulfill their automation needs at an affordable cost, enabling higher throughput in a wide variety of equipment. In addition, leveraging Kollmorgen's technical expertise and flexible engineering, the PMX is ready for seamless special and co-engineering options, allowing for swifter and easier integration into both new and existing applications.



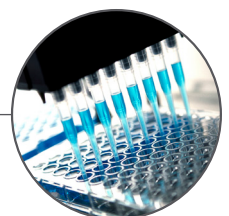
Chemical Analyzers



3-D Printers



Tabletop Equipment



Metering Pumps

# PMX™ Modifications and Special Features

## Kollmorgen's flexible manufacturing is shifting the viewpoint on custom motor capabilities.

Kollmorgen offers extensive experience in stepper motor enhancements and value-added stepper motor assemblies. Localized support provides technical solutions, leading to swifter prototype evaluation and time-to-market. Kollmorgen's ability to co-engineer – customize shafts, lead wires, connectors, encoders, gearboxes, etc – provides real flexibility to optimize each motor, making it easier to drop into existing applications with minimal adjustments.

### Shaft Modifications

A variety of motor output shaft modifications can be supplied, allowing swifter integration into drive mechanism.

- » Special shaft diameters and shaft lengths
- » Special shaft details including: flats, dual flats, slots, and thru holes
- » Spline shafts, helical gears, fixed acme lead screws

### Electrical Modifications

Kollmorgen can swiftly evaluate special winding considerations and attempt to match current, resistance, or inductance requirements for swifter control integration.

### Connectors and Cabling

Motors can be supplied with customer-specified connectors for swifter incorporation into existing cabling. Non-standard lead lengths and cable options can also be ordered.

### Encoders

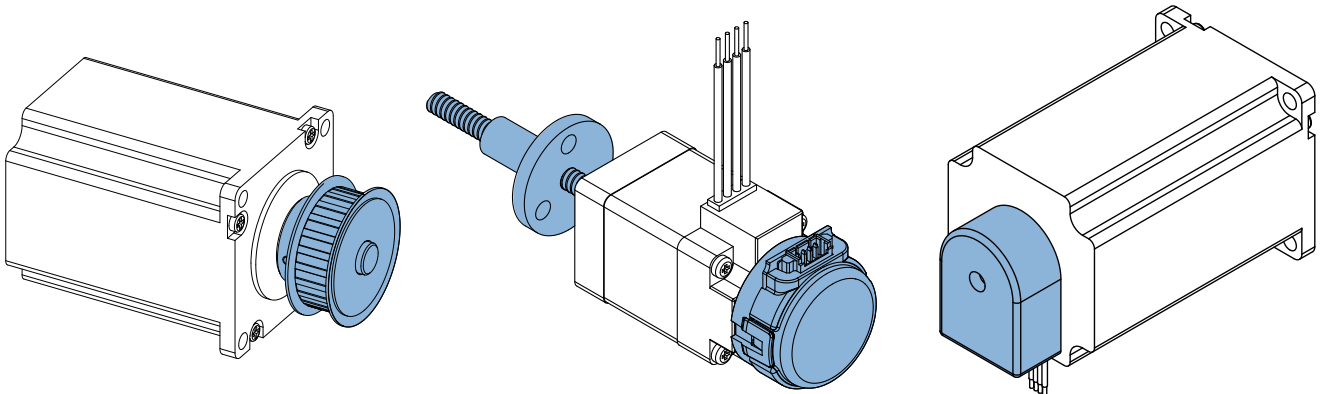
Kollmorgen can supply and mount customer-specified encoders. This includes different encoder types (i.e. incremental, absolute) and line counts.

### Gearboxes

Kollmorgen can provide spur and planetary gearbox customized solutions. These can extend the torque range of the motors and ship pre-mounted from the factory for your convenience.

### Complete Sub-Assemblies

Partnering with Kollmorgen for full co-engineering design adds significant value in motion selection. Complete sub-assembly solutions mean less integration and engineering to perform. Sub-assemblies can ship directly from the factory allowing for reduced machine SKU count and swifter production readiness.



To review non-standard capabilities, contact Kollmorgen today at [www.kollmorgen.com](http://www.kollmorgen.com)

# PMX™ Series Technical Overview

## PMX Stepper Motor General Specifications

Series	Stacks	Holding Torque (Motor Mounted)		Length		Features	
		Bipolar		in	mm		
		oz-in	Nm				
<b>Size 08 PMX Series</b>							
<b>2 Phase, 1.8° Step Motors. Frame size: 0.8 inch, 20 mm</b>							
	PMX081	1	2.50	0.018	1.18	30.0	<ul style="list-style-type: none"> <li>• Front shaft flat option</li> <li>• Rear shaft option</li> </ul>
	PMX082	2	4.00	0.028	1.65	42.0	
<b>Size 11 PMX Series</b>							
<b>2 Phase, 1.8° Step Motors. Frame size: 1.1 inch, 28 mm</b>							
	PMX111	1	10.1	0.071	1.26	32.0	<ul style="list-style-type: none"> <li>• Front shaft flat option</li> <li>• Rear shaft option</li> <li>• Integral connector option</li> </ul>
	PMX112	2	16.1	0.114	1.77	45.0	
	PMX113	3	16.8	0.119	2.01	51.0	
<b>Size 14 PMX Series</b>							
<b>2 Phase, 1.8° Step Motors. Frame size: 1.4 inch, 35 mm</b>							
	PMX141	1	14.7	0.104	1.02	26.0	<ul style="list-style-type: none"> <li>• Front shaft flat option</li> <li>• Rear shaft option</li> <li>• Rear encoder mounting holes</li> </ul>
	PMX142	2	20.1	0.142	1.10	28.0	
	PMX143	3	26.4	0.186	1.42	36.0	
<b>Size 17 PMX Series</b>							
<b>2 Phase, 0.9° or 1.8° Step Motors. Frame size: 1.7 inch, 42 mm</b>							
	PMX171 (1.8)	1	28.4	0.201	1.02	26.0	<ul style="list-style-type: none"> <li>• Front shaft flat option</li> <li>• Rear shaft option</li> <li>• Integral connector option</li> <li>• Bipolar or Unipolar winding available</li> <li>• Rear encoder mounting holes</li> </ul>
	PMX172 (1.8)	2	40	0.281	1.32	33.5	
	PMX173 (1.8)	3	61	0.427	1.56	39.5	
	PMX174 (1.8)	4	78	0.551	1.87	47.5	
	PMX171 (1.8)	5	107	0.756	2.36	60.0	
<b>Size 23 PMX Series</b>							
<b>2 Phase, 0.9° or 1.8° Step Motors. Frame size: 2.2 inch, 57 mm</b>							
	PMX231 (1.8)	1	102	0.722	1.61	41.0	<ul style="list-style-type: none"> <li>• Front shaft flat option</li> <li>• Bipolar or Unipolar winding available</li> <li>• Rear shaft option</li> <li>• Integral connector option</li> <li>• Rear encoder mounting holes</li> </ul>
	PMX232 (1.8)	2	208	1.47	2.20	56.0	
	PMX233 (1.8)	3	337	2.38	2.99	76.0	
	PMX234 (1.8)	4	378	2.67	3.35	85.0	
<b>Size 34 PMX Series</b>							
<b>2 Phase, 1.8° Step Motors. Frame size: 3.4 inch, 86 mm</b>							
	PMX341	1	490	3.46	2.56	65.0	<ul style="list-style-type: none"> <li>• Front shaft flat option</li> <li>• Rear shaft option</li> </ul>
	PMX342	2	704	4.97	3.15	80.0	
	PMX343	3	1285	9.07	4.65	118.0	
	PMX344	4	1739	12.28	6.14	156.0	

Note: For complete PMX series model nomenclature, refer to page 10.

# PMX™ Series Technical Overview

## PMX™ Common Ratings and Characteristics

	PMX08	PMX11	PMX14	PMX17	PMX23	PMX34
Phases	2					
Full Steps Per Revolution	200	200	200	200	400	200
Step Size Angle	1.8°	1.8°	1.8°	1.8°	0.9°	1.8°
Step Angle Accuracy	+/- 5.0%					
Maximum Case Temperature	130° C					
Insulation Class	NEMA Class B, 130° C					
Insulation Resistance	100 Megaohms @ 500 Vdc					
Ambient Temperature	-20.0 to + 40.0 °C					
Dielectric Strength	500 Vac, 1 minute					

## PMX Shaft Loading

Motor Frame Size	Max Radial Force at Distance "D" from Mounting Face lb [N]	Dimension "D" inches [mm]	Max Axial Force lb [N]
PMX08	3.4 [15]	0.787 [20.0]	1.4 [6]
PMX11	6.3 [28]		2.3 [10]
PMX14	6.3 [28]		2.3 [10]
PMX17	6.3 [28]		2.3 [10]
PMX23	16.9 [75]		3.4 [15]
PMX34	49.5 [220]		16.5 [60]

### Notes:

PMX motors do not include captured front bearings. They may be operated up to the maximum radial and axial loads and achieve an L10 life > 10,000 hours at speeds up to 3000 RPM. For applications with high radial/axial loading, it is recommended that an alternative Kollmorgen stepper series, with heavy duty, long-life bearings, be evaluated.

## PMX Agency Approval



CE, Compliance with Directive 2014/30/EU

PMX08 – PMX17  
 EN 61000-6-3:2007/  
 A1:2011  
 EN 61000-6-2:2005  
 EN 55014-2:1997/  
 A2:2008

PMX23 – PMX34  
 EN 61000-6-3:2007/  
 A1:2011  
 EN 61000-6-2:2005  
 EN 55014-2:1997/  
 A2:2008  
 EN 60034-1:2010



RoHS, Compliance with Directive 2011/65/EU

PMX08 – PMX34

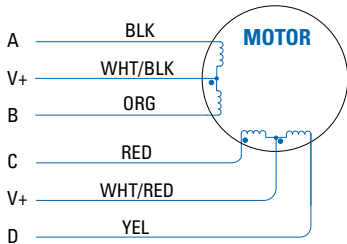


PMX08 – PMX34



# PMX™ Connection Information

## 6-Lead Configuration



## 6-Lead Unipolar Connection

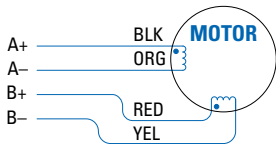
Driver Connection	Lead Color
A	Black (Blk)
B	Orange (Org)
C	Red
D	Yellow (Yel)
V+	Wht/Blk
V+	Wht/Red

## Unipolar Full Step Phase Sequence

STEP	A	B	C	D
1	GND	0	GND	0
2	0	GND	GND	0
3	0	GND	0	GND
4	GND	0	0	GND
1	GND	0	GND	0

CCW ↓      ↑ CW

## 4-Lead Configuration



## 4-Lead Bipolar Connection

Driver Connection	Lead Color
A	Black
$\bar{A}$	Orange
B	Red
$\bar{B}$	Yellow

## Bipolar Full Step Phase Sequence

STEP	A	$\bar{A}$	B	$\bar{B}$
1	+	-	-	+
2	-	+	-	+
3	-	+	+	-
4	+	-	+	-
1	+	-	-	+

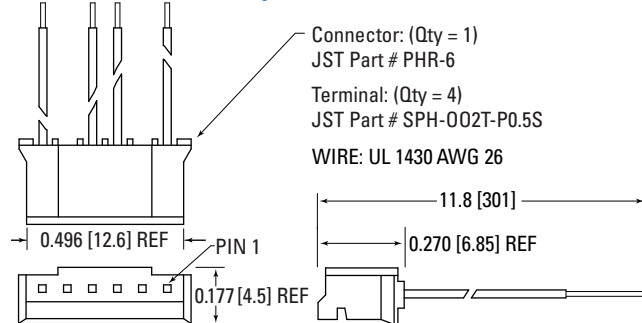
CCW ↓      ↑ CW

Notes:

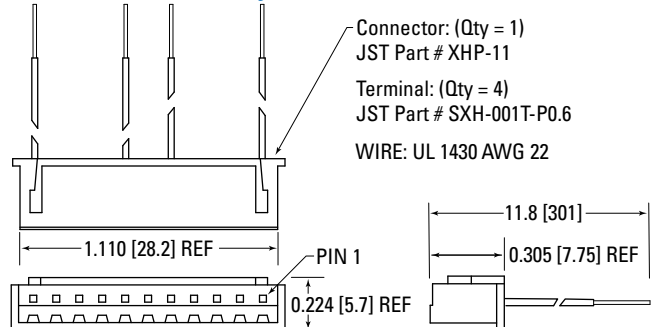
1. Indicated direction when viewed from the motor drive shaft end.
2. Because PMX series does not include any 8-lead configurations, Kollmorgen does not differentiate between Bipolar *Parallel* or *Series* within PMX series nomenclature. All 4-lead are simply stated as Bipolar. All Bipolar winding specifications in this guide represent simple 4-lead connection shown above.

## Integral Connector Configurations

### PMX17 Cable Assembly



### PMX23 Cable Assembly

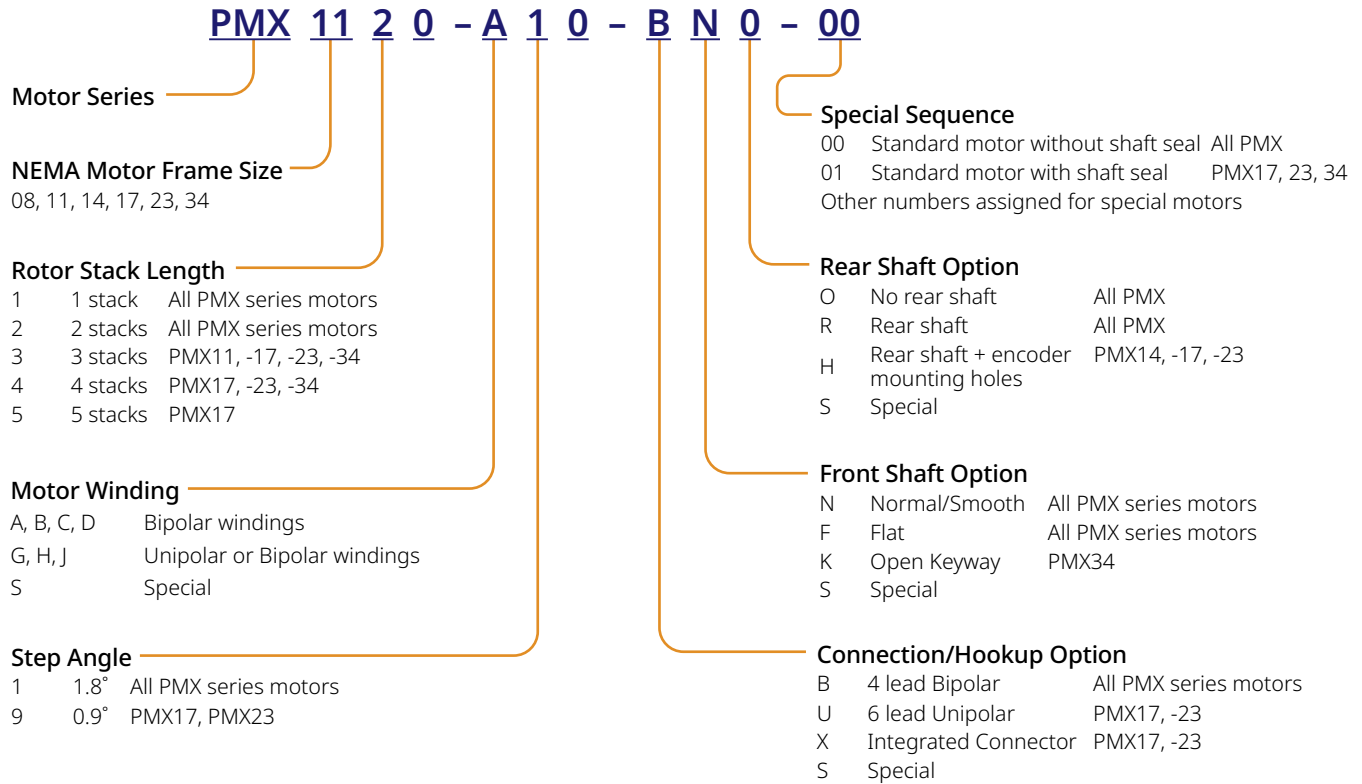


Notes:

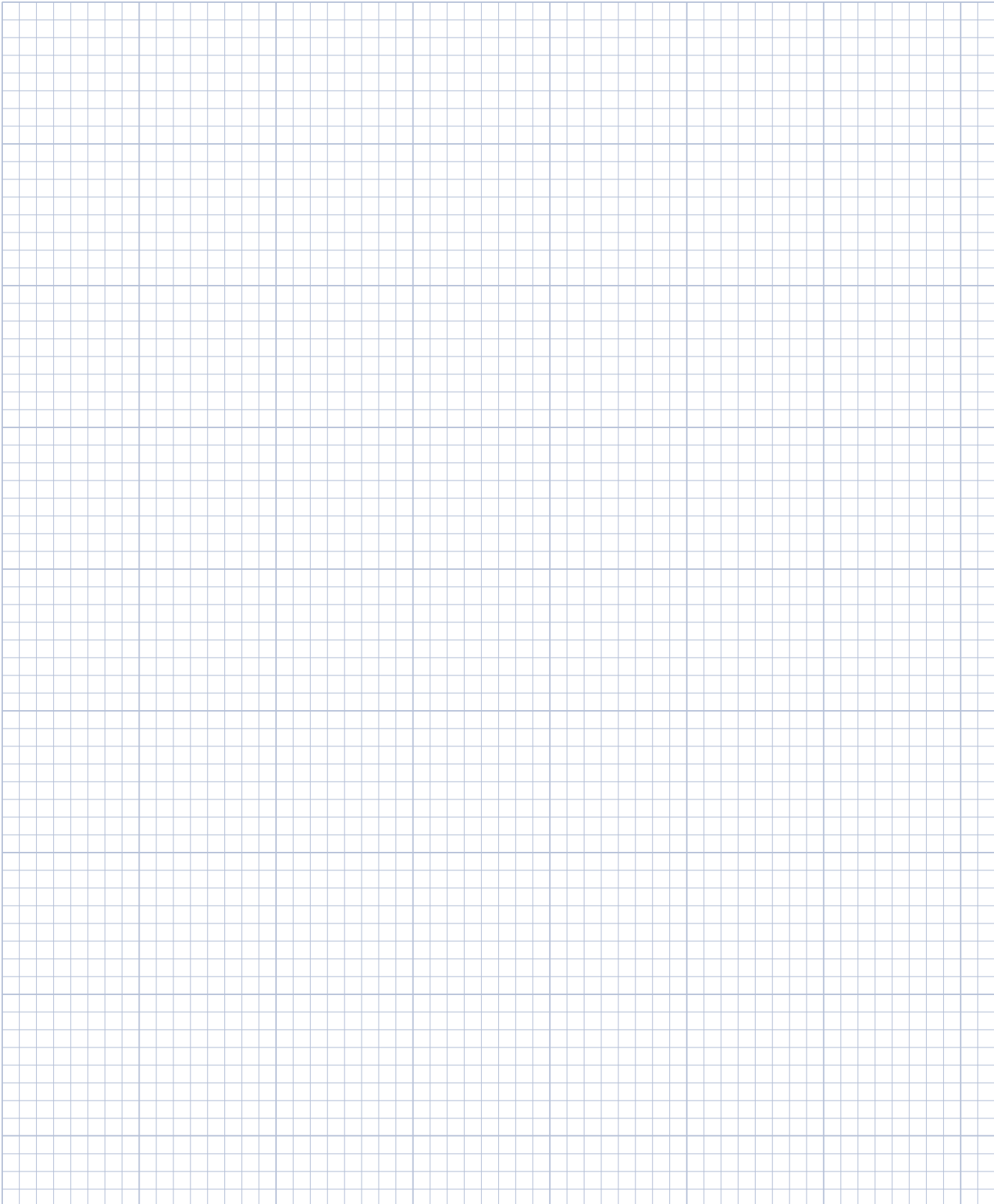
1. A 4-lead Bipolar, 12 inch (300 mm) mating cable assembly is included for all motors ordered with Integral Connector option. The leadwires exiting this cable assembly should be connected same as 4-lead Bipolar shown above.
2. Upon special request, 6-lead Unipolar mating cables are available for Unipolar windings only. Please contact Kollmorgen Customer Support for more information.

# PMX Series Nomenclature

## PMX Series Stepper Motor Nomenclature



# Notes



0.125 inch divisions

# PMX08 Series Stepper Motors

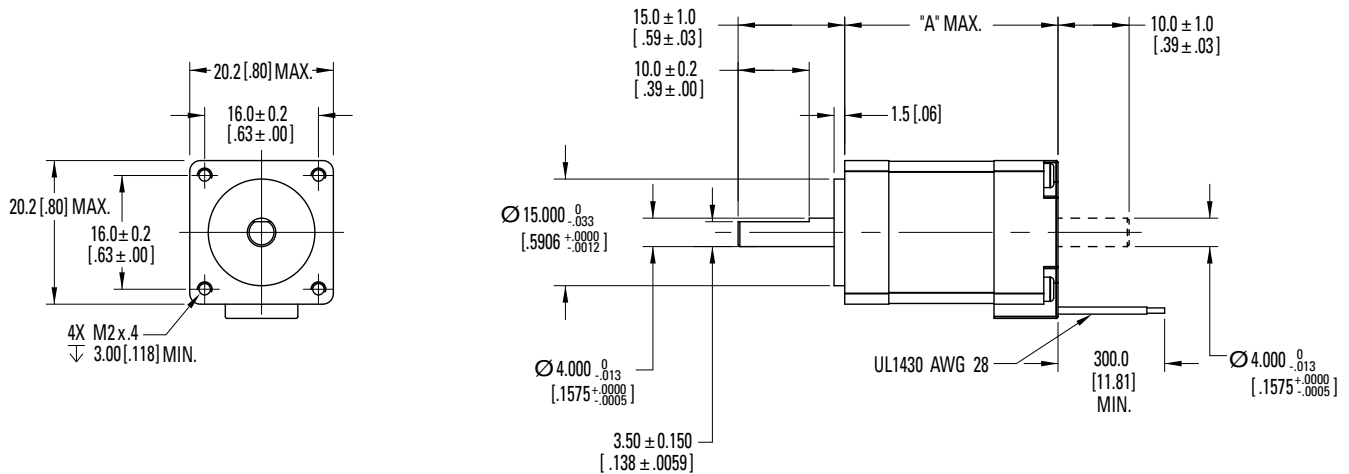
## PMX08 Standard Options and Specifications

- NEMA Size 08
- Smooth or Flat front shaft flat option
- Single or Rear shaft option
- Bipolar windings

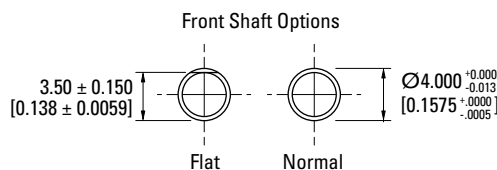
Phases	2
Full Steps Per Revolution	200
Step Size Angle	1.8°
Step Angle Accuracy %	+/- 5.0
Maximum Case Temperature	130° C
Insulation Class	NEMA Class B, 130° C
Insulation Resistance	100 Megaohms @ 500 Vdc
Ambient Temperature	-20.0 to + 40.0 °C
Dielectric Strength	500 Vac, 1 minute
Certifications:	CE, RoHS, REACH compliant



## PMX08 Dimensions



Model	"A" MAX
PMX081	30 [1.18]
PMX082	42 [1.65]



Dimensions in mm [inches]

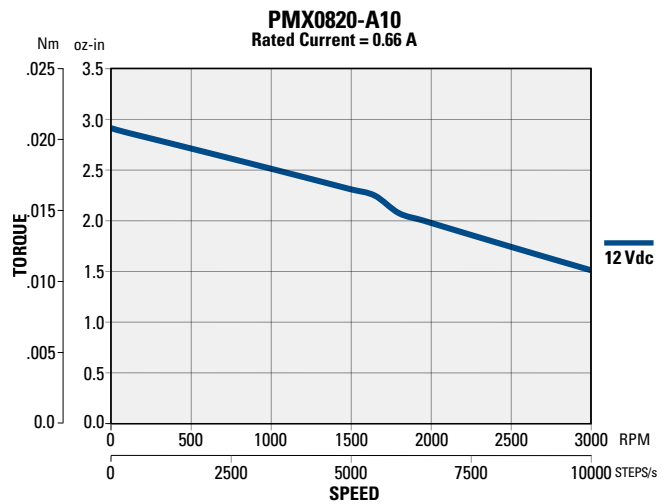
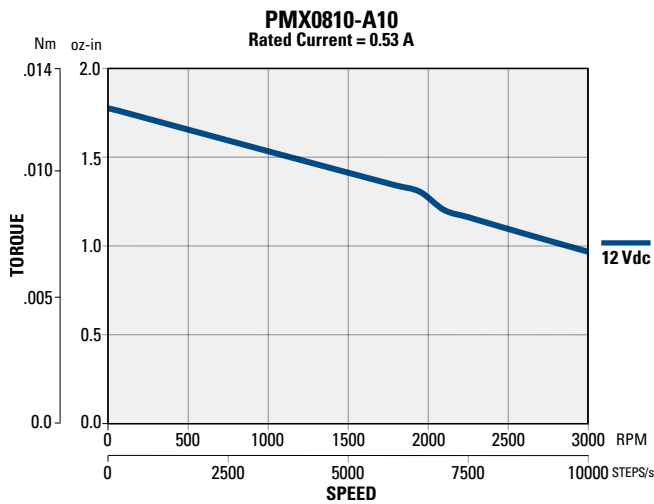
## PMX08 (1.8° Step) Performance Data

PMX08			Configuration		Holding Torque (2 phases on) oz-in [Nm] +/-12%	Rated Current/Phase Amps DC	Phase Resistance Ohms +/-10%	Phase Inductance mH Typical	Thermal Resistance Mounted °C/Watt	Rotor Inertia oz-in-s <sup>2</sup> [kg-m <sup>2</sup> ]	Weight lb [kg]	Shaft Loading	
Stack	Winding	Step	Bipolar	Unipolar								Radial Force lb [N]	Axial Force lb [N]
1	A	1	•		2.5 [0.018]	0.53	6.70	2.00	15.85	2.84E-05 [2.01E-07]	0.1 [0.06]	4.50 [20.0]	0.45 [2.0]
2	A	1	•		4.0 [0.028]	0.66	5.28	1.64	12.99	5.11E-05 [3.61E-07]	0.2 [0.08]	4.50 [20.0]	0.45 [2.0]

Notes:

1. All ratings typical and at 40° C unless otherwise noted.
2. Rated current is  $\Delta T = 80^\circ C$ , ON-PLATE; motor mounted to square aluminum plate heatsink, 2.5X motor diameter, 5mm thick.
3. Small signal inductance as measured with impedance bridge @ 1 KHz, 1 amp.

## PMX08 Series (Bipolar - 1.8° Step) Performance Curves

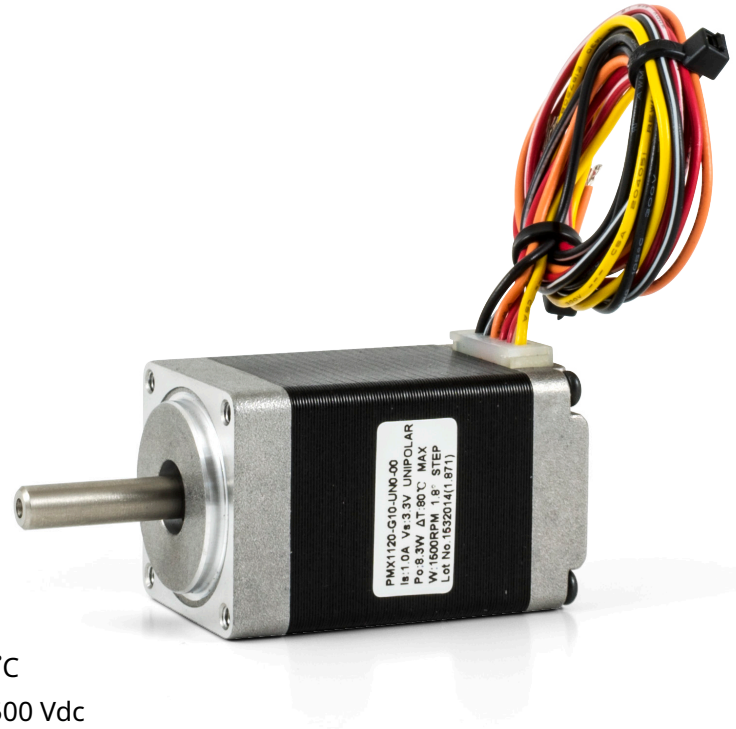


# PMX11 Series Stepper Motors

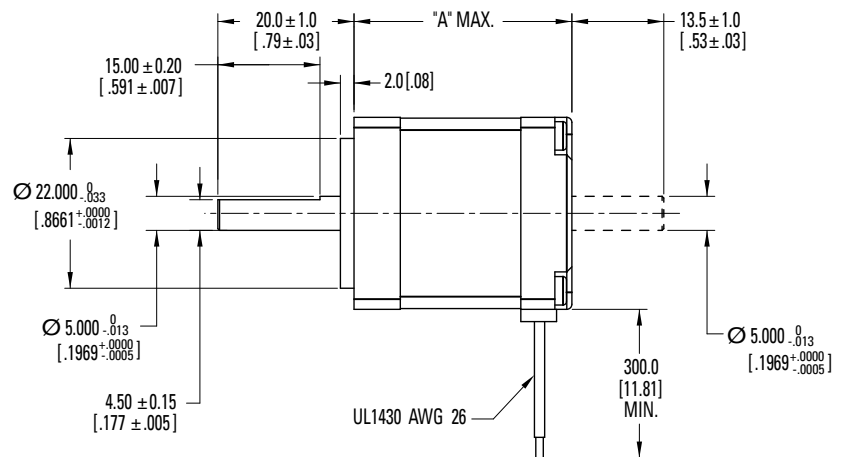
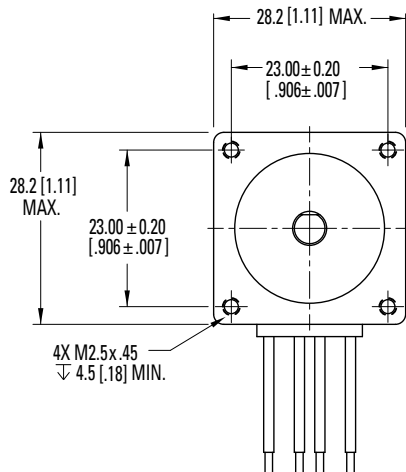
## PMX11 Standard Options and Specifications

- NEMA Size 11
- Front shaft flat option
- Rear shaft option
- Integral connector option
- Bipolar windings

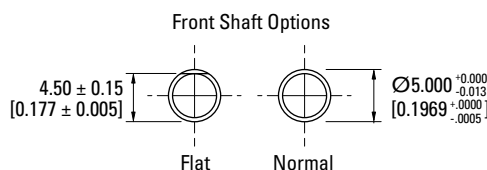
Phases	2
Full Steps Per Revolution	200
Step Size Angle	1.8°
Step Angle Accuracy %	+/- 5.0
Maximum Case Temperature	130° C
Insulation Class	NEMA Class B, 130 °C
Insulation Resistance	100 Megaohms @ 500 Vdc
Ambient Temperature	-20.0 to + 40.0 °C
Dielectric Strength	500 Vac, 1 minute
Certifications:	CE, RoHS, REACH compliant



## PMX11 Dimensions



Model	"A" MAX
PMX111	32 [1.26]
PMX112	45 [1.77]
PMX113	51 [2.01]



Dimensions in mm [inches]

### PMX11 (1.8° Step) Performance Data

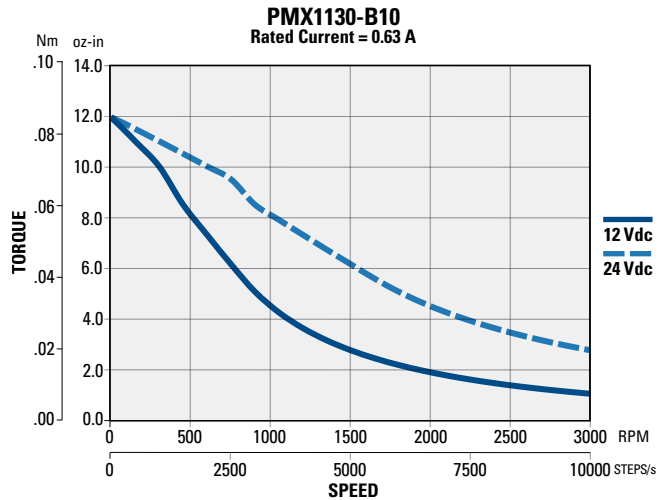
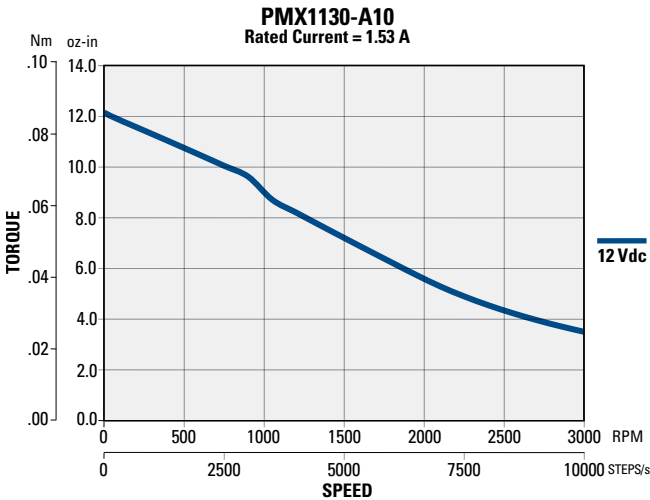
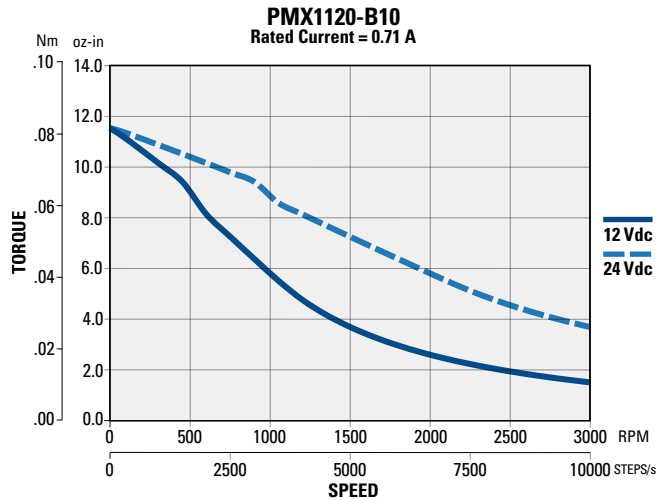
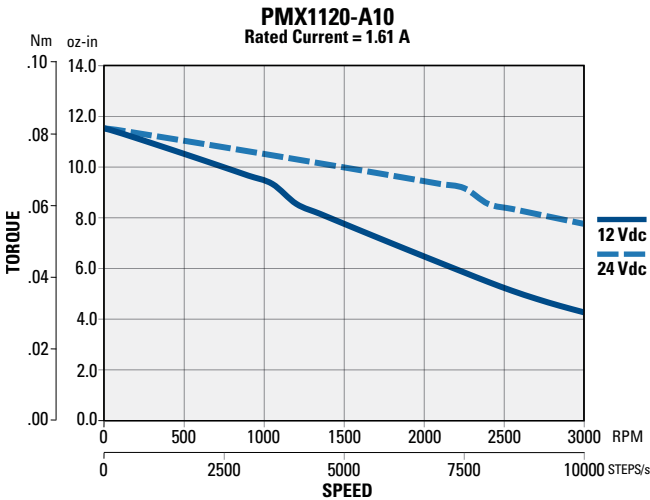
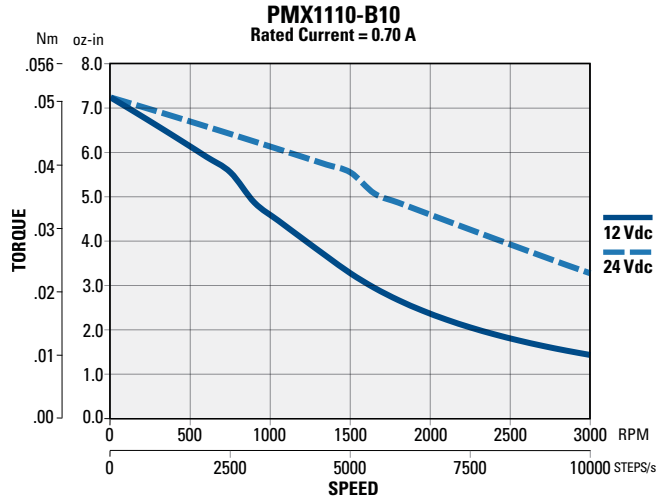
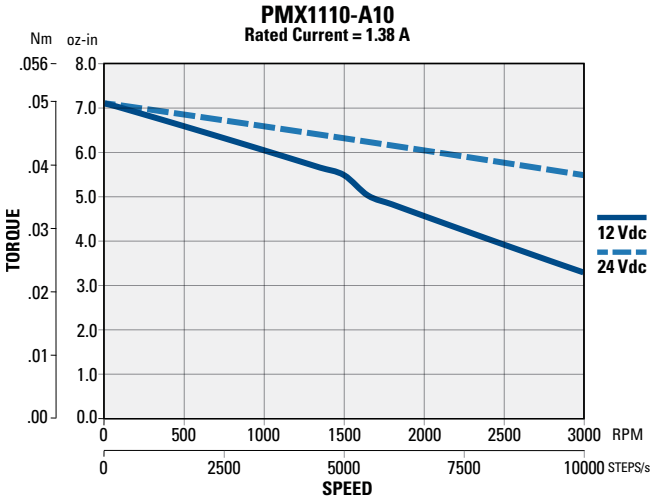
PMX11			Configuration		Holding Torque (2 phases on) oz-in [Nm] +/-12%	Rated Current/Phase Amps DC	Phase Resistance Ohms +/-10%	Phase Inductance mH Typical	Thermal Resistance Mounted °C/Watt	Rotor Inertia oz-in-s <sup>2</sup> [kg-m <sup>2</sup> ]	Weight lb [kg]	Shaft Loading	
Stack	Winding	Step	Bipolar	Unipolar								Radial Force lb [N]	Axial Force lb [N]
1	A	1	•		9.9 [0.070]	1.38	1.50	0.89	11.17	1.28E-04 [9.00E-07]	0.2 [0.11]	6.30 [28.0]	2.25 [10.0]
1	B	1	•		10.1 [0.071]	0.70	5.41	3.57					
2	A	1	•		16.1 [0.114]	1.61	1.38	0.93	8.94	1.70E-04 [1.20E-06]	0.3 [0.14]	6.30 [28.0]	2.25 [10.0]
2	B	1	•		16.1 [0.114]	0.71	6.56	4.78					
3	A	1	•		16.8 [0.119]	1.53	1.61	1.20	8.35	2.56E-04 [1.81E-06]	0.4 [0.20]	6.30 [28.0]	2.25 [10.0]
3	B	1	•		16.7 [0.118]	0.63	9.07	7.01					

Notes:

1. All ratings typical and at 40° C unless otherwise noted.
2. Rated current is T = 80° C, ON-PLATE; motor mounted to square aluminum plate heatsink, 2.5X motor diameter, 5mm thick.
3. Small signal inductance as measured with impedance bridge @ 1 KHz, 1 amp.

# PMX11 Series Stepper Motors

## PMX11 Series (Bipolar - 1.8° Step) Performance Curves





# Notes

PMX | 11 | 2 | 0 | - | G | 1 | 0 | - | B | N | 0 | - | 00  
Motor Series | Frame Size | Stack Length | Winding | Step Angle | Connection | Front Shaft Opt. | Rear Shaft Opt.

A large grid area for taking notes, with a 0.125 inch division size.

0.125 inch divisions

# PMX14 Series Stepper Motors

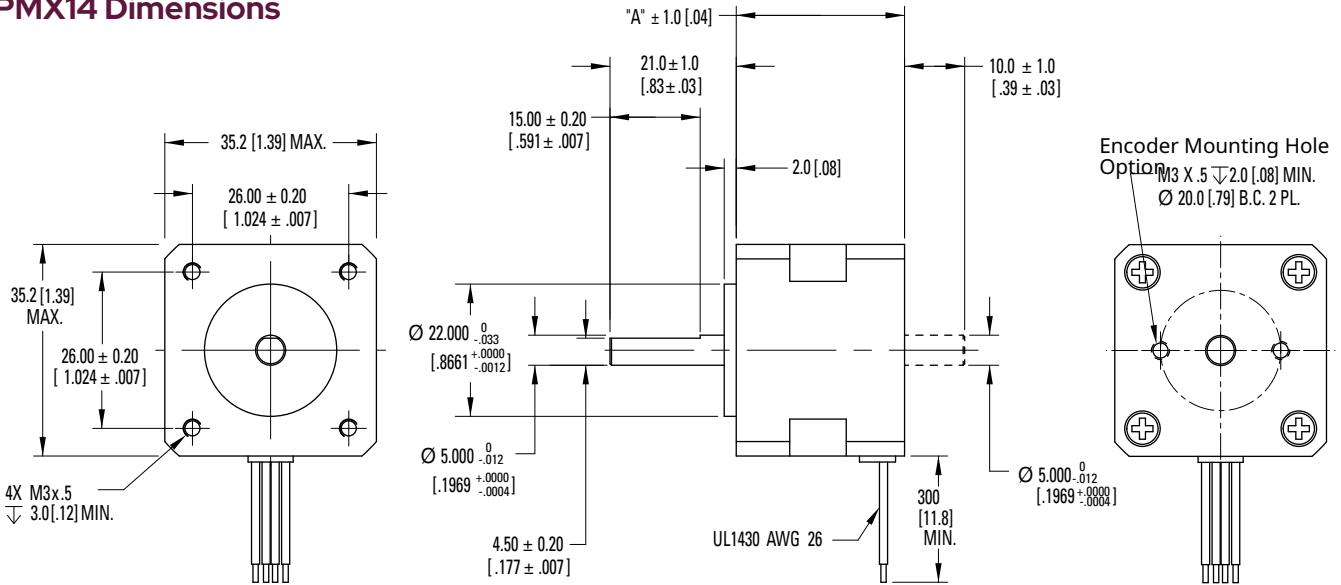
## PMX14 Standard Options and Specifications

- NEMA Size 14
- Front shaft flat option
- Single, rear shaft, or rear shaft + encoder holes option
- Bipolar windings

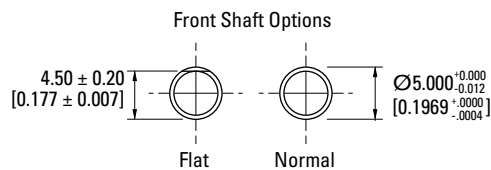
Phases	2
Full Steps Per Revolution	200
Step Size Angle	1.8°
Step Angle Accuracy %	+/- 5.0
Maximum Case Temperature	130° C
Insulation Class	NEMA Class B, 130 °C
Insulation Resistance	100 Megaohms @ 500 Vdc
Ambient Temperature	-20.0 to + 40.0 °C
Dielectric Strength	500 Vac, 1 minute
Certifications:	CE, RoHS, REACH compliant



## PMX14 Dimensions



Model	"A" MAX
PMX141	26 [1.02]
PMX142	28 [1.10]
PMX143	36 [1.42]



Dimensions in mm [inches]

### PMX14 (1.8° Step) Performance Data

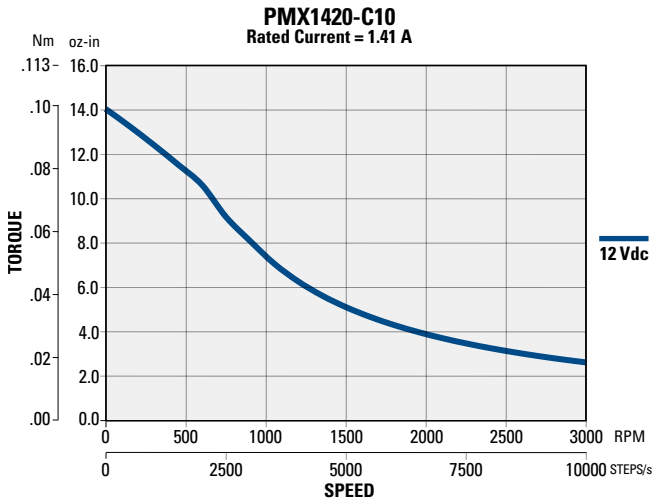
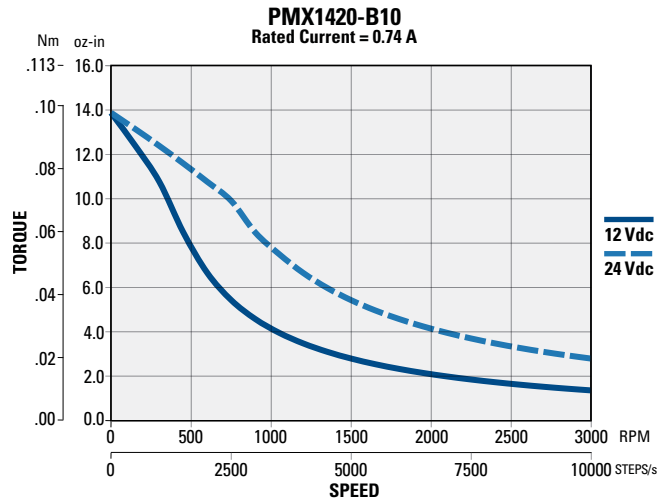
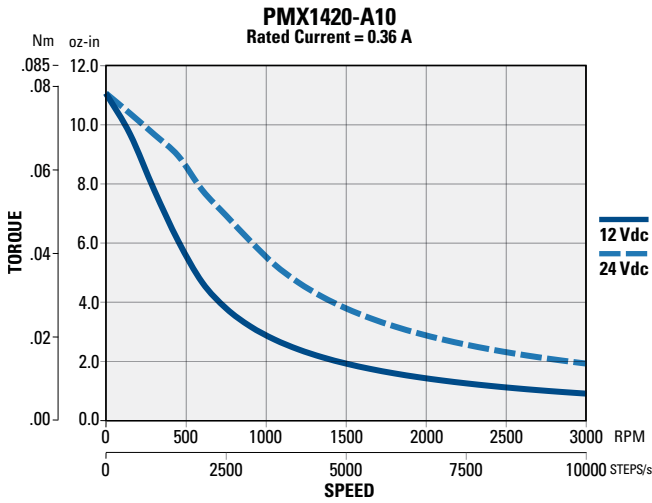
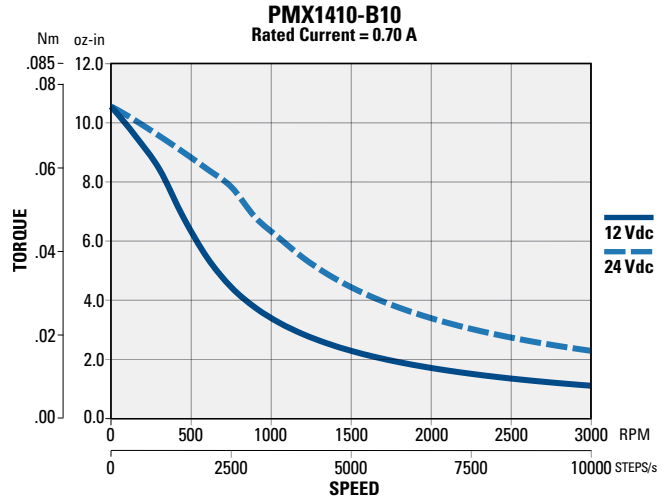
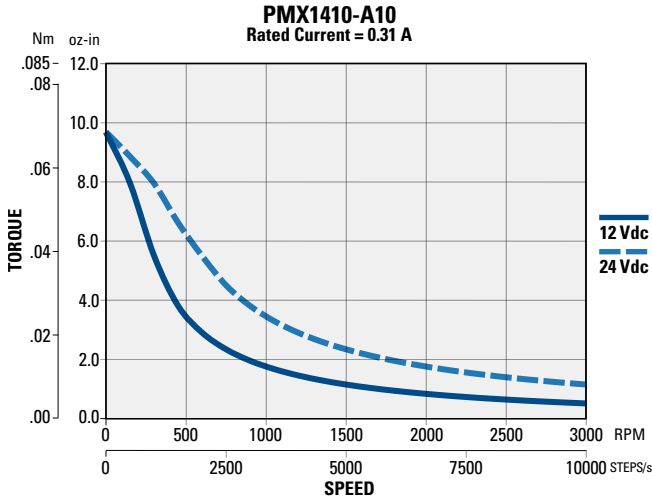
PMX14			Configuration		Holding Torque (2 phases on) oz-in [Nm] +/-12%	Rated Current/Phase Amps DC	Phase Resistance Ohms +/-10%	Phase Inductance mH Typical	Thermal Resistance Mounted °C/Watt	Rotor Inertia oz-in-s <sup>2</sup> [kg-m <sup>2</sup> ]	Weight lb [kg]	Shaft Loading	
Stack	Winding	Step	Bipolar	Unipolar								Radial Force lb [N]	Axial Force lb [N]
1	A	1	•		13.5 [0.095]	0.31	28.61	30.62	10.81	1.420E-04 [1.00E-06]	0.3 [0.13]	6.30 [28.0]	2.25 [10.0]
1	B	1	•		14.7 [0.104]	0.70	5.69	7.75					
2	A	1	•		15.8 [0.112]	0.36	22.23	14.63	10.11	1.560E-04 [1.10E-06]	0.3 [0.14]	6.30 [28.0]	2.25 [10.0]
2	B	1	•		19.8 [0.140]	0.74	5.43	6.56					
2	C	1	•		20.1 [0.142]	1.41	1.54	1.86					
3	A	1	•		26.3 [0.186]	1.21	2.57	4.39	8.00	1.990E-04 [1.41E-06]	0.4 [0.18]	6.30 [28.0]	2.25 [10.0]
3	B	1	•		26.1 [0.184]	0.82	5.49	9.30					
3	C	1	•		26.4 [0.186]	1.60	1.51	2.54					

Notes:

1. All ratings typical and at 40° C unless otherwise noted.
2. Rated current is T = 80° C, ON-PLATE; motor mounted to square aluminum plate heatsink, 2.5X motor diameter, 5mm thick.
3. Small signal inductance as measured with impedance bridge @ 1 KHz, 1 amp.

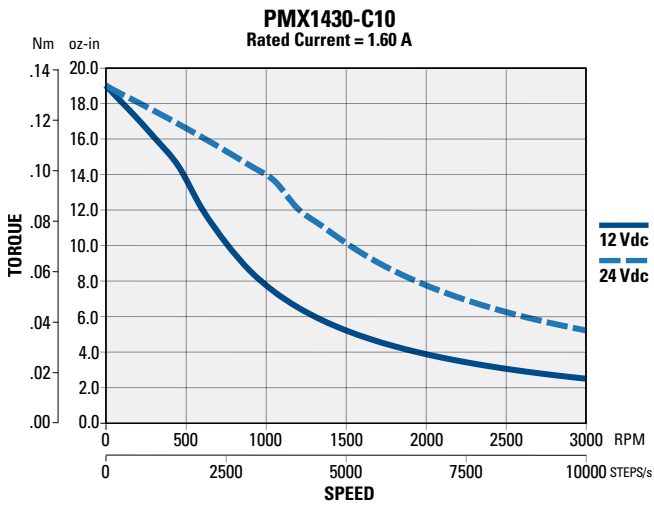
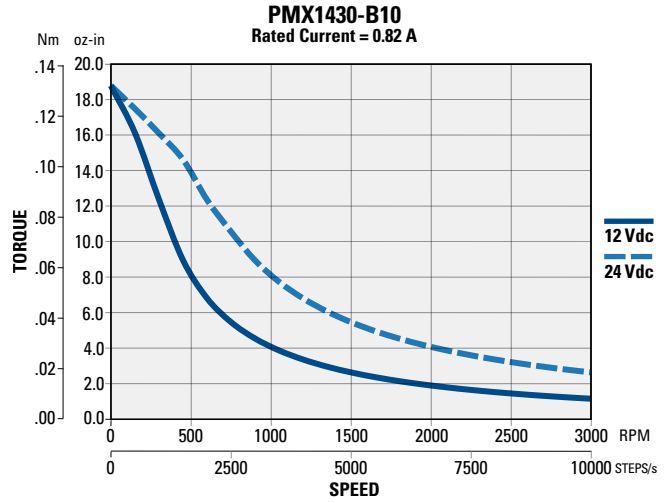
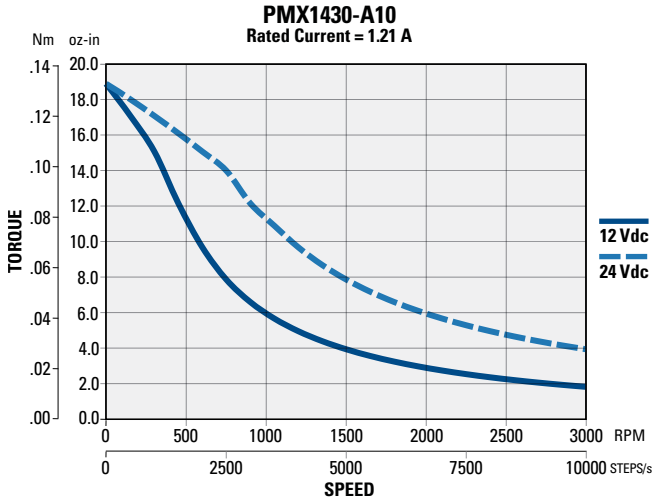
# PMX14 Series Stepper Motors

## PMX14 Series (Bipolar - 1.8° Step) Performance Curves



**PMX** | **14** | **2** | **0** - **A** | **1** | **0** - **B** | **N** | **0** - **00**  
 Motor Series | Frame Size | Stack Length | Winding | Step Angle | Connection | Front Shaft Opt. | Rear Shaft Opt.

## PMX14 Series (Bipolar - 1.8° Step) Performance Curves

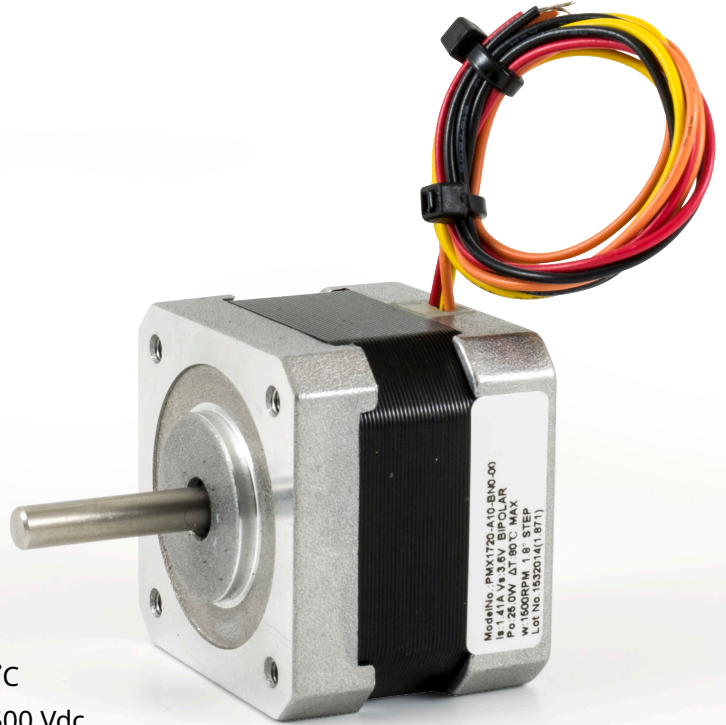


# PMX17 Series Stepper Motors

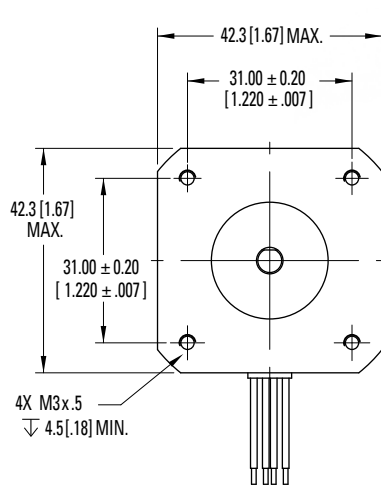
## PMX17 Standard Options and Specifications

- NEMA Size 17
- Front shaft flat option
- Rear shaft option
- Integral connector option
- Rear encoder mounting holes
- Bipolar and Unipolar windings

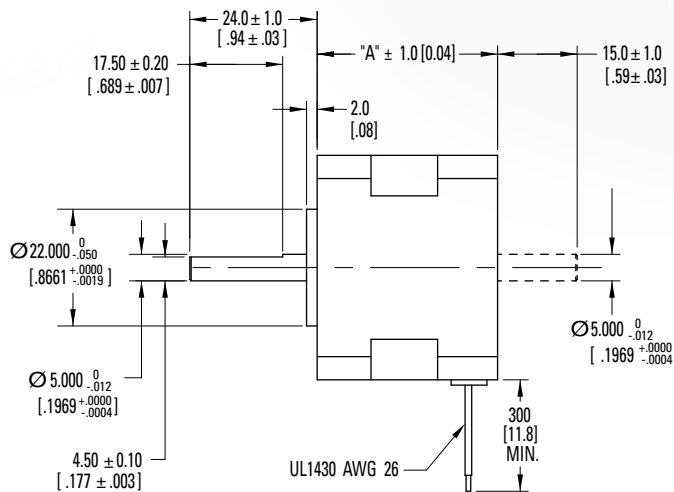
Phases	2
Full Steps Per Revolution	200
Step Size Angle	1.8°, 0.9°
Step Angle Accuracy %	+/- 5.0
Maximum Case Temperature	130° C
Insulation Class	NEMA Class B, 130 °C
Insulation Resistance	100 Megaohms @ 500 Vdc
Ambient Temperature	-20.0 to + 40.0 °C
Dielectric Strength	500 Vac, 1 minute
Certifications:	CE, RoHS, REACH compliant



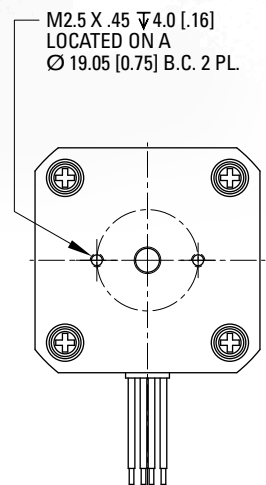
## PMX17 Dimensions



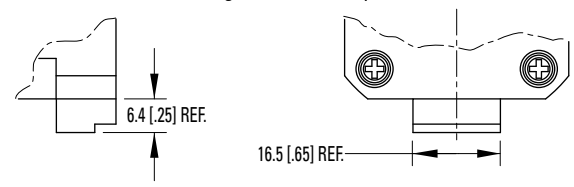
Dimensions in mm [inches]



### Encoder Mounting Hole Option

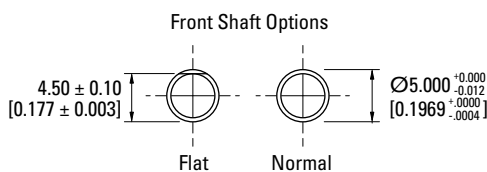


### Integral Connector Option



A 4-lead Bipolar, 12 inch (300 mm) mating cable assembly is included for all motors ordered with Integral Connector option.

Model	"A" MAX
PMX171	26 [1.02]
PMX172	33.5 [1.32]
PMX173	39.5 [1.56]
PMX174	47.5 [1.87]
PMX175	60 [2.36]



### PMX17 (1.8° Step) Performance Data

PMX17			Configuration		Holding Torque (2 phases on) oz-in [Nm] +/-12%	Rated Current/ Phase Amps DC	Phase Resistance Ohms +/-10%	Phase Inductance mH Typical	Thermal Resistance Mounted °C/Watt	Rotor Inertia oz-in-s <sup>2</sup> [kg-m <sup>2</sup> ]	Weight lb [kg]	Shaft Loading	
Stack	Winding	Step	Bipolar	Unipolar								Radial Force lb [N]	Axial Force lb [N]
1	A	1	•		28.4 [0.201]	0.39	24.80	31.09	7.98	2.84E-04 [2.01E-06]	0.3 [0.15]	6.30 [28.0]	2.25 [10.0]
1	B	1	•		27.0 [0.191]	0.69	7.74	8.35					
2	A	1	•		39.2 [0.277]	1.48	2.00	2.56	7.00	4.97E-04 [3.51E-06]	0.5 [0.22]	6.30 [28.0]	2.25 [10.0]
2	B	1	•		38.0 [0.268]	1.00	4.25	5.13					
2	H	1	•		39.5 [0.279]	0.31	44.78	60.73					
2	H	1		•	27.9 [0.197]	0.43	22.37	15.18					
2	J	1	•		39.8 [0.281]	0.74	7.76	10.65					
2	J	1		•	28.1 [0.199]	1.04	3.86	2.66					
3	A	1	•		60.2 [0.425]	1.60	1.74	3.16	6.92	7.67E-04 [5.42E-06]	0.6 [0.28]	6.30 [28.0]	2.25 [10.0]
3	B	1	•		60.1 [0.424]	1.52	1.92	3.48					
3	G	1	•		58.4 [0.412]	0.26	62.75	109.85					
3	G	1		•	41.3 [0.292]	0.37	31.35	27.46					
3	H	1	•		58.8 [0.415]	0.55	13.92	24.74					
3	H	1		•	41.6 [0.294]	0.78	6.94	6.19					
3	J	1	•		60.5 [0.427]	0.80	6.64	12.62					
3	J	1		•	42.8 [0.302]	1.14	3.30	3.16					
4	A	1	•		76.0 [0.537]	1.71	1.82	2.98	5.77	9.66E-04 [6.82E-06]	0.8 [0.35]	6.30 [28.0]	2.25 [10.0]
4	B	1	•		75.7 [0.535]	2.17	1.16	1.83					
4	G	1	•		78.1 [0.552]	0.30	57.16	105.47					
4	G	1		•	55.2 [0.390]	0.42	28.56	26.37					
4	H	1	•		70.7 [0.499]	0.57	15.91	22.67					
4	H	1		•	50.0 [0.353]	0.80	7.93	5.67					
4	J	1	•		70.9 [0.501]	0.85	7.08	10.08					
4	J	1		•	50.1 [0.354]	1.20	3.52	2.52					
5	A	1	•		102.2 [0.722]	1.02	5.87	12.28	4.78	1.45E-03 [1.02E-05]	1.1 [0.50]	6.30 [28.0]	2.25 [10.0]
5	B	1	•		103.2 [0.729]	1.76	2.02	4.26					
5	G	1	•		107.1 [0.756]	0.73	11.67	27.62					
5	G	1		•	75.7 [0.535]	1.03	5.81	6.90					

Notes:

1. All ratings typical and at 40° C unless otherwise noted.
2. Rated current is T = 80° C, ON-PLATE; motor mounted to square aluminum plate heatsink, 2.5X motor diameter, 5mm thick.
3. Small signal inductance as measured with impedance bridge @ 1 KHz, 1 amp.

# PMX17 Series Stepper Motors

## PMX17 (0.9° Step) Performance Data

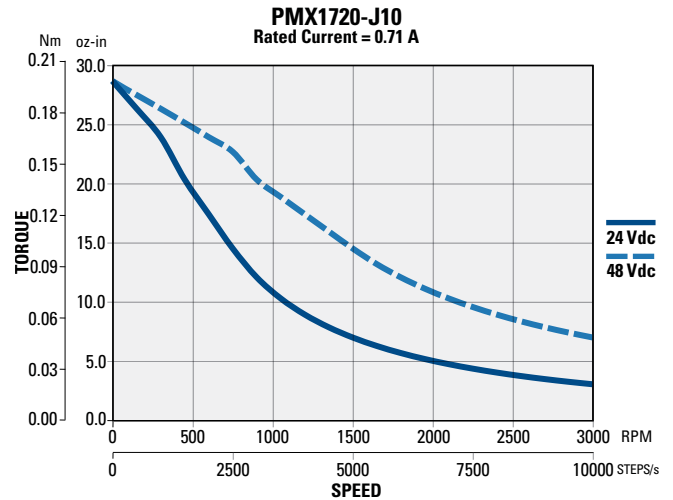
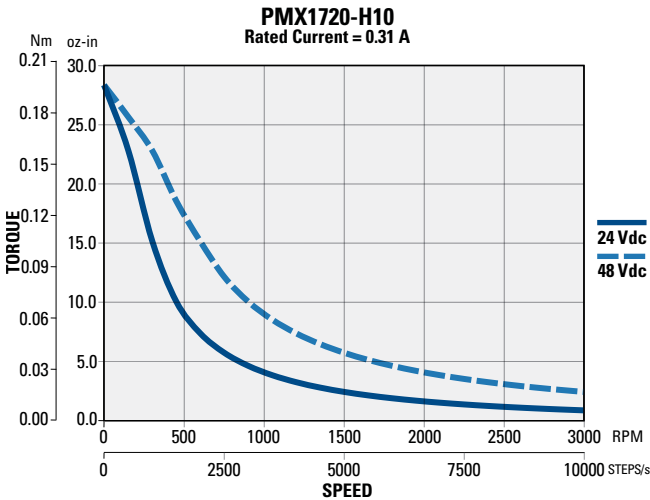
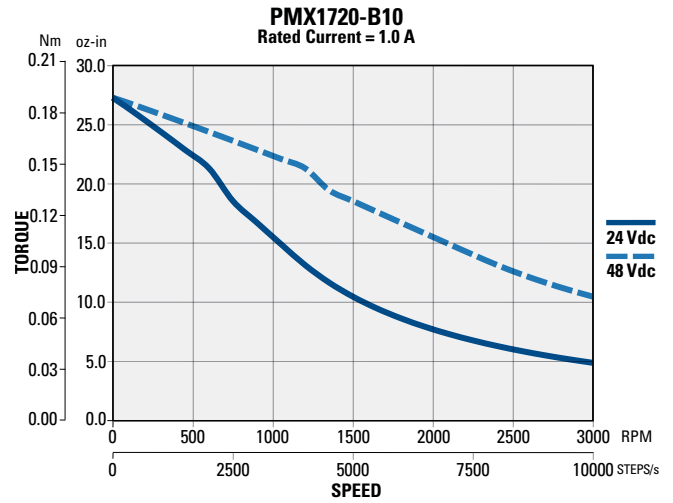
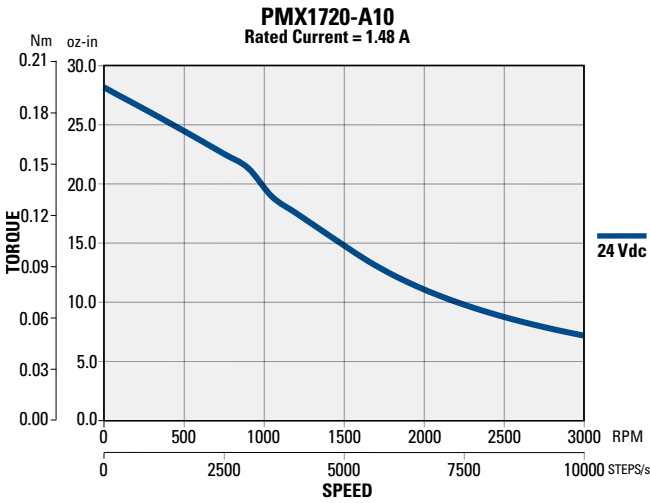
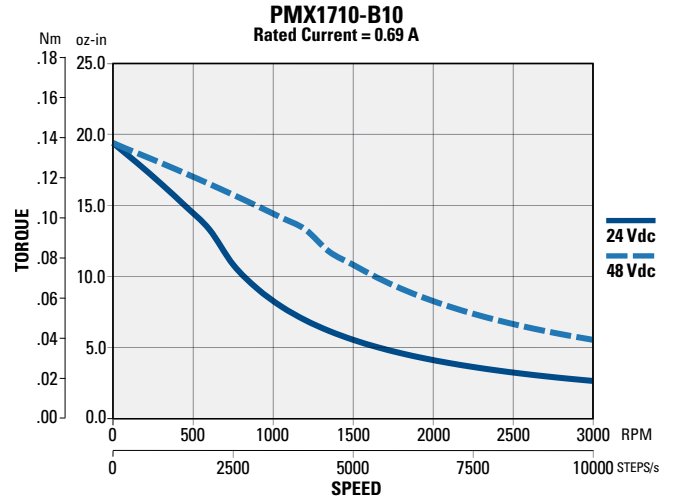
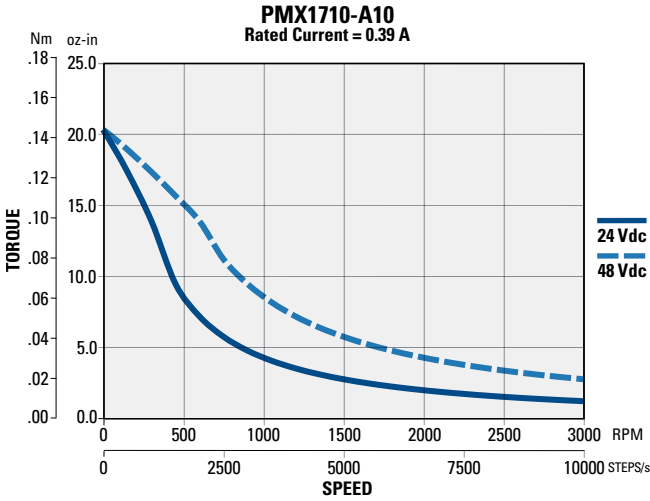
PMX17			Configuration		Holding Torque (2 phases on)	Rated Current/ Phase	Phase Resistance	Phase Inductance	Thermal Resistance	Rotor Inertia	Weight	Shaft Loading	
Stack	Winding	Step	Bipolar	Unipolar								Radial Force	Axial Force
					oz-in [Nm] +/-12%	Amps DC	Ohms +/-10%	mH Typical	Mounted °C/Watt	oz-in-s <sup>2</sup> [kg-m <sup>2</sup> ]	lb [kg]	lb [N]	lb [N]
2	A	9	•		38.1 [0.269]	1.41	2.20	5.69	7.00	4.97E-04 [3.51E-06]	0.5 [0.22]	6.30 [28.0]	2.25 [10.0]
2	B	9	•		36.0 [0.254]	1.00	4.25	9.02					
2	H	9	•		36.4 [0.257]	0.44	21.49	48.70					
2	H	9		•	25.7 [0.182]	0.62	10.73	12.18					
3	A	9	•		55.9 [0.395]	1.60	1.74	4.50	6.92	7.67E-04 [5.42E-06]	0.6 [0.28]	6.30 [28.0]	2.25 [10.0]
3	B	9	•		55.8 [0.394]	1.52	1.92	4.96					
3	H	9	•		56.8 [0.401]	0.52	15.65	44.61					
3	H	9		•	40.2 [0.284]	0.74	7.81	11.15					
4	A	9	•		68.6 [0.484]	1.67	1.91	5.99	5.77	9.66E-04 [6.82E-06]	0.8 [0.35]	6.30 [28.0]	2.25 [10.0]
4	B	9	•		67.5 [0.477]	2.17	1.16	3.31					
4	G	9	•		70.2 [0.496]	0.29	61.31	177.65					
4	G	9		•	49.2 [0.348]	0.41	30.64	44.41					

Notes:

1. All ratings typical and at 40° C unless otherwise noted.
2. Rated current is T = 90° C, ON-PLATE; motor mounted to square aluminum plate heatsink, 2.5X motor diameter, 5mm thick.
3. Small signal inductance as measured with impedance bridge @ 1 KHz, 1 amp.
4. Complete PMX series model nomenclature can be found on page 52.

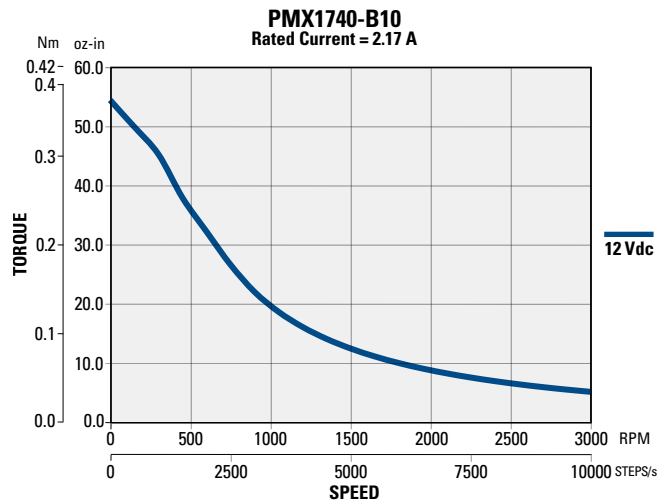
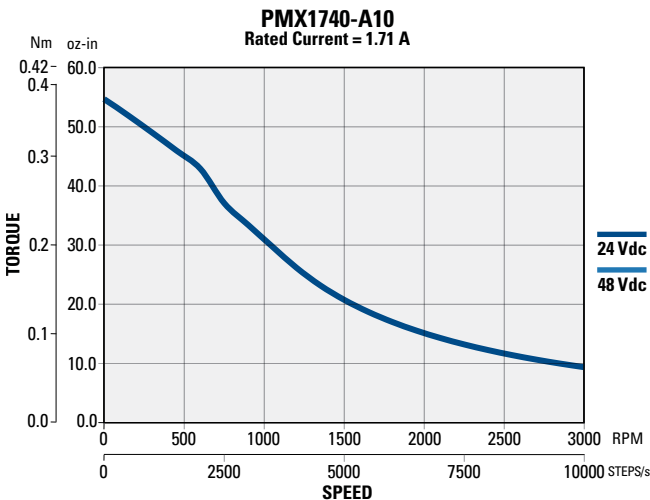
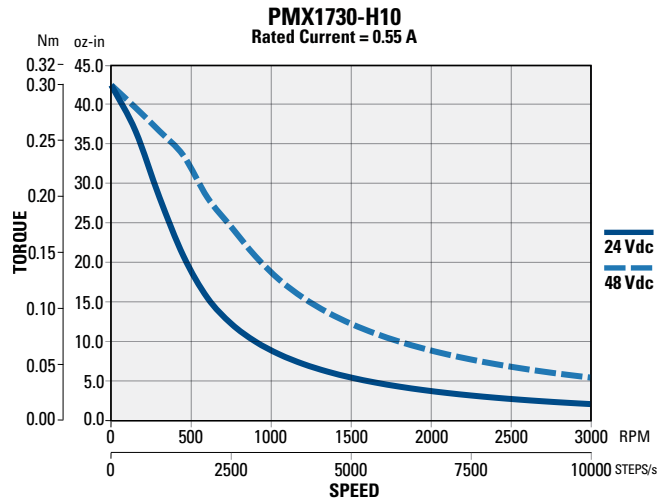
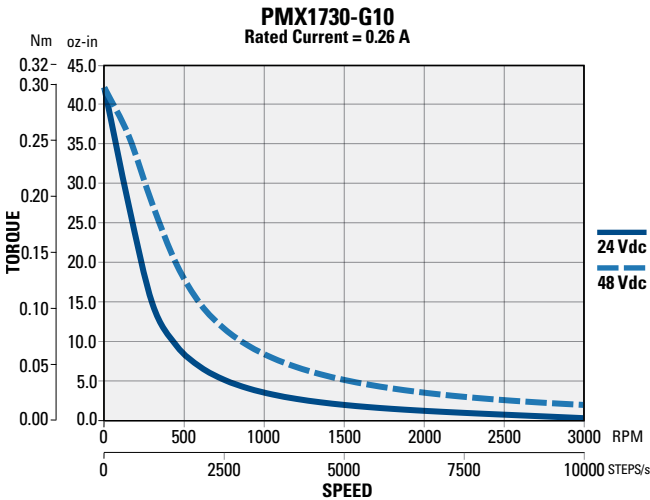
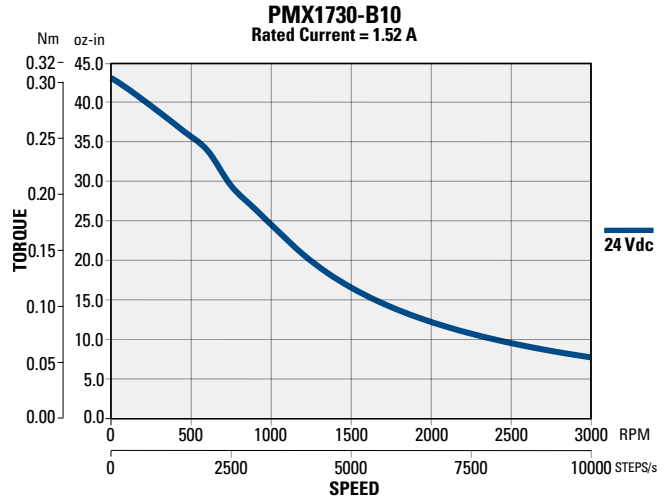
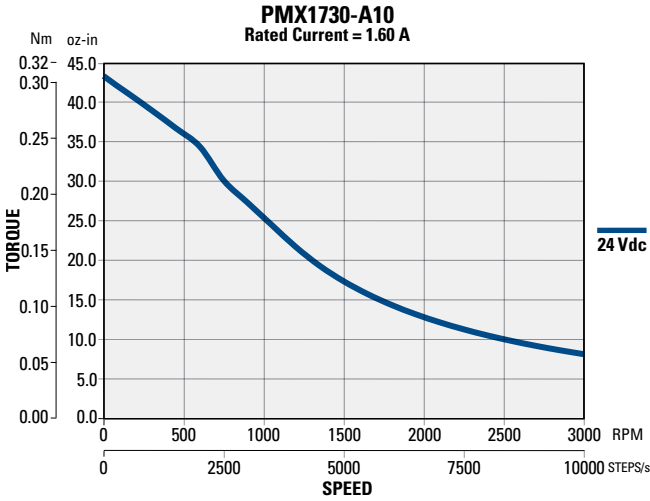


## PMX17 Series (Bipolar - 1.8° Step) Performance Curves

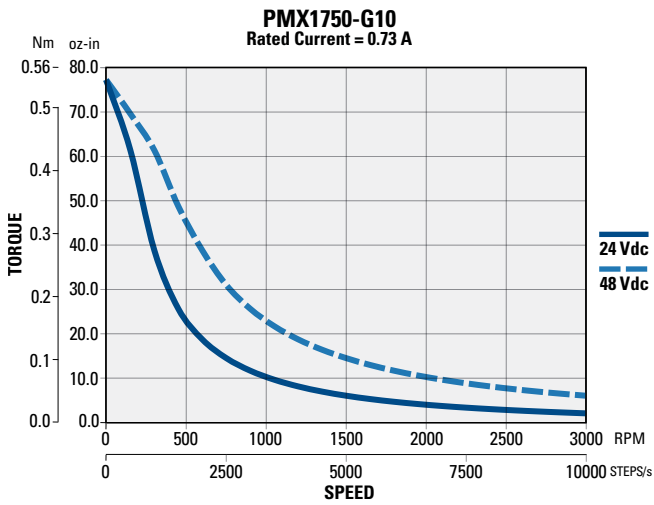
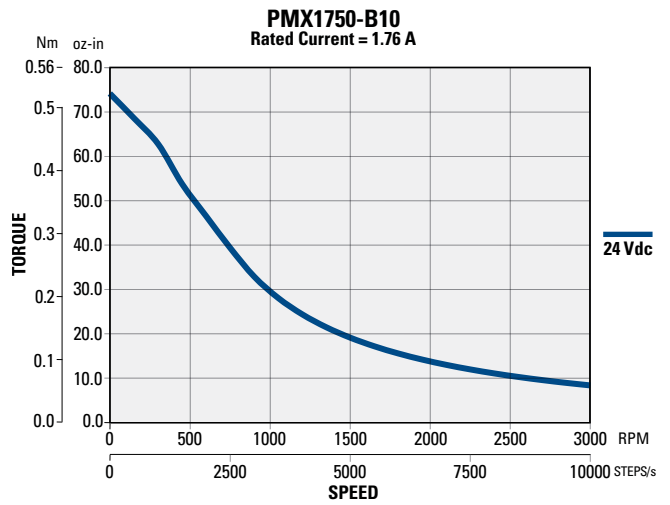
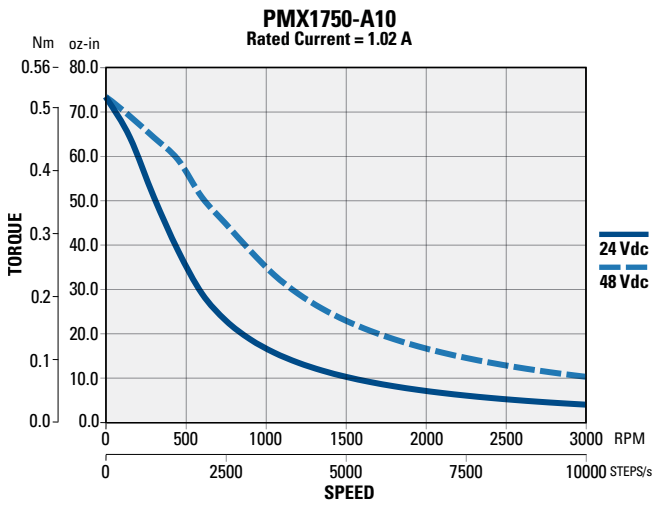
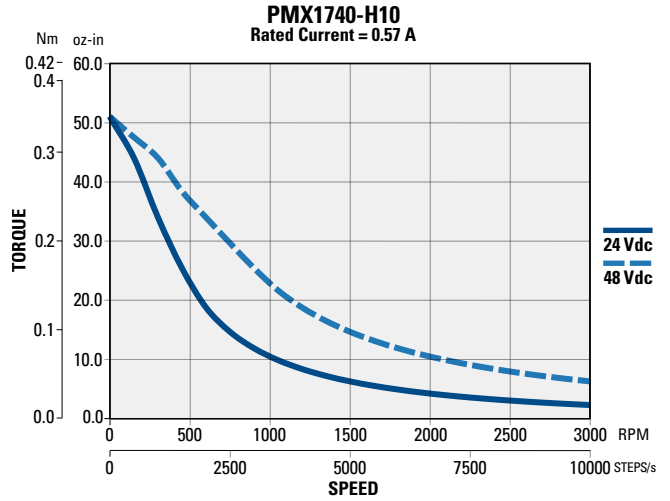
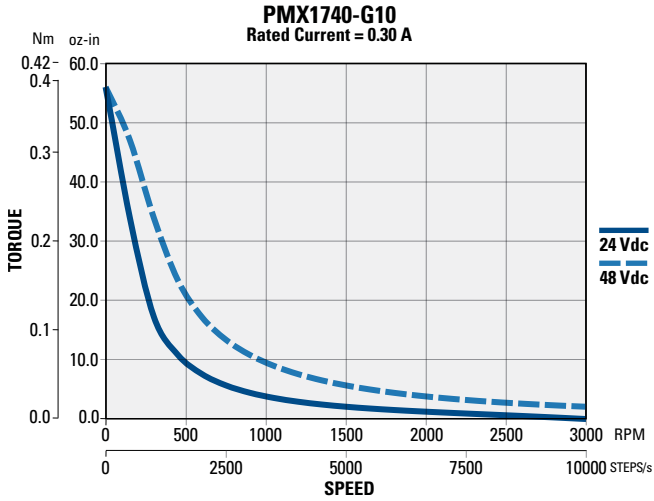


# PMX17 Series Stepper Motors

## PMX17 Series (Bipolar - 1.8° Step) Performance Curves

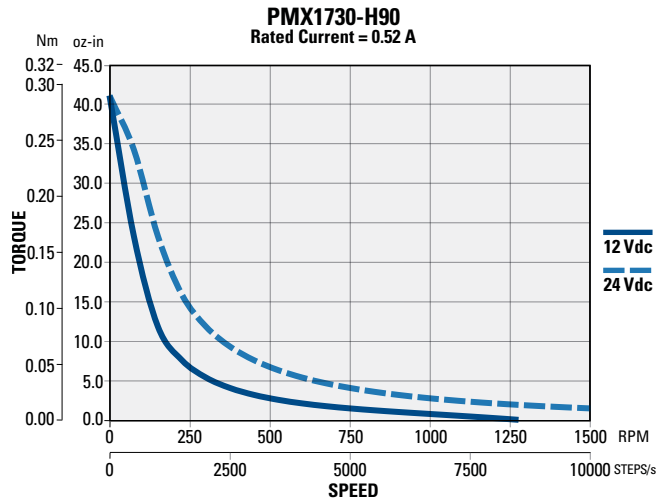
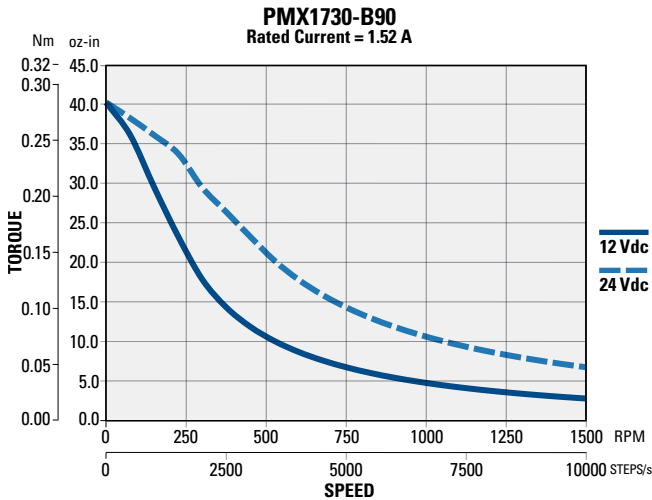
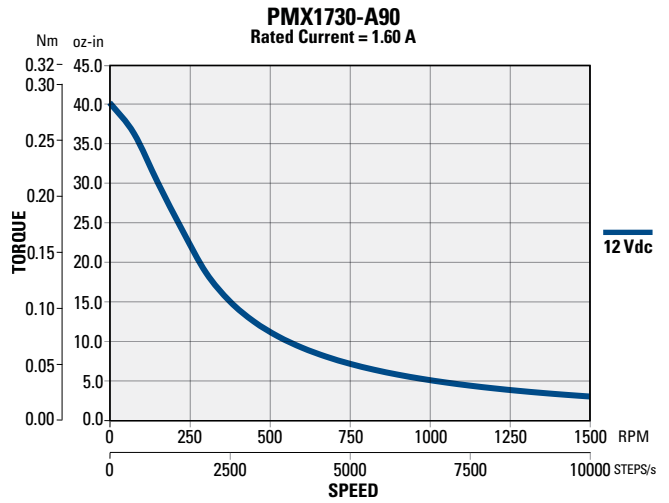
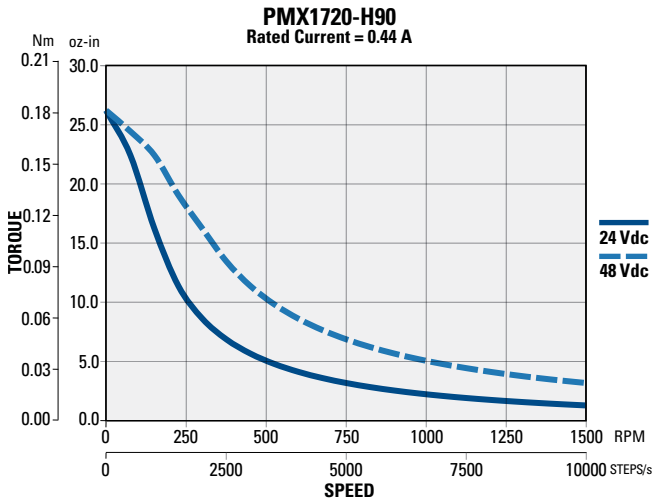
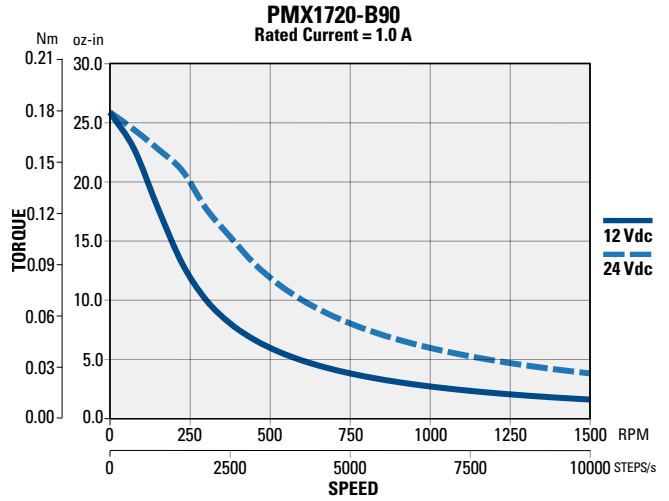
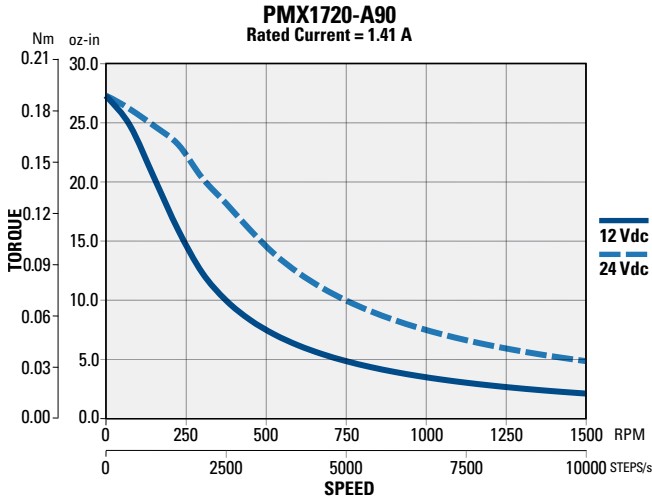


## PMX17 Series (Bipolar - 1.8° Step) Performance Curves

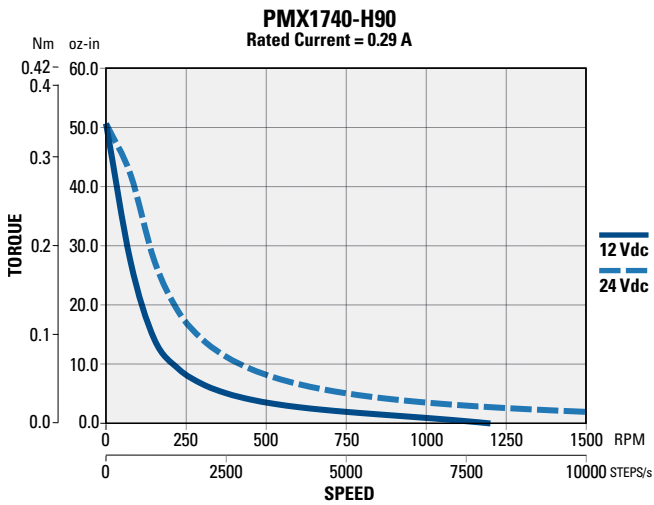
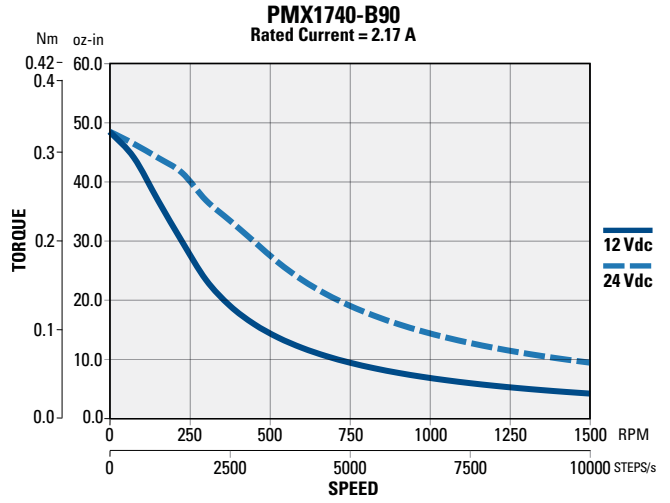
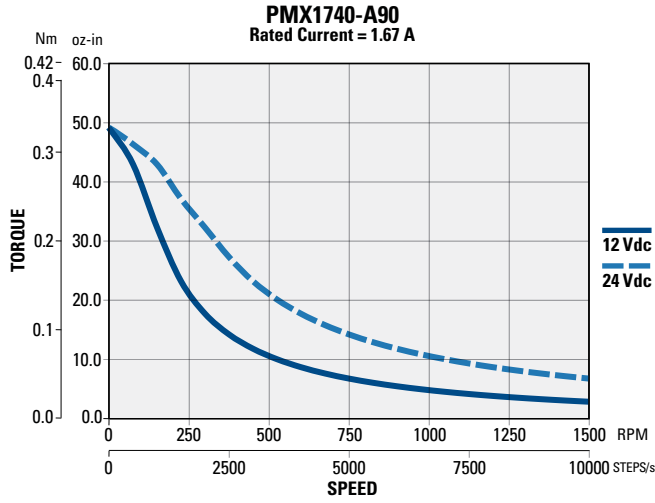


# PMX17 Series Stepper Motors

## PMX17 Series (Bipolar - 0.9° Step) Performance Curves



## PMX17 Series (Bipolar - 0.9° Step) Performance Curves

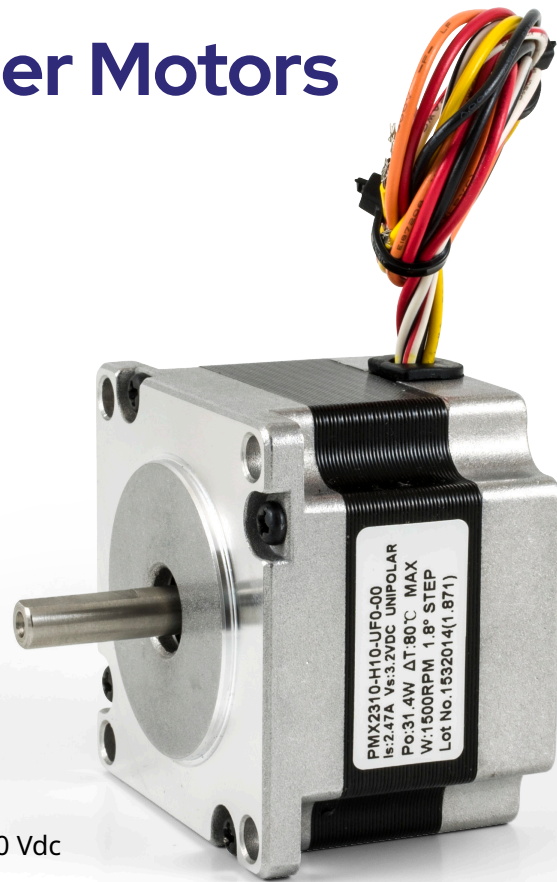


# PMX23 Series Stepper Motors

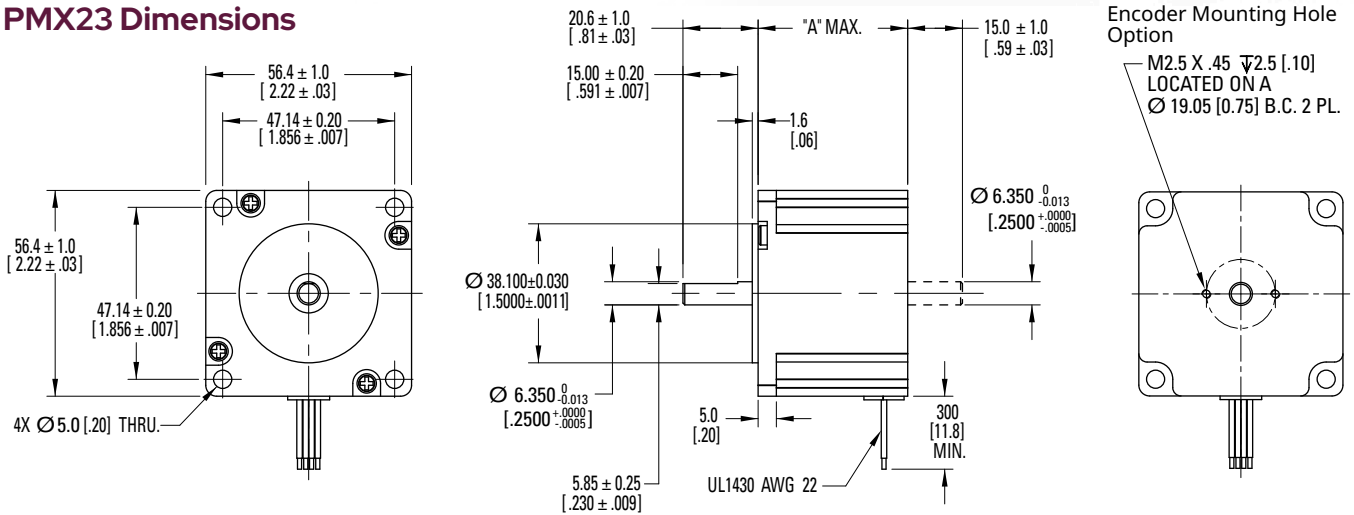
## PMX23 Standard Options and Specifications

- NEMA Size 23
- Front shaft flat option
- Rear shaft option
- Integral connector option
- Rear encoder mounting holes
- Bipolar and Unipolar windings

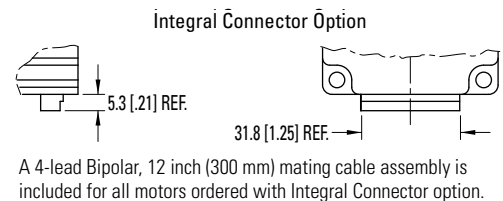
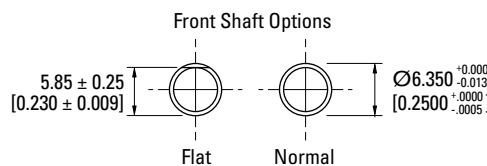
Phases	2
Full Steps Per Revolution	200
Step Size Angle	1.8°, 0.9°
Step Angle Accuracy %	+/- 5.0
Maximum Case Temperature	130° C
Insulation Class	NEMA Class B, 130 °C
Insulation Resistance	100 Megaohms @ 500 Vdc
Ambient Temperature	-20.0 to + 40.0 °C
Dielectric Strength	500 Vac, 1 minute
Certifications:	CE, RoHS, REACH compliant



## PMX23 Dimensions



Model	"A" MAX
PMX231	41 [1.61]
PMX232	56 [2.20]
PMX233	76 [2.99]
PMX234	85 [3.35]



Dimensions in mm [inches]

### PMX23 (1.8° Step) Performance Data

PMX23			Configuration		Holding Torque (2 phases on) oz-in [Nm] +/-12%	Rated Current/ Phase Amps DC	Phase Resistance Ohms +/-10%	Phase Inductance mH Typical	Thermal Resistance Mounted °C/Watt	Rotor Inertia oz-in-s <sup>2</sup> [kg-m <sup>2</sup> ]	Weight lb [kg]	Shaft Loading	
Stack	Winding	Step	Bipolar	Unipolar								Radial Force lb [N]	Axial Force lb [N]
1	A	1	•		100.7 [0.711]	3.50	0.68	1.33	4.69	1.70E-03 [1.20E-05]	1.0 [0.45]	16.88 [75.0]	3.38 [15.0]
1	B	1	•		98.9 [0.698]	0.48	34.78	59.94					
1	C	1	•		95.8 [0.676]	1.27	4.94	8.93					
1	G	1	•		100.4 [0.709]	0.87	10.48	21.33					
1	G	1		•	71.0 [0.501]	1.23	5.23	5.33					
1	H	1	•		100.7 [0.711]	1.75	2.62	5.33					
1	H	1		•	71.2 [0.503]	2.47	1.31	1.33					
1	J	1	•		102.3 [0.722]	2.53	1.27	2.66					
1	J	1		•	72.3 [0.511]	3.58	0.63	0.67					
2	A	1	•		205.2 [1.449]	3.45	0.83	2.63	3.11	4.26E-03 [3.01E-05]	1.5 [0.70]	16.88 [75.0]	3.38 [15.0]
2	B	1	•		196.5 [1.388]	0.56	30.23	88.58					
2	C	1	•		198.9 [1.405]	1.24	6.20	18.73					
2	G	1	•		199.9 [1.412]	0.84	13.25	40.74					
2	G	1		•	141.4 [0.999]	1.19	6.62	10.19					
2	H	1	•		208.4 [1.472]	1.76	3.06	10.53					
2	H	1		•	147.4 [1.041]	2.49	1.52	2.63					
2	J	1	•		204.3 [1.443]	2.57	1.46	4.68					
2	J	1		•	144.5 [1.020]	3.63	0.72	1.17					

Continued on the following page

Notes:

1. All ratings typical and at 40° C unless otherwise noted.
2. Rated current is T = 80° C, ON-PLATE; motor mounted to square aluminum plate heatsink, 2.5X motor diameter, 5mm thick.
3. Small signal inductance as measured with impedance bridge @ 1 KHz, 1 amp.

# PMX23 Series Stepper Motors

## PMX23 (1.8° Step) Performance Data (continued)

PMX23			Configuration		Holding Torque (2 phases on) oz-in [Nm] +/-12%	Rated Current/ Phase Amps DC	Phase Resistance Ohms +/-10%	Phase Inductance mH Typical	Thermal Resistance Mounted °C/Watt	Rotor Inertia oz-in-s <sup>2</sup> [kg-m <sup>2</sup> ]	Weight lb [kg]	Shaft Loading	
Stack	Winding	Step	Bipolar	Unipolar								Radial Force lb [N]	Axial Force lb [N]
3	A	1	•		326.4 [2.305]	3.23	1.14	3.75	2.70	6.82E-03 [4.82E-05]	2.2 [1.00]	16.88 [75.0]	3.38 [15.0]
3	B	1	•		336.8 [2.378]	3.96	0.73	2.57					
3	G	1	•		320.2 [2.261]	0.80	16.81	53.95					
3	G	1		•	226.6 [1.600]	1.14	8.39	13.47					
3	H	1	•		326.4 [2.305]	1.57	4.45	15.00					
3	H	1		•	230.8 [1.630]	2.21	2.22	3.75					
3	J	1	•		327.4 [2.312]	2.40	1.92	6.44					
3	J	1		•	231.5 [1.635]	3.40	0.95	1.61					
4	A	1	•		378.4 [2.672]	3.83	0.81	3.23	2.52	7.38E-03 [5.21E-05]	2.6 [1.20]	16.88 [75.0]	3.38 [15.0]
4	B	1	•		347.5 [2.454]	0.75	20.81	67.27					
4	C	1	•		349.3 [2.467]	1.16	8.66	28.34					
4	D	1	•		354.0 [2.500]	0.99	11.82	40.08					

Notes:

1. All ratings typical and at 40° C unless otherwise noted.
2. Rated current is T = 80° C, ON-PLATE; motor mounted to square aluminum plate heatsink, 2.5X motor diameter, 5mm thick.
3. Small signal inductance as measured with impedance bridge @ 1 KHz, 1 amp.
4. Complete PMX series model nomenclature can be found on page 52.



**PMX** **23** **2** **0** - **A** **1** **0** - **B** **N** **0** - **00**  
 Motor Series    Frame Size    Stack Length    Winding    Step Angle    Connection    Front Shaft Opt.    Rear Shaft Opt.

### PMX23 (0.9° Step) Performance Data

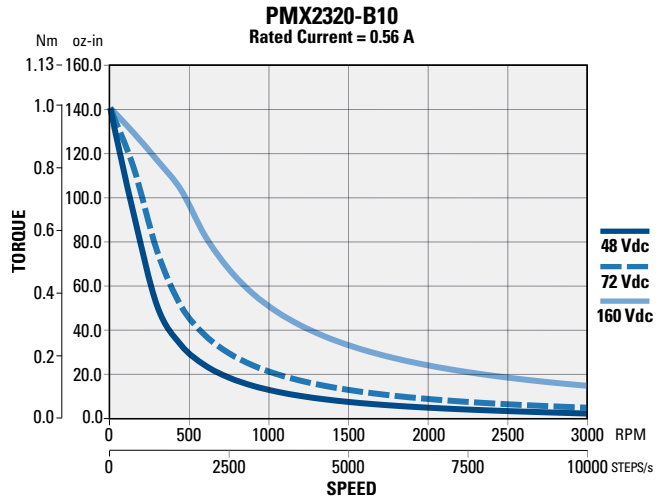
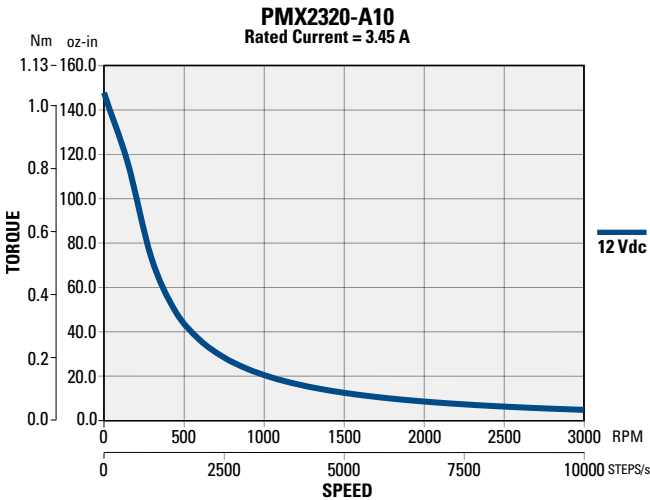
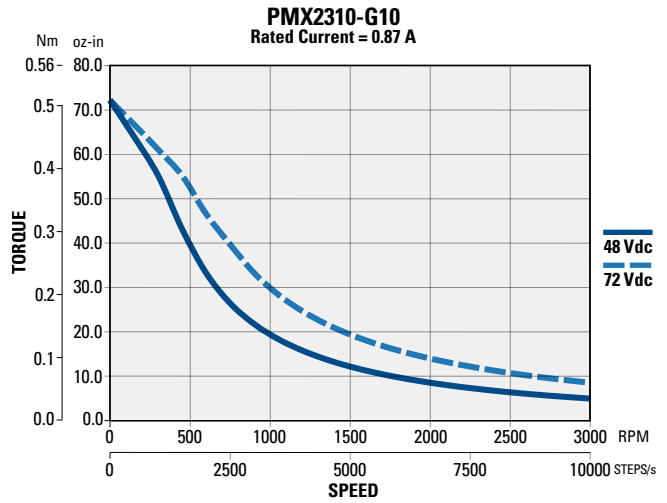
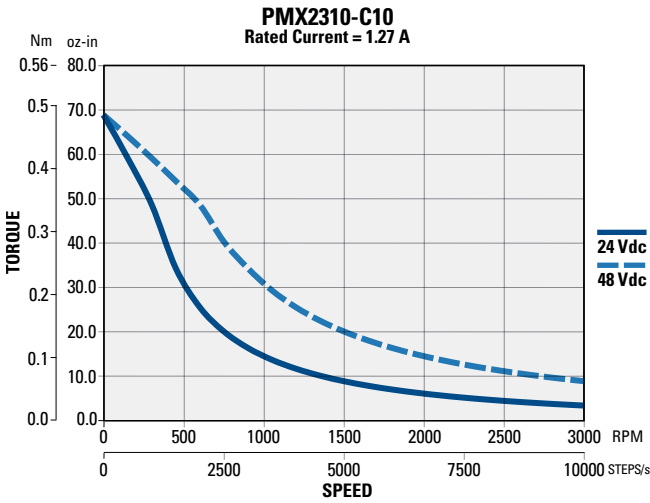
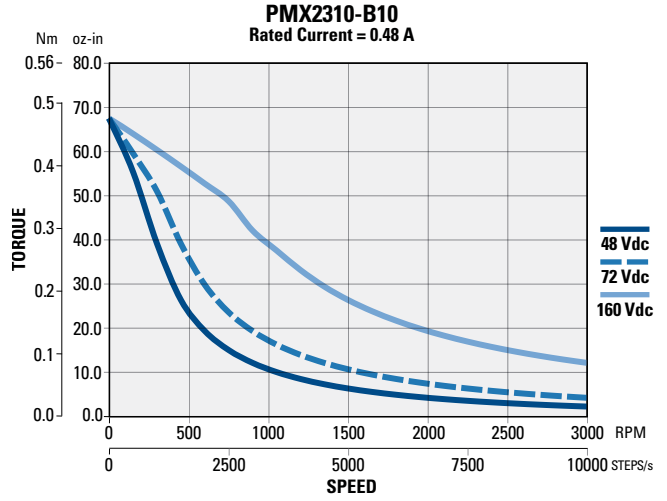
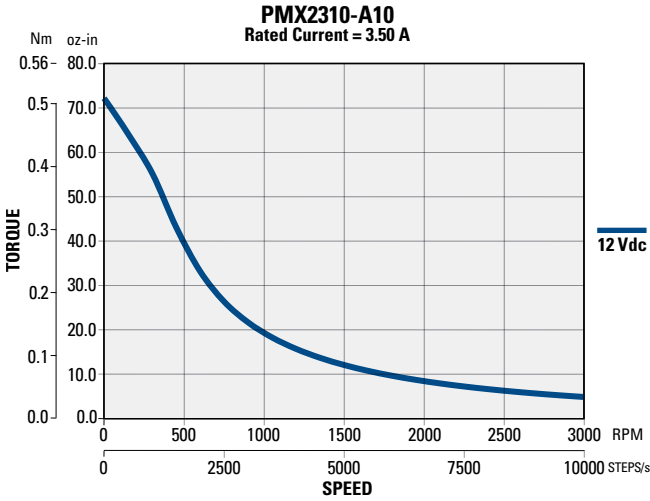
PMX23			Configuration		Holding Torque (2 phases on)	Rated Current/ Phase	Phase Resistance	Phase Inductance	Thermal Resistance	Rotor Inertia	Weight	Shaft Loading	
Stack	Winding	Step	Bipolar	Unipolar	oz-in [Nm] +/-12%	Amps DC	Ohms +/-10%	mH Typical	Mounted °C/Watt	oz-in-s <sup>2</sup> [kg-m <sup>2</sup> ]	lb [kg]	Radial Force lb [N]	Axial Force lb [N]
1	A	9	•		97.6 [0.689]	3.37	0.74	2.66	4.69	1.70E-03 [1.20E-05]	1.0 [0.45]	16.88 [75.0]	3.38 [15.0]
1	B	9	•		92.5 [0.653]	0.47	35.54	106.70					
1	C	9	•		93.7 [0.662]	1.26	5.05	15.89					
1	G	9	•		97.4 [0.688]	0.86	10.66	37.95					
1	G	9		•	68.1 [0.481]	1.22	5.22	9.48					
2	A	9	•		203.8 [1.439]	3.24	0.93	5.15	3.11	4.26E-03 [3.01E-05]	1.5 [0.70]	16.88 [75.0]	3.38 [15.0]
2	B	9	•		195.1 [1.378]	0.56	29.59	124.49					
2	C	9	•		196.9 [1.390]	1.25	6.07	26.32					
2	G	9	•		204.8 [1.446]	0.80	14.94	87.46					
2	G	9		•	146.8 [1.037]	1.16	7.47	21.87					
3	A	9	•		313.0 [2.210]	3.26	1.06	6.67	2.70	6.82E-03 [4.82E+05]	2.2 [1.00]	16.88 [75.0]	3.38 [15.0]
3	B	9	•		304.5 [2.150]	4.14	0.67	3.75					
3	G	9	•		305.4 [2.157]	0.78	17.85	106.72					
3	G	9		•	216.0 [1.525]	1.10	8.92	26.68					

Notes:

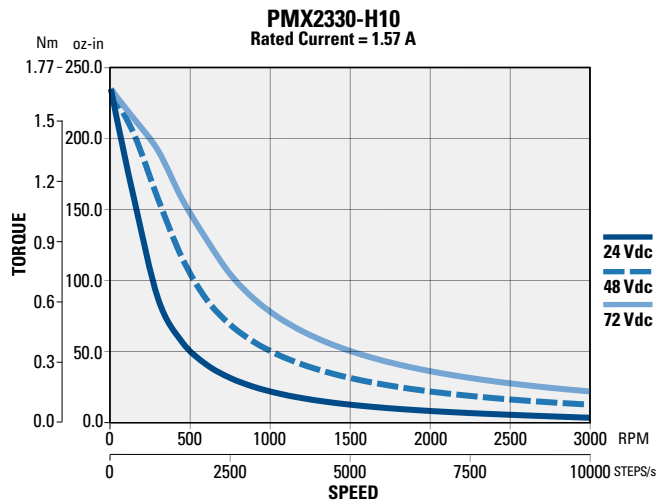
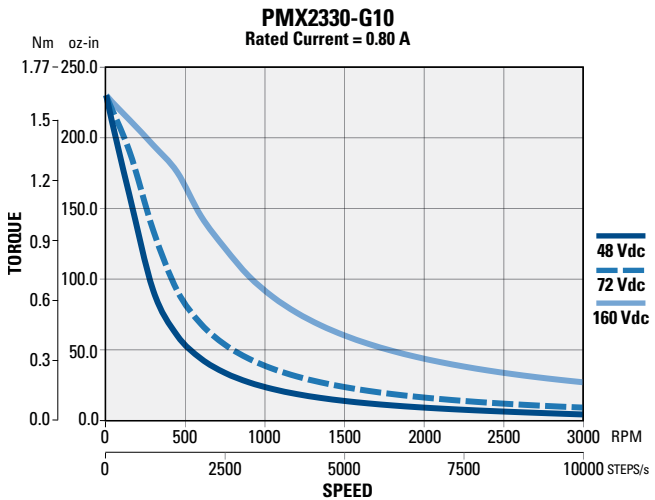
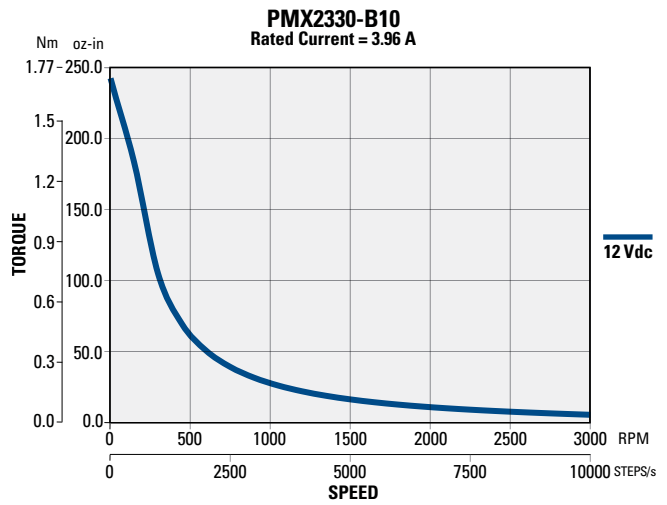
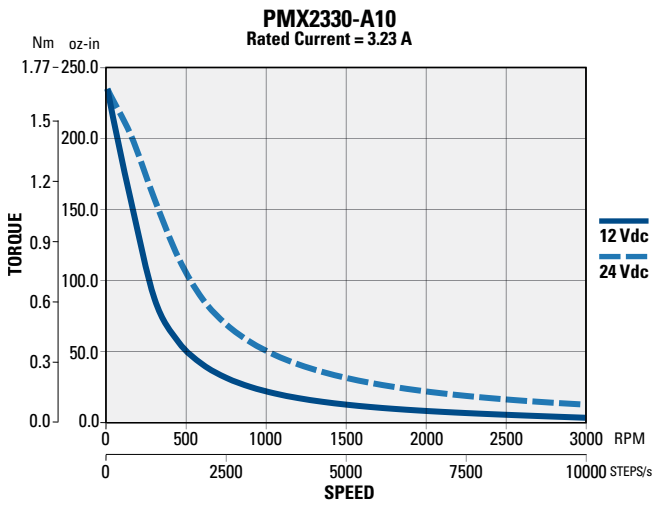
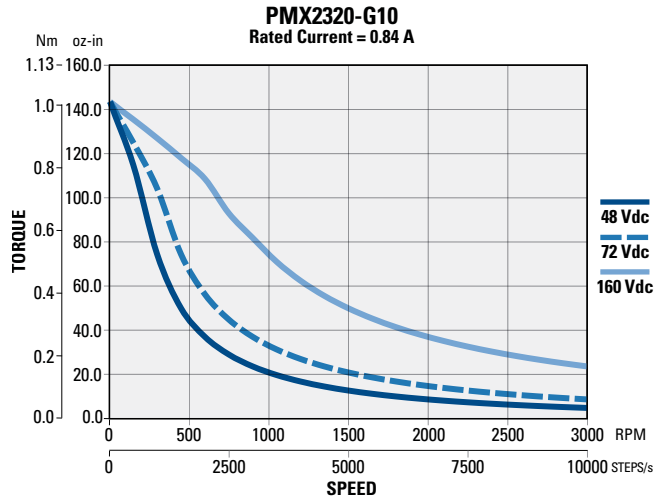
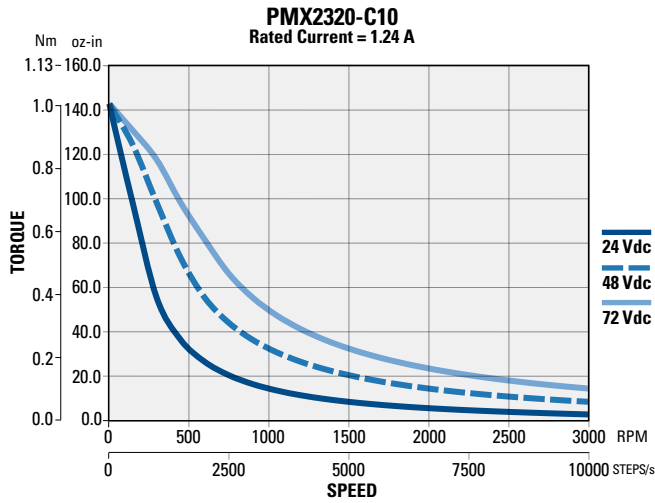
1. All ratings typical and at 40° C unless otherwise noted.
2. Rated current is T = 80° C, ON-PLATE; motor mounted to square aluminum plate heatsink, 2.5X motor diameter, 5mm thick.
3. Small signal inductance as measured with impedance bridge @ 1 KHz, 1 amp.

# PMX23 Series Stepper Motors

## PMX23 Series (Bipolar - 1.8° Step) Performance Curves

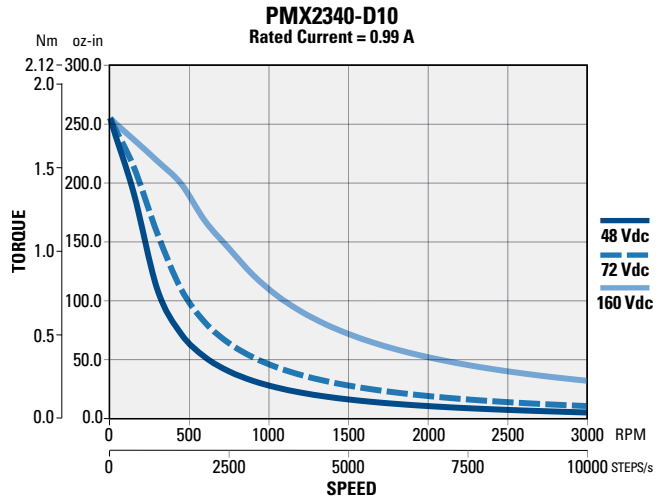
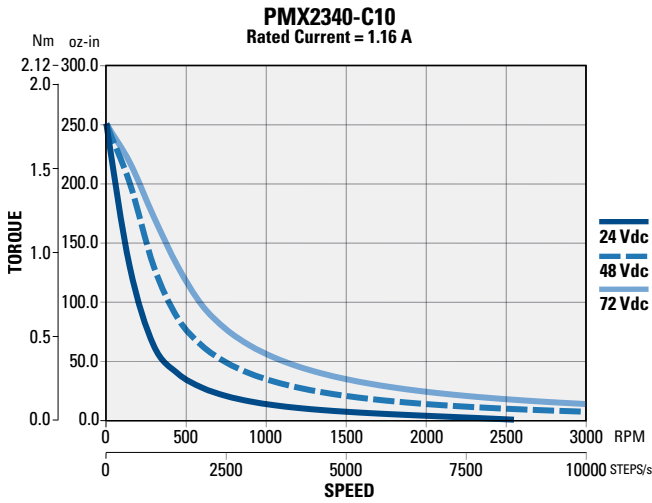
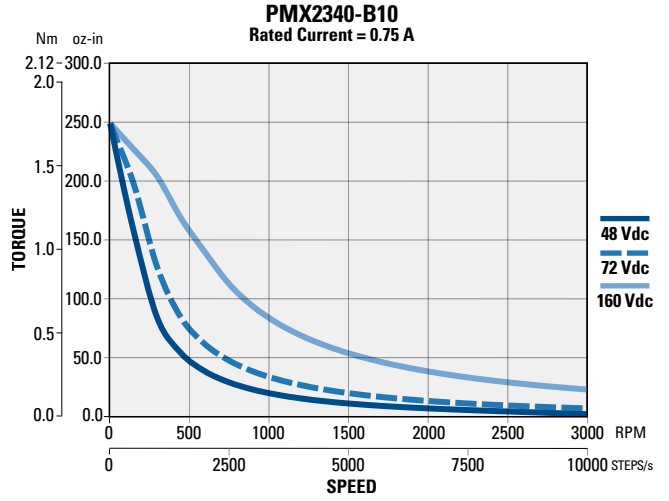
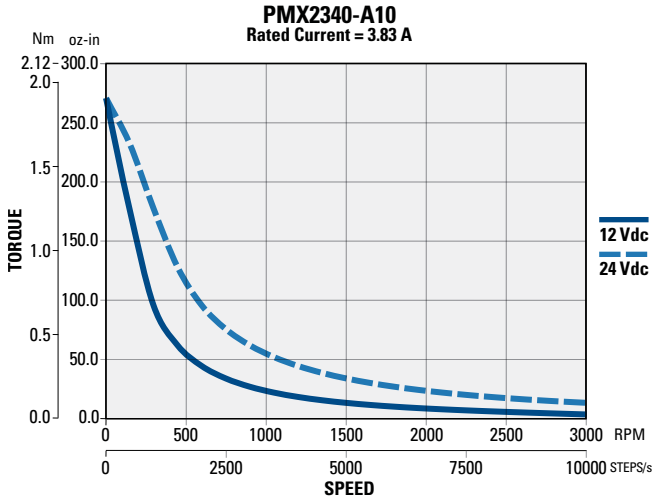


## PMX23 Series (Bipolar - 1.8° Step) Performance Curves

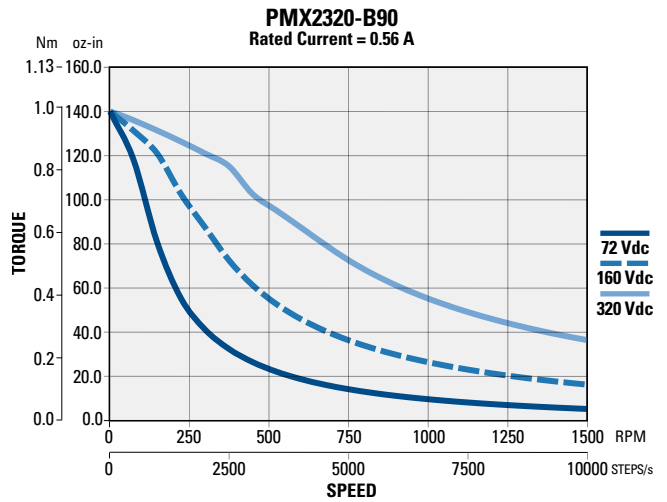
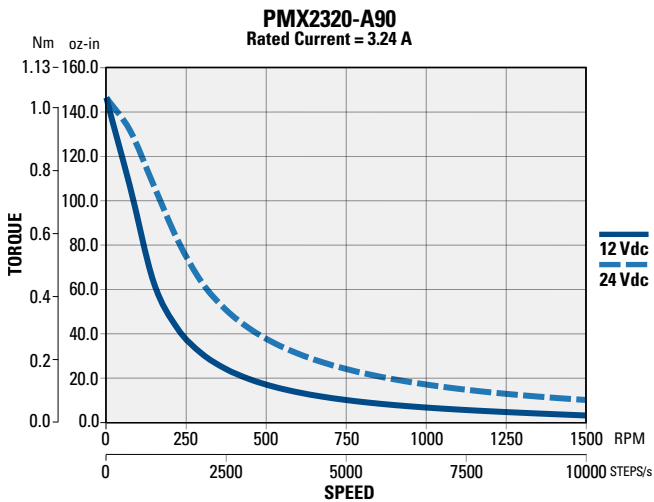
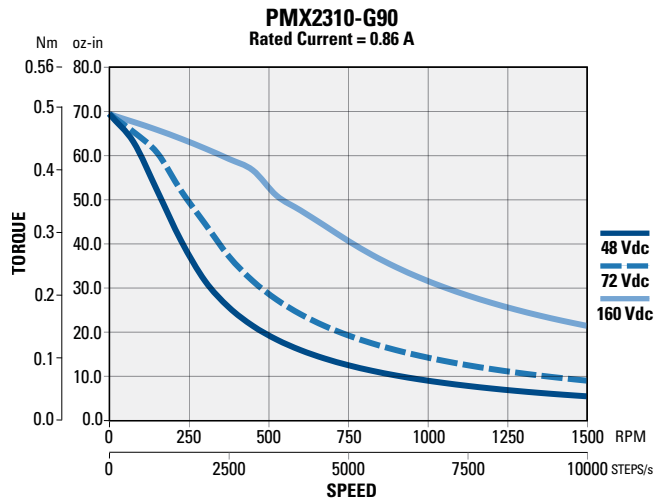
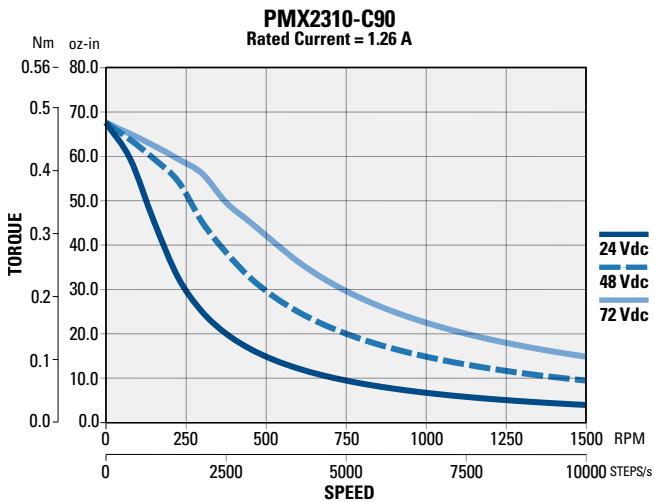
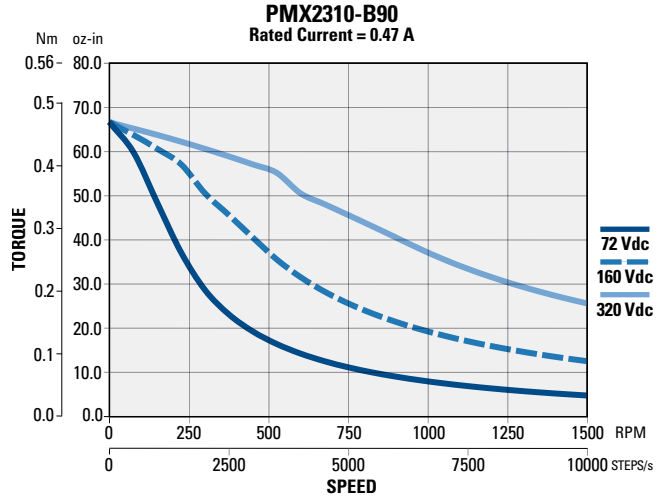
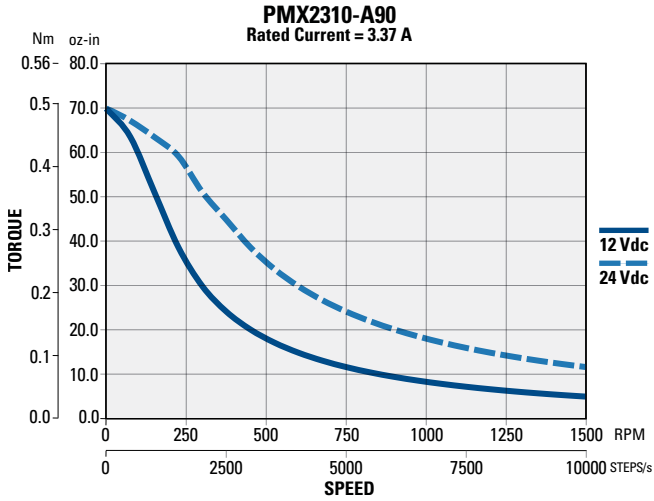


# PMX23 Series Stepper Motors

## PMX23 Series (Bipolar - 1.8° Step) Performance Curves

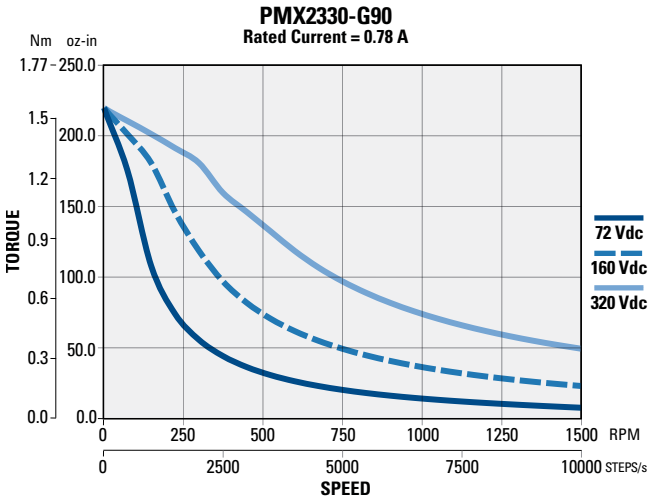
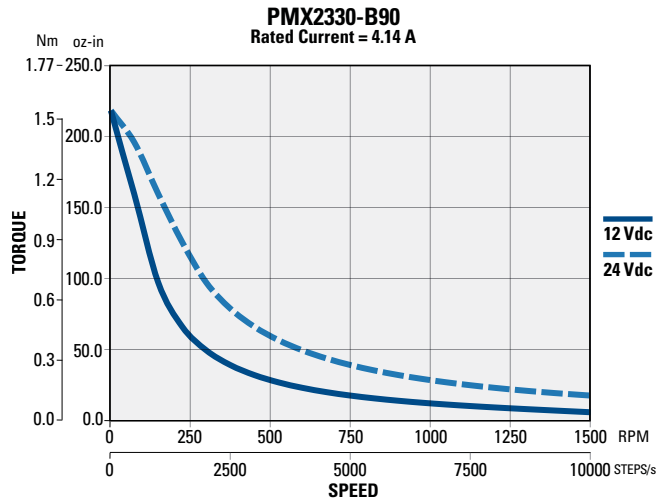
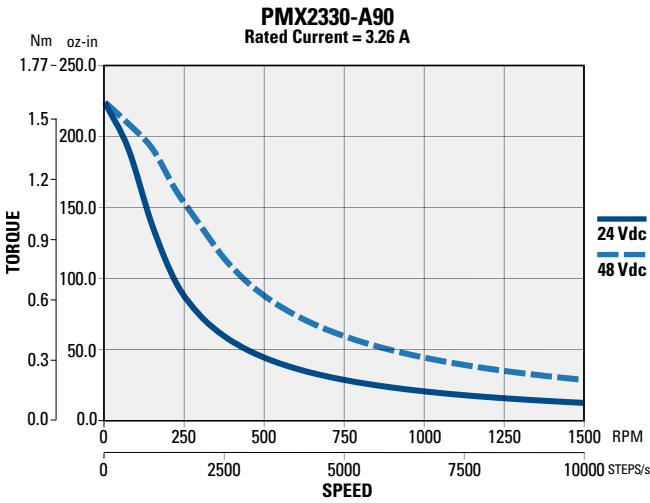
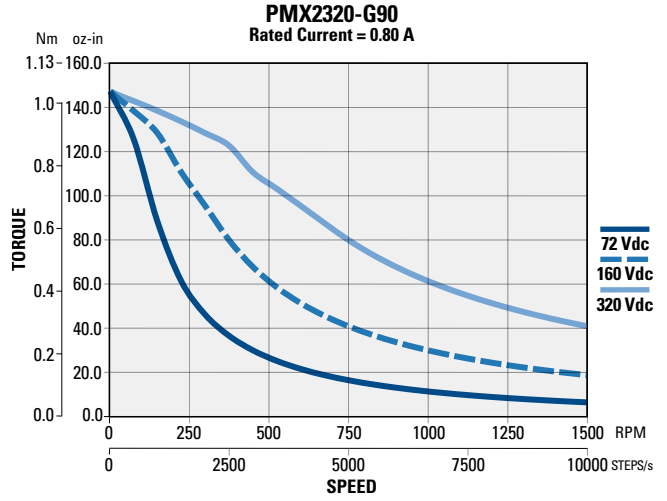
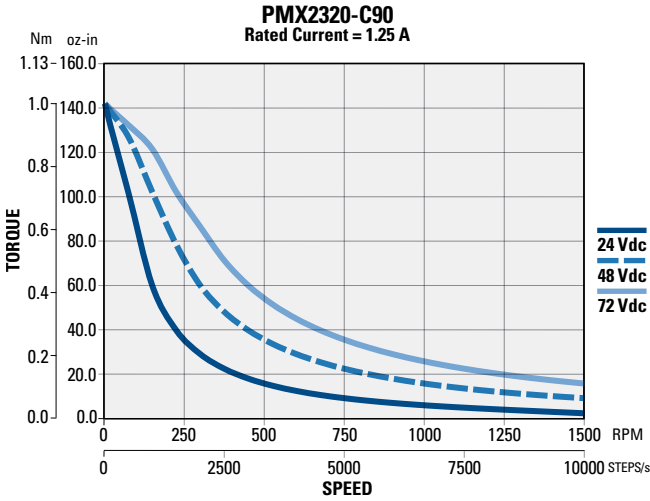


## PMX23 Series (Bipolar - 0.9° Step) Performance Curves



# PMX23 Series Stepper Motors

## PMX23 Series (Bipolar - 0.9° Step) Performance Curves



# Notes

PMX 23 2 0 - A 1 0 - B N 0 - 00  
Motor Series      Frame Size      Stack Length      Winding      Step Angle      Connection      Front Shaft Opt.      Rear Shaft Opt.

A large grid area for taking notes, with a 0.125 inch division size.

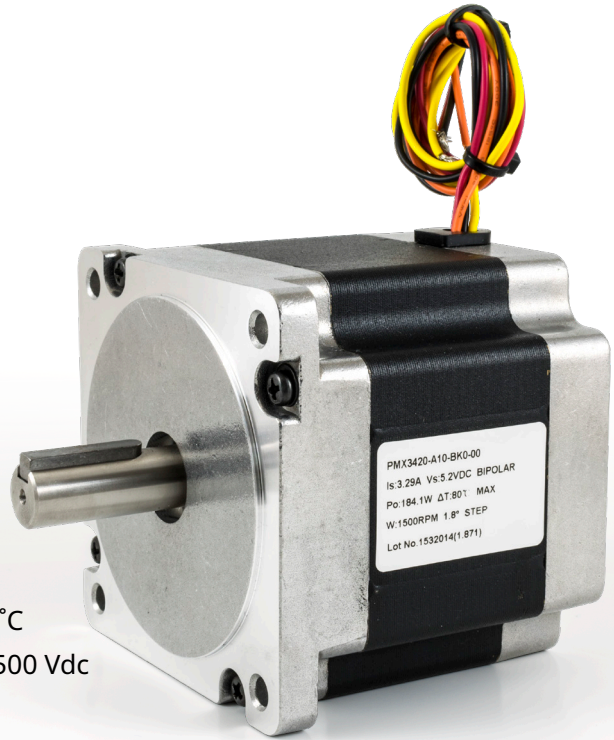
0.125 inch divisions

# PMX34 Series Stepper Motors

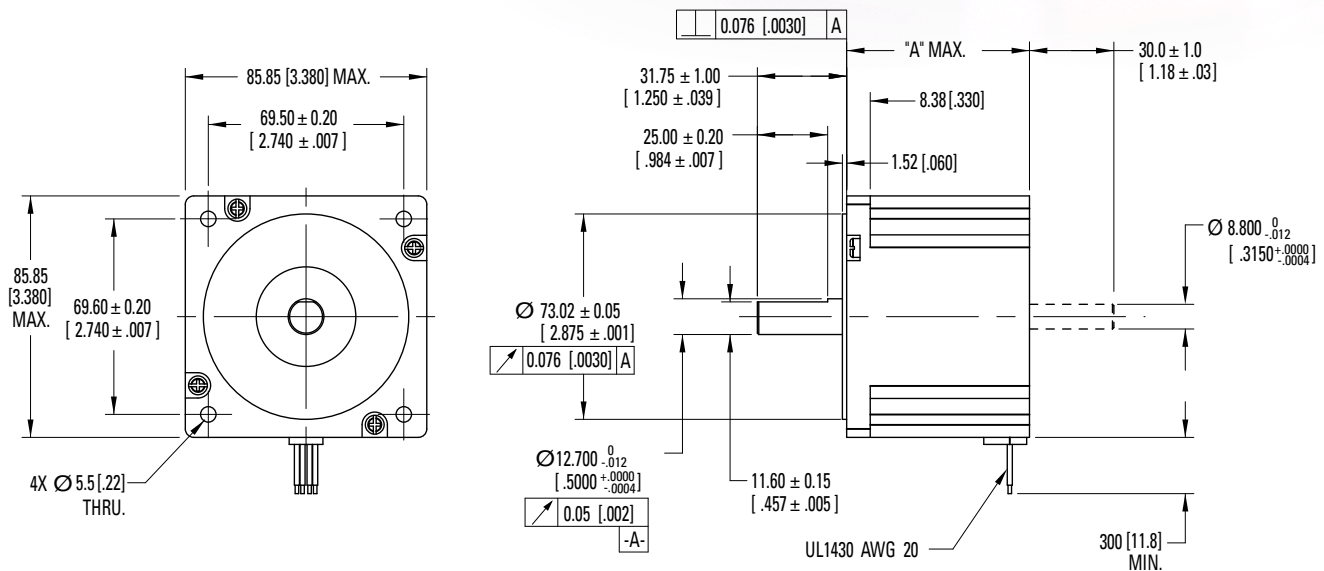
## PMX34 Standard Options and Specifications

- NEMA Size 34
- Front shaft flat option
- Rear shaft option
- Bipolar windings

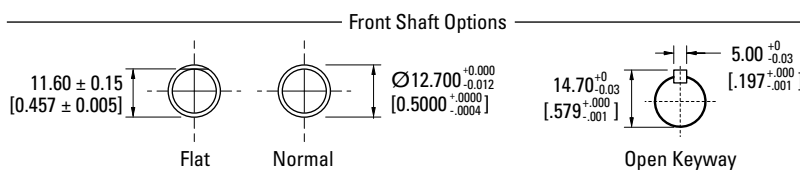
Phases	2
Full Steps Per Revolution	200
Step Size Angle	1.8°
Step Angle Accuracy %	+/- 5.0
Maximum Case Temperature	130 °C
Insulation Class	NEMA Class B, 130 °C
Insulation Resistance	100 Megaohms @ 500 Vdc
Ambient Temperature	-20.0 to + 40.0 °C
Dielectric Strength	500 Vac, 1 minute
Certifications:	CE, RoHS, REACH compliant



## PMX34 Dimensions



Model	"A" MAX
PMX341	65 [2.56]
PMX342	80 [3.15]
PMX343	118 [4.65]
PMX344	156 [6.14]



Dimensions in mm [inches]



### PMX34 (1.8° Step) Performance Data

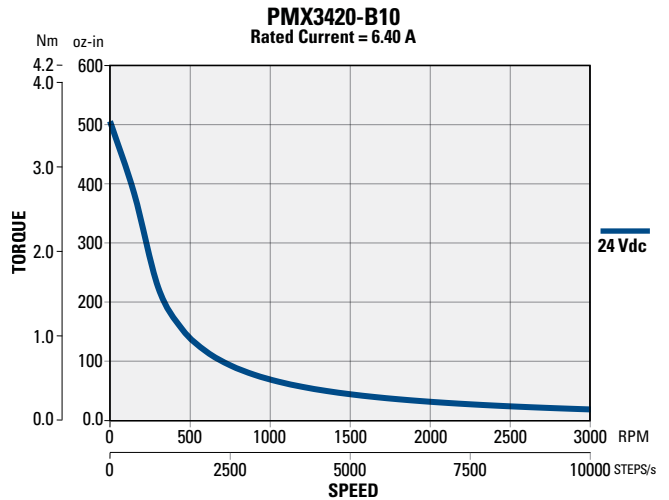
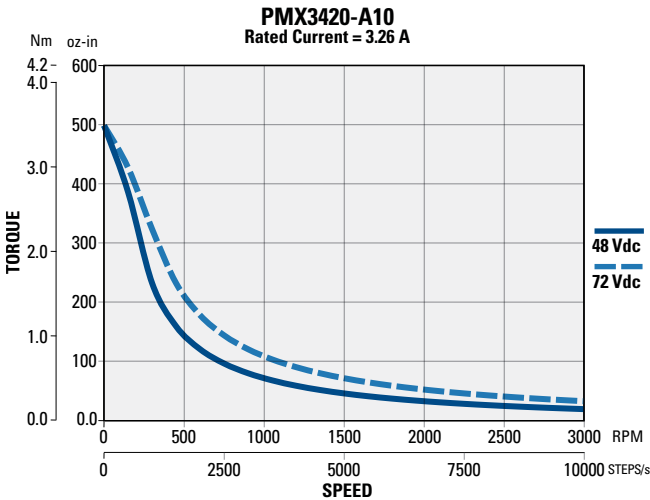
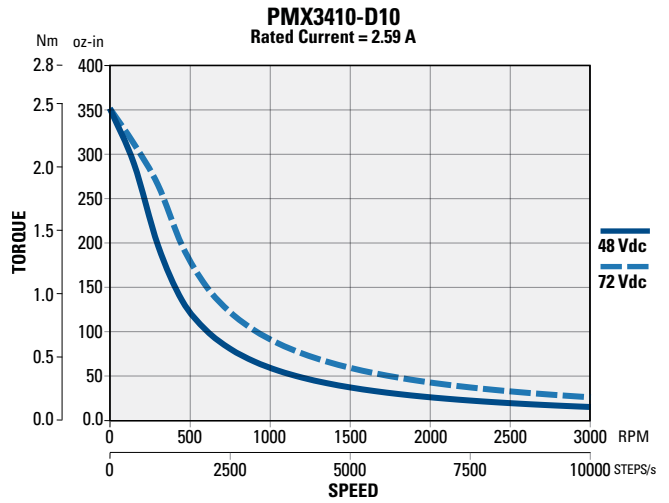
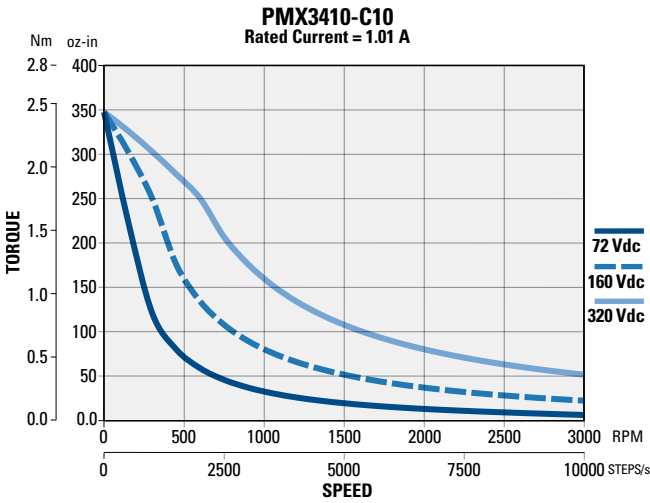
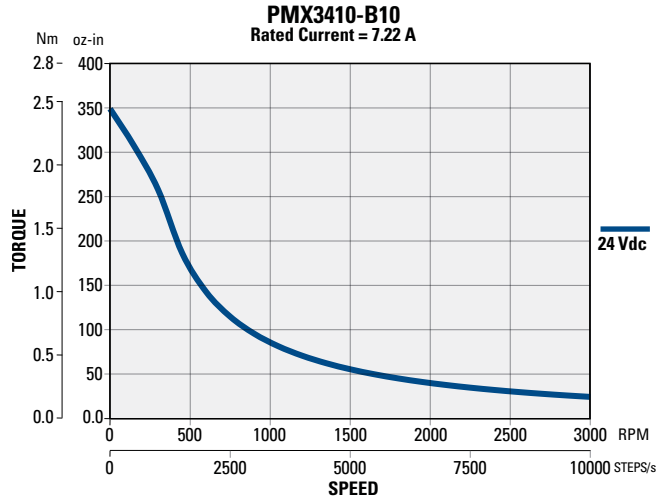
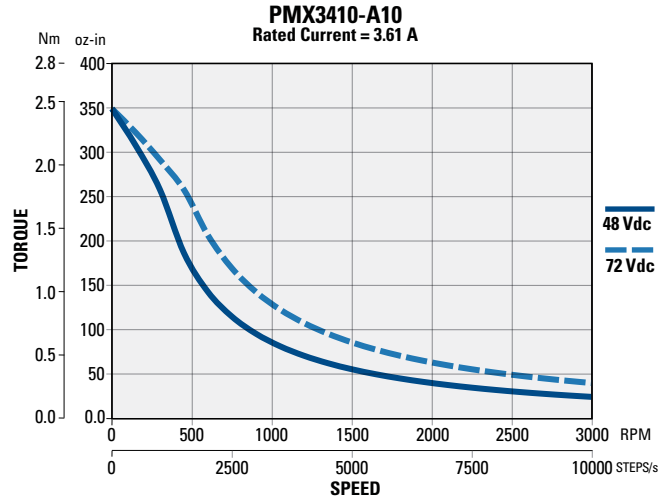
PMX34			Configuration		Holding Torque (2 phases on)	Rated Current/ Phase	Phase Resistance	Phase Inductance	Thermal Resistance	Rotor Inertia	Weight	Shaft Loading	
Stack	Winding	Step	Bipolar	Unipolar	oz-in [Nm] +/-12%	Amps DC	Ohms +/-10%	mH Typical	Mounted °C/Watt	oz-in-s <sup>2</sup> [kg-m <sup>2</sup> ]	lb [kg]	lb [N]	lb [N]
1	A	1	•		486.1 [3.433]	3.61	1.15	6.46	1.98	1.42E-02 [1.00E-04]	3.7 [1.70]	49.46 [220]	13.49 [60]
1	B	1	•	486.1 [3.433]	7.22	0.31	1.62						
1	C	1	•	483.1 [3.411]	1.01	14.65	81.70						
1	D	1	•	489.5 [3.457]	2.59	2.21	12.81						
2	A	1	•		695.8 [4.913]	3.26	1.51	12.71	1.83	1.99E-02 [1.41E-04]	5.1 [2.30]	49.46 [220]	13.49 [60]
2	B	1	•	703.5 [4.968]	6.40	0.41	3.41						
2	C	1	•	685.0 [4.837]	1.09	13.56	108.98						
2	D	1	•	698.9 [4.935]	2.87	1.95	16.60						
3	A	1	•		1238.5 [8.746]	3.04	2.34	22.20	1.35	3.83E-02 [2.70E-04]	8.4 [3.79]	49.46 [220]	13.49 [60]
3	B	1	•	1285.4 [9.077]	6.45	0.54	5.56						
3	C	1	•	1223.4 [8.639]	1.23	14.29	151.00						
3	D	1	•	1250.1 [8.828]	4.80	0.95	10.58						
4	A	1	•		1630.7 [11.515]	2.94	3.05	33.14	1.21	5.68E-02 [4.01E-04]	11.7 [5.29]	49.46 [220]	13.49 [60]
4	B	1	•	1739.2 [12.281]	6.00	0.75	8.94						
4	C	1	•	1659.0 [11.715]	1.42	12.93	148.28						
4	D	1	•	1689.0 [11.927]	4.46	1.33	15.88						

Notes:

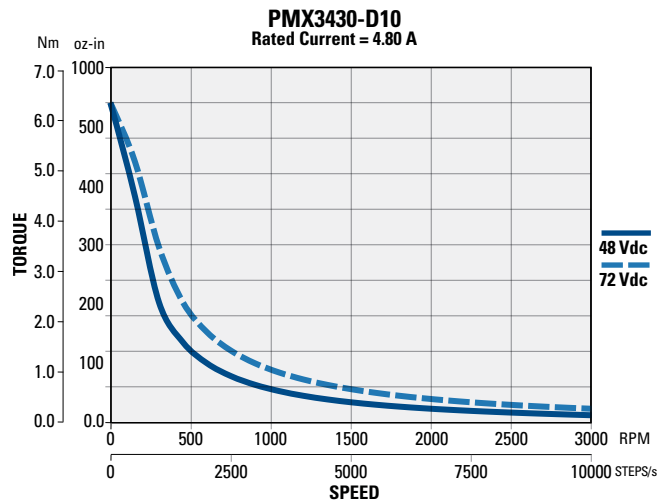
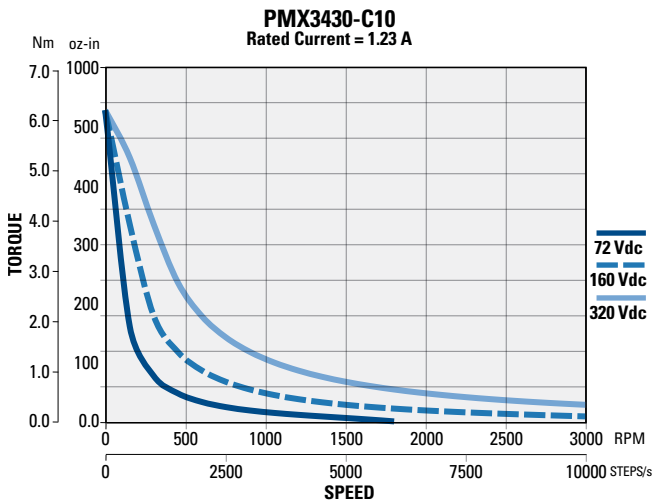
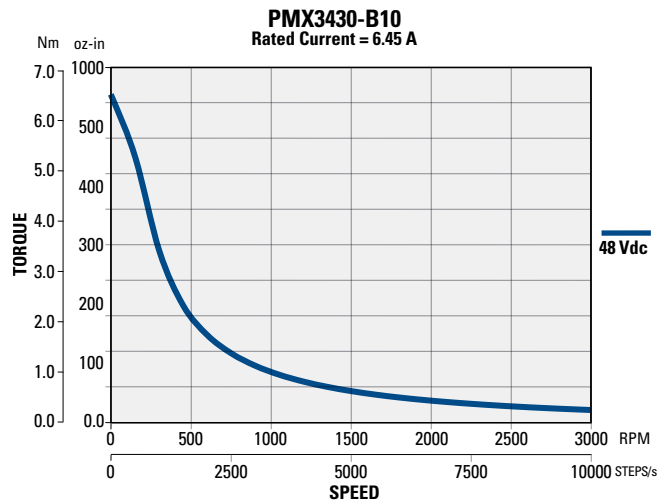
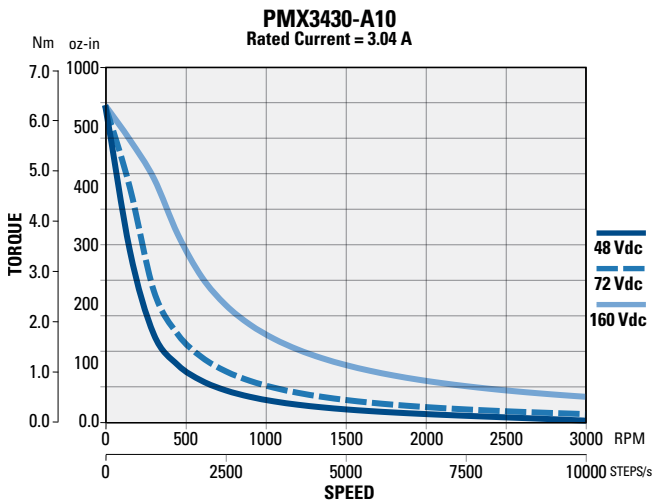
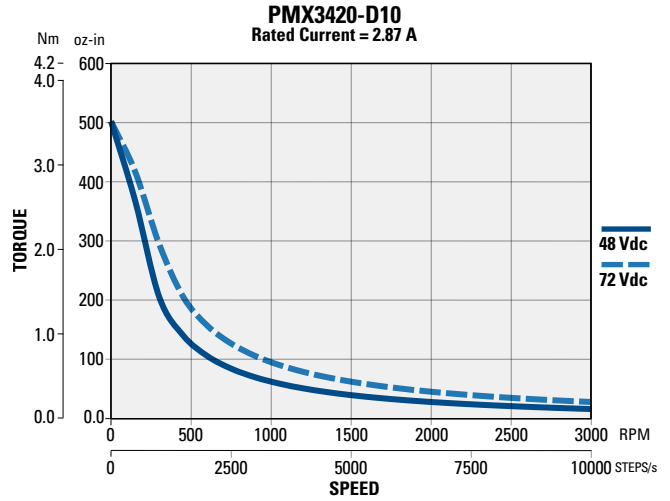
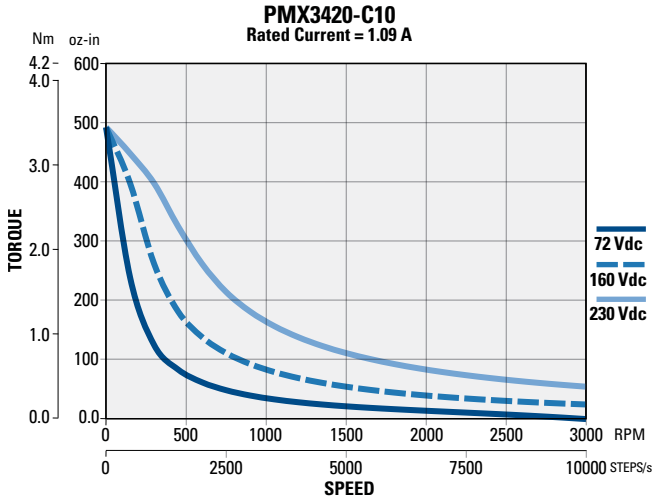
1. All ratings typical and at 40° C unless otherwise noted.
2. Rated current is T = 80° C, ON-PLATE; motor mounted to square aluminum plate heatsink, 2.5X motor diameter, 5mm thick.
3. Small signal inductance as measured with impedance bridge @ 1 KHz, 1 amp.

# PMX34 Series Stepper Motors

## PMX34 Series (Bipolar - 1.8° Step) Performance Curves

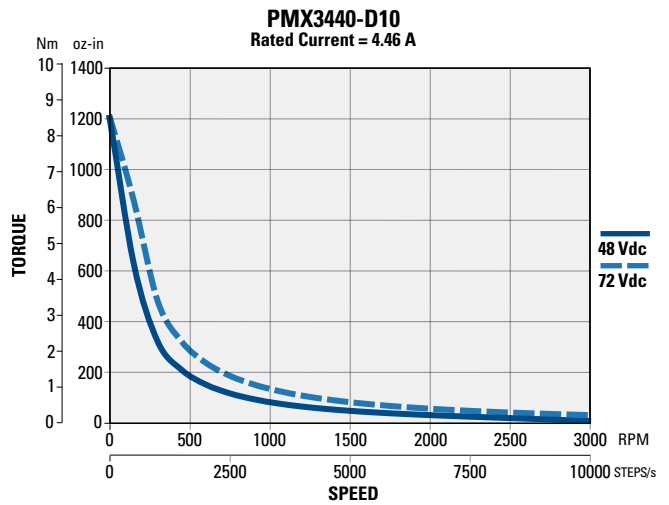
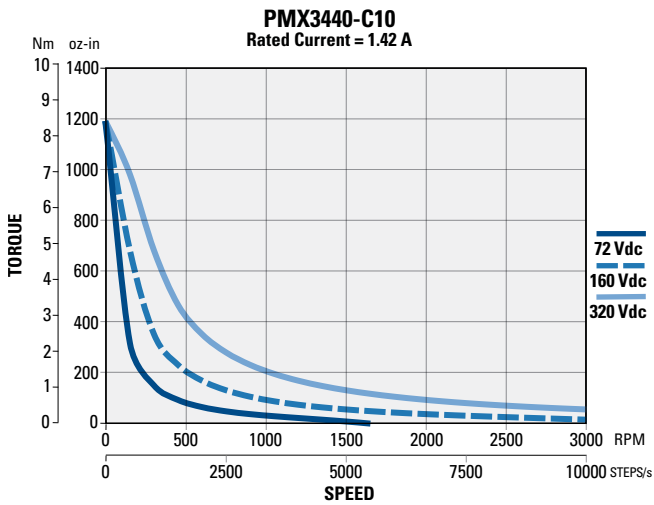
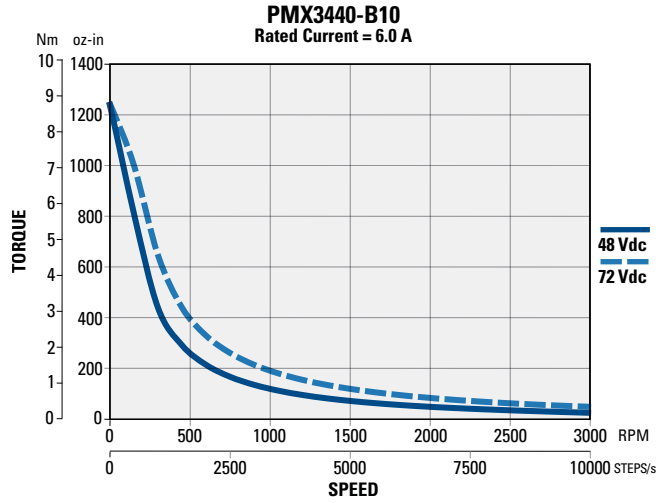
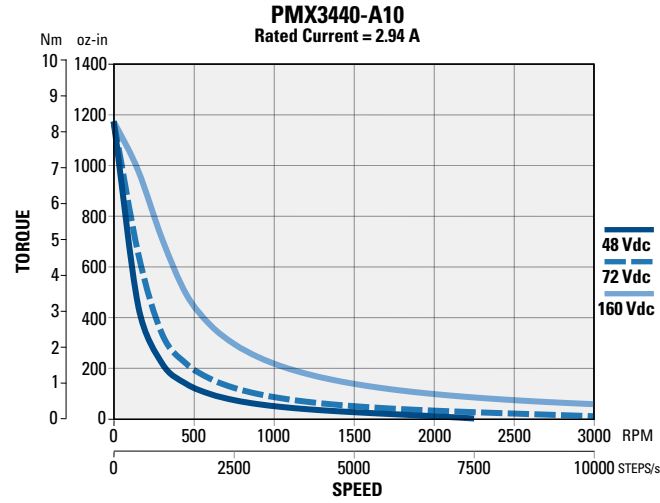


## PMX34 Series (Bipolar - 1.8° Step) Performance Curves



# PMX34 Series Stepper Motors

## PMX34 Series (Bipolar - 1.8° Step) Performance Curves



# Notes

PMX 34 2 0 - A 1 0 - B N 0 - 00  
Motor Series      Frame Size      Stack Length      Winding      Step Angle      Connection      Front Shaft Opt.      Rear Shaft Opt.

0.125 inch divisions

# Stepper Motor General Technical Guide

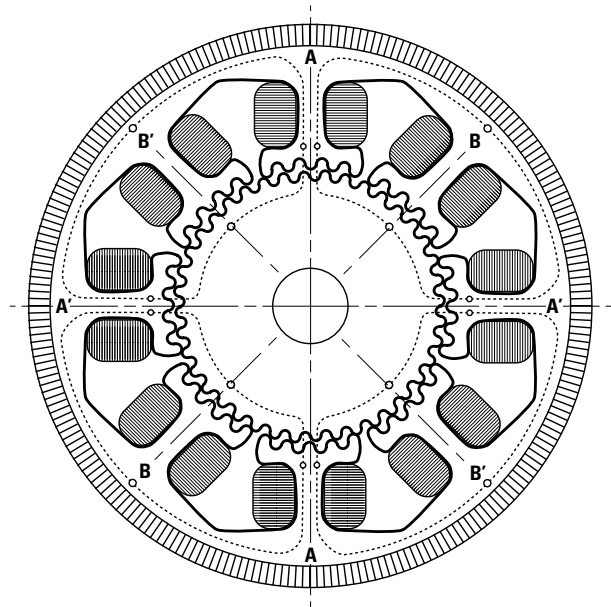
## Stepper Motor Basics

A Kollmorgen stepper motor is a brushless motor consisting of a rotor and a stator assembly. The illustration shows the internal construction and tooth alignment of the motor. The fine teeth, evenly spaced around the entire diameter, provide the incremental angular rotation that results in mechanical motion.

Kollmorgen Hybrid stepper motors have two windings (two phases) that are energized with DC current. When the current in one winding is reversed, the motor shaft moves one step, or  $1.8^\circ$  (options for  $0.9^\circ$  step angles are also available). By reversing the current in each winding, the position and speed of the motor is easily and precisely controlled, making these motors extremely useful for many different motion control applications.

## Holding Torque

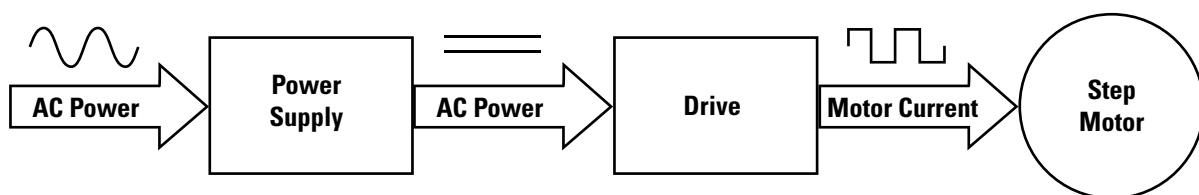
“Holding torque” and the corresponding rated current are leading specifications for selection in the ratings tables for all motors. Holding torque is often used as a figure of merit when comparing motors. It specifies the maximum external torque that can be applied to a stopped motor with rated current applied without causing the motor to rotate continuously. When the motor begins to rotate the torque available is often referred to as “pullout torque.” Pullout torque ratings correspond to values shown in performance speed/torque curves. At starting speeds the pullout torque is typically 20-30% lower than the motor’s rated holding torque.



Stepper motor rotor & stator cross section

## Drive Selection and Motor Performance

Stepper drives amplify and send DC current and voltage into the motor windings. Kollmorgen stepper motors are used with a variety of drives available from Kollmorgen and other manufacturers. These drives typically have a broad range of voltage and current ratings. A motor’s performance is highly dependent on the current and voltage supplied by a drive. For even finer resolution and smoother operation, micro-stepping drives divide each step into many increments by controlling the magnitude of the current in each winding.



As applied voltage and/or current to the motor is changed, motor performance is altered. A performance speed/torque curve shows the pullout torque, which is directly dependent on the available current from the stepper drive. The torque values are shown along the motor’s entire speed range, which is dependent on the available voltage.

## Effects of Available Current

Figure 1 shows the performance of the same motor driven by bipolar stepper drive with different current ratings. In this comparison all drives have the same supply voltage. Note that high speed performance is not appreciably affected by the different current ratings. Low speed running torque, however, varies considerably with changes in the current rating. It is important to understand that when current over the rated current of the motor is applied, the increase in torque will not be proportional to the increased current. Furthermore, applied current levels above rated current will likely result in damage to the motor from demagnetization and/or overheating.

## Effects of Available Voltage

Figure 2 shows the performance of the same motor driven by bipolar stepper drive with different supply voltage ratings. In this comparison, all drives have the same current rating. Note that low speed running torque is high and not appreciably affected by supply voltage differences. High speed performance, however, varies considerably with changes in supply voltage. Caution must be exercised when increasing supply voltage. Higher voltages will result in increased motor heating regardless of motor speed.

## Effects of Motor Inductance

For a given supply voltage, a low inductance motor will give better performance at high speeds than a high inductance motor, but will operate at a higher temperature. This is true because current will increase faster in a low inductance winding, each time the winding power is switched. High inductance motors yield higher maximum torque and operate cooler, but their top speed is limited and torque falls off more rapidly as speed rises, versus a lower inductance motor.

## Full-Step, Half-Step, and Microstepping

The terms full-step, half-step and “microstep” are commonly used in the discussion of step motors. A  $1.8^\circ$  step motor, for example, has 200 discrete positions in a full  $360^\circ$  revolution. Since  $360^\circ$  divided by 200 equals  $1.8^\circ$ , the motor shaft will advance  $1.8^\circ$  each time the motor is given a digital command to take one step. This is known as a full-step. The term “half-step” indicates a  $0.9^\circ$  step angle (half of a full  $1.8^\circ$  step). This is achieved with a switching technique that alternately applies positive current, no current, and negative current to each winding in succession. The term “microstep” refers to a more sophisticated form of control which goes beyond the simple switching of power between phase A and phase B of the motor windings, and takes control of the amount of current being sent to the individual windings. Microstepping permits the shaft to be positioned at places other than the  $1.8^\circ$  or  $0.9^\circ$  locations provided by the full-step and half-step methods. Microstepping positions occur between these two angular points in the rotation of the rotor. The most commonly used microstep increments are  $1/5$ ,  $1/10$ ,  $1/16$ ,  $1/32$ ,  $1/125$  and  $1/250$  of a full step. A major benefit of microstepping is that it reduces the amplitude of the resonance that occurs when the motor is operated at its natural frequency or at sub-harmonics of that frequency. The improved step response and reduced amplitude of the natural resonances result from the finer step angle.

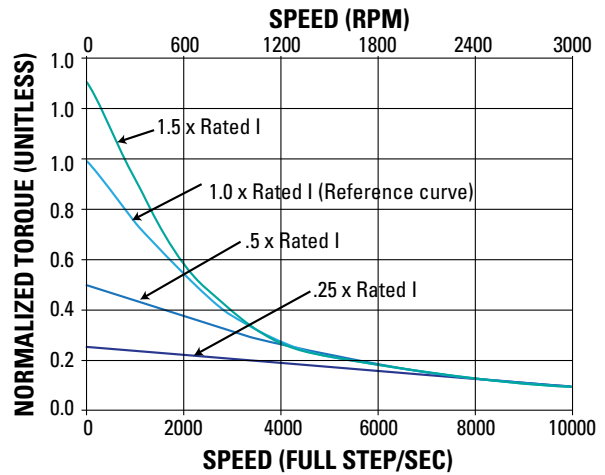


Figure 1

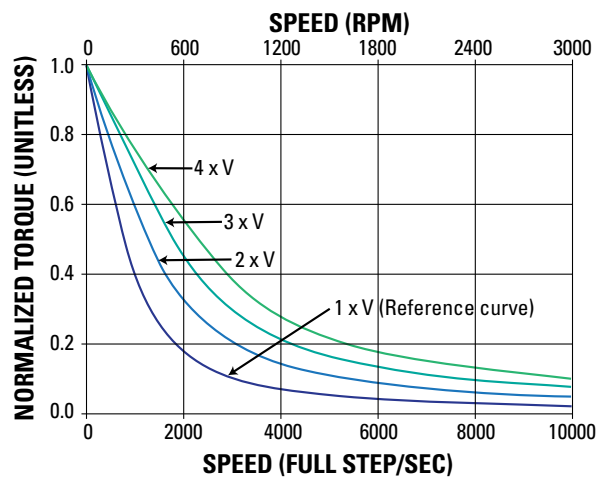


Figure 2

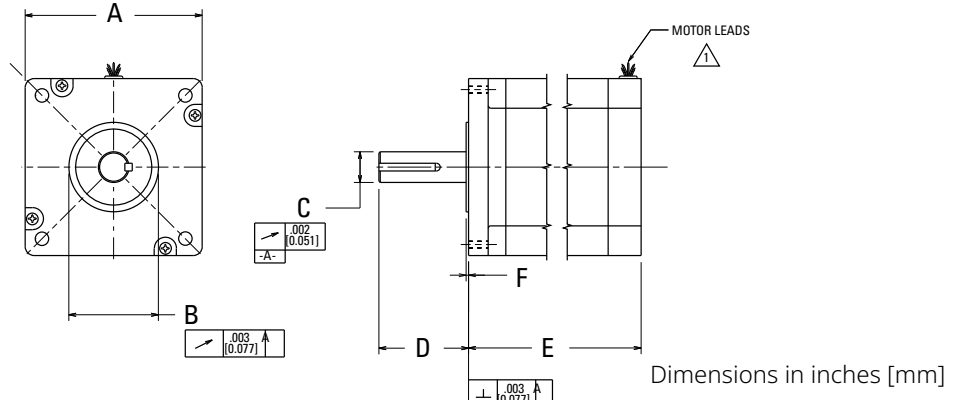
# Stepper Motor Application Worksheet

Company \_\_\_\_\_ Date \_\_\_\_\_

## MOTOR

circle or specify  
 Note: All motors are 1.8°, 2 Phase.

- Pilot Diameter
- Flange Width
- Max Motor Length



Dimensions in inches [mm]

### • STANDARD AND SPECIAL FEATURES

Motor model number from catalog:  
 \_\_\_\_\_

Circle whether you want standard or special features. If special, indicate details. Note that special features may result in increased price or leadtime.

#### • FRONT SHAFT (standard) (special)

- D shaft length \_\_\_\_\_ ± \_\_\_\_\_ (±.015)\*
- C shaft dia. \_\_\_\_\_ ± \_\_\_\_\_ (+.0000/- .0005)\*
- run out \_\_\_\_\_ (.002 std. ext.)\*

- **Straight Key** per electric motor standards (standard option) (special)

Key: width \_\_\_\_\_ height \_\_\_\_\_  
 length \_\_\_\_\_ other \_\_\_\_\_

- **Flat** See Fig. 1 (standard option) (special)

- Min. usable length X \_\_\_\_\_
- Dim. over flat Y \_\_\_\_\_ ± \_\_\_\_\_ (±.005)\*
- Corner radius R allowed \_\_\_\_\_ (±.060)\*
- Other \_\_\_\_\_

#### • REAR END BELL (standard) (special)

- mtg. hole B.C. \_\_\_\_\_ ± \_\_\_\_\_ (±.010)\*
- mtg. holes \_\_\_\_\_
- hole pattern \_\_\_\_\_
- other \_\_\_\_\_

#### • REAR SHAFT (standard) (special)

- shaft length \_\_\_\_\_ ± \_\_\_\_\_ (±.040)\*
- shaft dia. \_\_\_\_\_ ± \_\_\_\_\_ (+.0000/- .0005)\*
- run out \_\_\_\_\_ (.002)\*
- other \_\_\_\_\_

- **Woodruff Key** See Fig. 2 (standard option) (special)

- ANSI std. key no. \_\_\_\_\_ (Example 303)
- Key location Z \_\_\_\_\_ ± \_\_\_\_\_ (±.020)\*
- Other \_\_\_\_\_

FIGURE 1

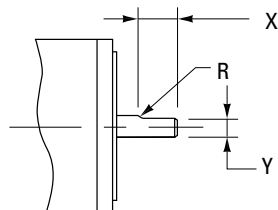
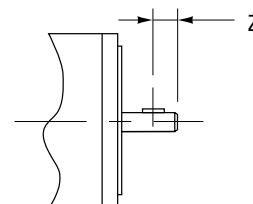


FIGURE 2



Notes:

- NEMA standard for shaft run out is .002" + .001" for each additional inch of extension past the standard length.
- \* Example of typical tolerance

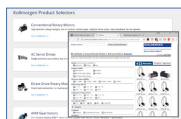


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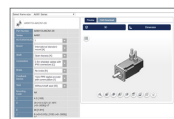
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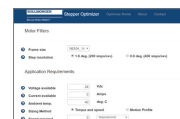
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## About Kollmorgen

Kollmorgen, a Regal Rexnord brand, has more than 100 years of motion experience, proven in the industry's highest-performing, most reliable motors, drives, linear actuators, AGV (Automated Guided Vehicle) control solutions, and automation control platforms. We deliver breakthrough solutions that combine exceptional performance, reliability and ease of use, giving machine builders an irrefutable marketplace advantage.

# **KOLLMORGEN**

A REGAL REXNORD BRAND

[www.kollmorgen.com](http://www.kollmorgen.com)

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