

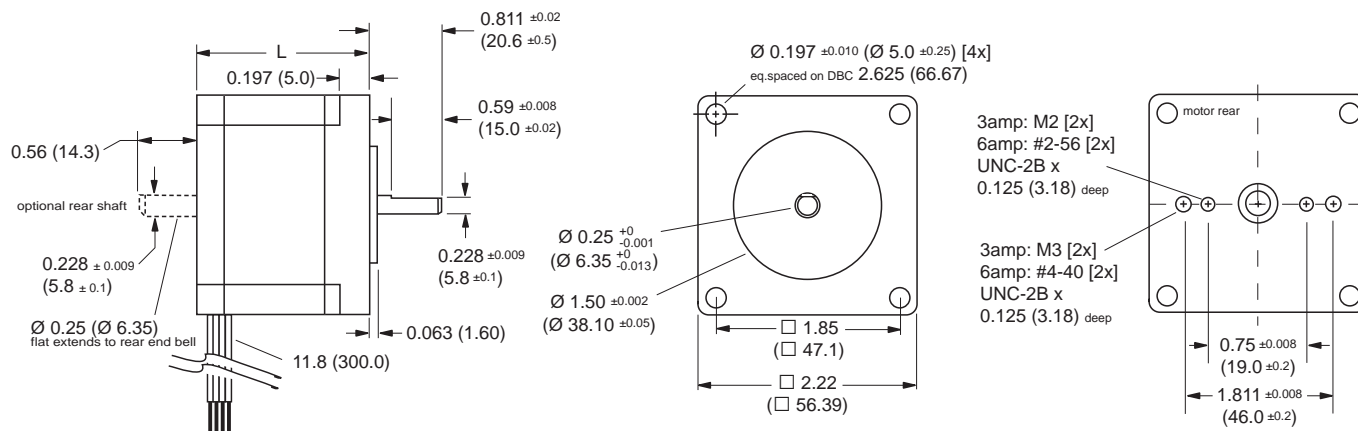
# NEMA23 stepper motors

## 1.8° 2-phase stepper motors



### Dimensions — NEMA23

Dimensions in inches (mm)



	L		
	2.4 amp motor	3.0 amp motor	6.0 amp motor
M-2218•	1.77 (45)	1.77 (45)	1.75 (44.5)
M-2226•	2.13 (54)	2.13 (54)	2.2 (56)
M-2231•	2.99 (76)	2.99 (76)	3.09 (79)

### Ambient conditions

Ambient temperature	°C	-25 ... +40
Max. installation height over m.s.l. without power loss	m	< 1000
Transport and storage temperature	°C	-25 ... +70
Relative humidity	%	15 ... 85, no condensation allowed
Thermal class		130 (B)

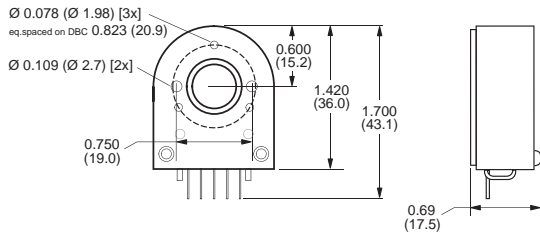
### Electrical and mechanical data

NEMA23		M-2218-2.4S	M-2222-2.4S	M-2231-2.4S	M-2218-3.0•	M-2222-3.0•	M-2231-3.0•	M-2218-6.0•	M-2222-6.0•	M-2231-6.0•
Stack length		single	double	triple	single	double	triple	single	double	triple
Phase current	amps	2.4	2.4	2.4	3.0	3.0	3.0	6.0	6.0	6.0
Holding torque	oz-in	90	144	239	90	144	239	100	150	257
	N-cm	64	102	169	64	102	169	71	106	181
Rotor inertia	oz-in-sec <sup>2</sup>	0.00255	0.00368	0.0065	0.00255	0.00368	0.0065	0.0017	0.00397	0.0068
	kg-cm <sup>2</sup>	0.18	0.26	0.46	0.18	0.26	0.46	0.12	0.28	0.48
Phase inductance	mH	2.4	4.0	5.4	1.5	2.6	3.36	0.47	0.73	1.04
Phase resistance	Ω	0.95	1.2	1.5	0.65	0.85	0.95	0.16	0.19	0.23
Weight	oz	16.9	21.2	35.3	16.9	21.2	35.3	16.6	24.7	35.3
	grams	480	600	1000	480	600	1000	470	700	1000

References							
<b>Example:</b>	<b>M</b>	<b>-</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>- 3.0 S</b>
<b>Motor type</b> M = stepper motor	<b>M</b>	-	2	2	2	2	- 3.0 S
<b>Flange size</b> 22 = NEMA23 (57 mm)	M	-	2	2	2	2	- 3.0 S
<b>Motor length</b> 18 = single stack 22 = double stack 31 = triple stack	M	-	2	2	2	2	- 3.0 S
<b>Phase current</b> 2.4 = 2.4 amp (1) 3.0 = 3.0 amp 6.0 = 6.0 amp	M	-	2	2	2	2	- 3.0 S
<b>Shaft</b> S = single shaft D = double shaft (1)							S
<b>Optional encoder (1)</b> Selecting the encoder option replaces the shaft designator in the part number  ES = single-end optical encoder ED = differential optical encoder  100 = line count 200 = line count 250 = line count 400 = line count 500 = line count 1000 = line count							ES100

(1) Double shaft and encoder option are unavailable with 2.4amp NEMA23 motors.

Dimensions in inches (mm)



Encoders		
Optical encoder	ES• (single-end)	ED• (differential)
Number of signals	3	5
Line counts (1)	100, 200, 250, 400, 500 or 1000	100, 200, 250, 400, 500 or 1000
Mating cable part #	ES-CABLE-2 (2)	ED-CABLE-6
Mating cable lengths feet (m)	1.0 (0.3)	6.0 (1.8)

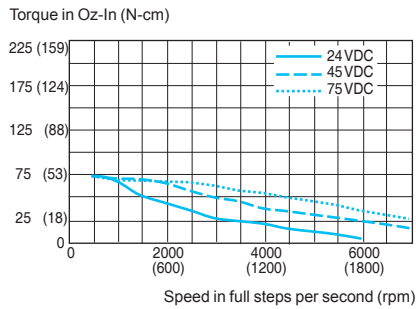
(1) All encoders have an index mark, except the 1000 line count version.  
 (2) Mating cable is not included and must be ordered separately.

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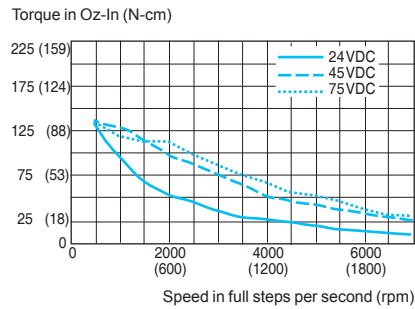
## 1.8° 2-phase

### Speed-torque curves

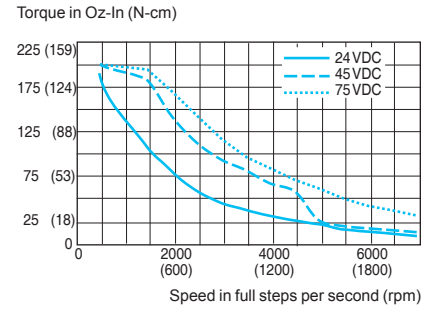
**M-2218-2.4S**



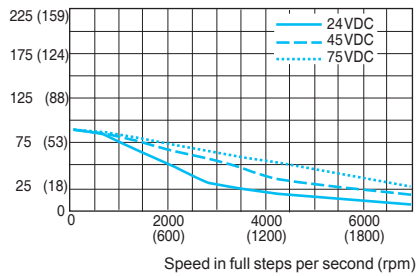
**M-2222-2.4S**



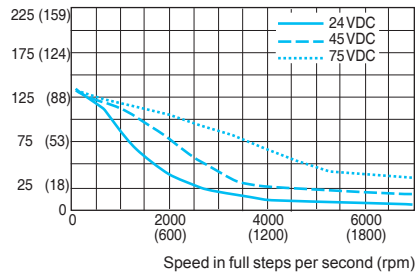
**M-2231-2.4S**



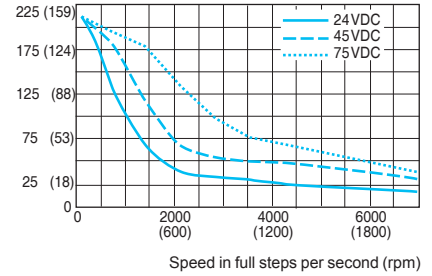
**M-2218-3.0•**



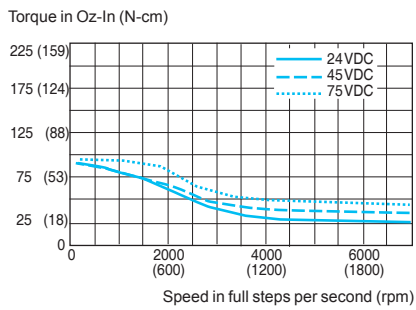
**M-2222-3.0•**



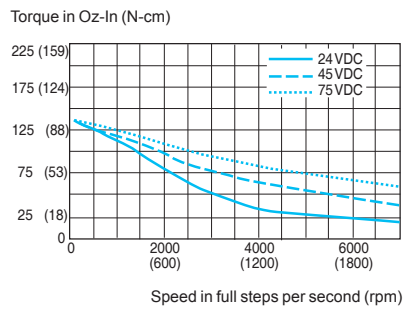
**M-2231-3.0•**



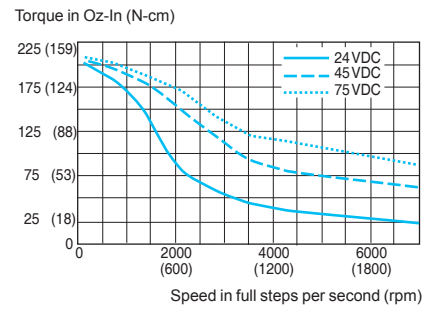
**M-2218-6.0•**







**M-2222-6.0•**



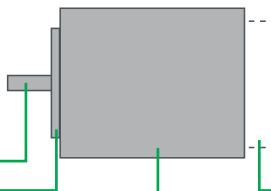
**M-2231-6.0•**



### Complete product offer

2-phase stepper motors		M-11•	M-14•	M-17•	M-22•	M-34•
						
Size	NEMA	11	14	17	23	34
Holding torque	oz-in	13 ... 24	10	32 ... 75	90 ... 239	408 ... 1090
	N-cm	9 ... 17	7	23 ... 53	64 ... 169	288 ... 770
Number of full steps per revolution		200				
Step angle α		° 1.8				
Motor connection		pluggable connector		4 flying leads		

### Motor types



Shaft version	Centering collar		Flange size		Lengths without shaft		Winding	Motor connection	Optional rear shaft (1)	Optional encoder		
	inches	mm	inches	mm	inches	mm						
<b>M-11•</b>												
Round shaft with single flat feature	Ø 0.197	Ø 5.0	Ø 0.866	Ø 22	0.65	16.5	1.22 1.57 2.01	31 40 51	2-phase full coil for bi-polar operation	pluggable connector	Round shaft	1000-line differential
<b>M-14•</b>												
Round shaft with single flat feature	Ø 0.197	Ø 5.0	Ø 0.866	Ø 22	1.39	35.3	1.02	26	2-phase full coil for bi-polar operation	4 flying leads	Round shaft	Single-end or differential
<b>M-17•</b>												
Round shaft with single flat feature	Ø 0.197	Ø 5.0	Ø 0.866	Ø 22	1.67	42.3	1.34 1.57 1.89	34 40 48	2-phase full coil for bi-polar operation	4 flying leads	Flat feature extending to rear end bell	Single-end or differential
<b>M-22•</b>												
Round shaft with single flat feature	Ø 0.25	Ø 6.35	Ø 1.50	Ø 38	2.22	56.4	1.77 2.13 2.99	45 54 76	2-phase full coil for bi-polar operation	4 flying leads	Flat feature extending to rear end bell (2)	Single-end or differential
<b>M-34•</b>												
Round shaft with single flat feature	Ø 0.554	Ø 14.0	Ø 2.874	Ø 73	3.386	86.0	2.48 3.15 4.72	63 80 120	2-phase full coil for bi-polar operation	4 flying leads	Flat feature on round shaft	Single-end or differential

(1) Optional rear shaft available except for NEMA23 2.4amp motors.  
 (2) Optional rear shaft on NEMA23 6.0amp motors is round without a flat feature.