Stepper Motors

1.8° 2-phase stepper motors

NEMA 14, 17, 23 and 34
1.8° 2-phase stepper motors

Schneider Electric

Contents

Stepper motors

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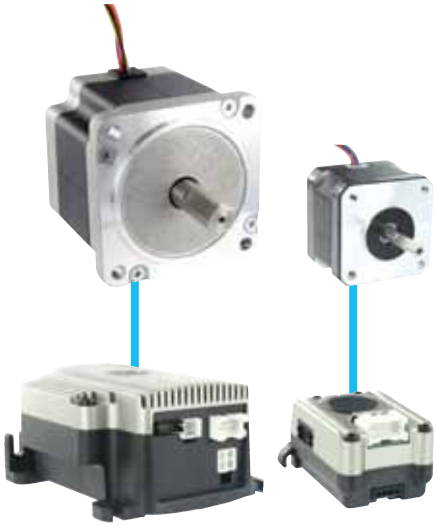
1.8° 2-phase



Stepper motors with MForce drives

Presentation

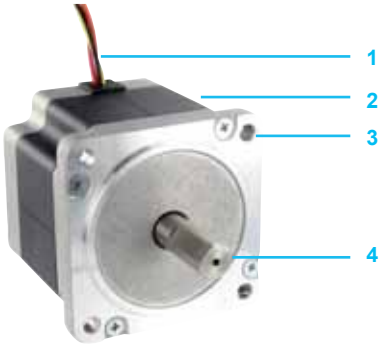
The 2-phase stepper motors from Schneider Electric Motion USA are extremely robust, maintenance-free motors. They carry out precise step-by-step movements that are controlled by a stepper motor drive, such as MForce, to comprise a stepper motor drive system.

The 2-phase stepper motors can be operated at very high resolutions, depending on the stepper motor drive. Maximum power can only be obtained if motor and electronics are perfectly tuned to each other.

Special features

Quiet
As a result of the special mechanical design of the motors and the sine commutation of the MForce drives, the stepper motors are very quiet and run virtually without resonance.

Strong
The optimized internal geometry of the motor ensures a high power density.



Description

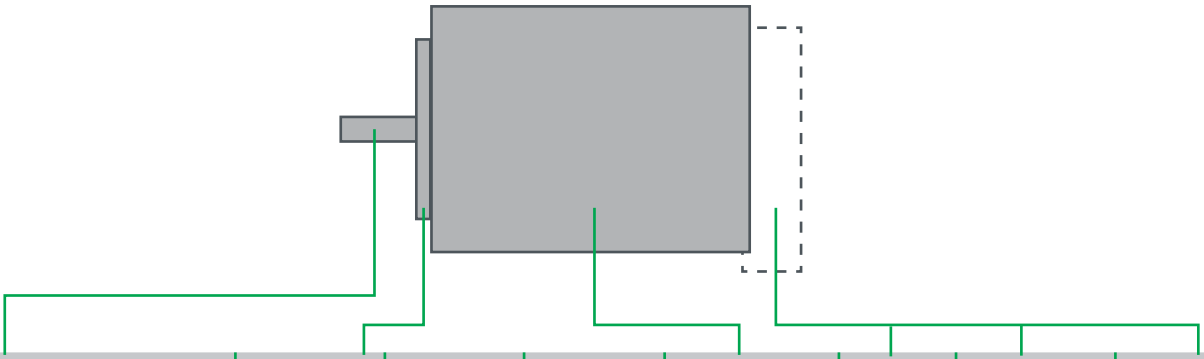
1 Motor connection, flying leads
2 Housing, with black protective coating
3 Axial flange with four mounting points as per NEMA motor standards
4 Smooth shaft end

Stepper motors
1.8° 2-phase

Product offer

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

Motor types



Shaft version			Centering collar		Flange size		Lengths without shaft		Winding	Motor connection	Optional rear shaft *(1)*	Optional encoder
M-14•	inches	mm	inches	mm	inches	mm	inches	mm				
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
M-17•												
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
M-22•												
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
M-34•												
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.

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

NEMA14		**M-1410-0.75•**
Stack length		single
Phase current	**amps**	0.75
Holding torque	**oz-in**	10
	N-cm	7
Rotor inertia	**oz-in-sec²**	0.00017
	kg-cm²	0.012
Phase inductance	**mH**	4.0
Phase resistance	Ω	4.3
Weight	oz	4.2
	grams	120

NEMA17		**M-1713-1.5•**	**M-1715-1.5•**	**M-1719-1.5•**
Stack length		single	double	triple
Phase current	**amps**	1.5	1.5	1.5
Holding torque	**oz-in**	32	60	75
	N-cm	23	42	53
Rotor inertia	**oz-in-sec²**	0.000538	0.0008037	0.0011562
	kg-cm²	0.038	0.057	0.082
Phase inductance	**mH**	2.1	5.0	3.85
Phase resistance	Ω	1.3	2.1	2.0
Weight	oz	7.4	8.1	12.7
	grams	210	230	360

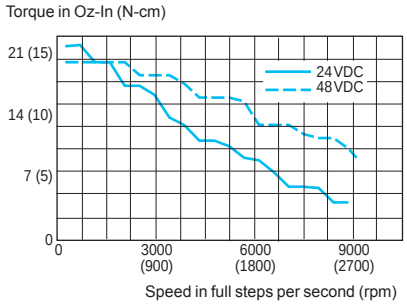
NEMA23		**M-2218-2.4S**	**M-2222-2.4S**	**M-2231-2.4S**	**M-2218-3.0•**	**M-2222-3.0•**	**M-2231-3.0•**	**M-2218-6.0•**	**M-2222-6.0•**	**M-2231-6.0•**
Stack length		single	double	triple	single	double	triple	single	double	triple
Phase current	**amps**	2.4	2.4	2.4	3.0	3.0	3.0	6.0	6.0	6.0
Holding torque	**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-sec²**	0.00255	0.00368	0.0065	0.00255	0.00368	0.0065	0.0017	0.00397	0.0068
	kg-cm²	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

NEMA34		**M-3424-6.3•**	**M-3431-6.3•**	**M-3447-6.3•**
Stack length		single	double	triple
Phase current	**amps**	6.3	6.3	6.3
Holding torque	**oz-in**	408	574	1090
	N-cm	288	405	770
Rotor inertia	**oz-in-sec²**	0.01275	0.01924	0.03849
	kg-cm²	0.90	1.35	2.70
Phase inductance	**mH**	1.9	3.3	6.2
Phase resistance	Ω	0.30	0.32	0.56
Weight	oz	60.0	84.7	141.1
	grams	1700	2400	4000

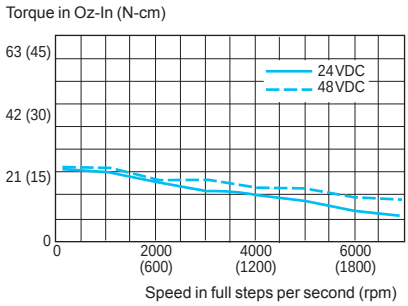
Stepper motors
1.8° 2-phase

Speed-torque curves

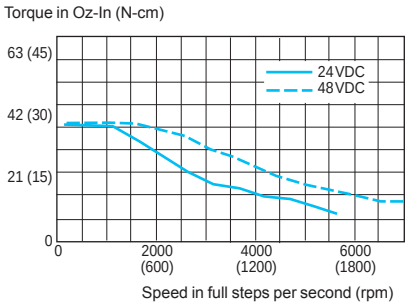
M-1410-0.75•



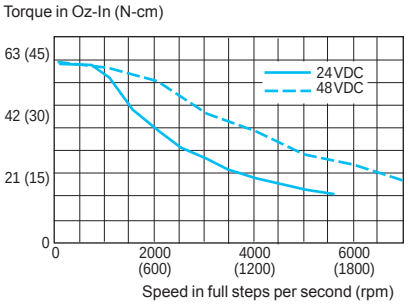
M-1713-1.5•



M-1715-1.5•



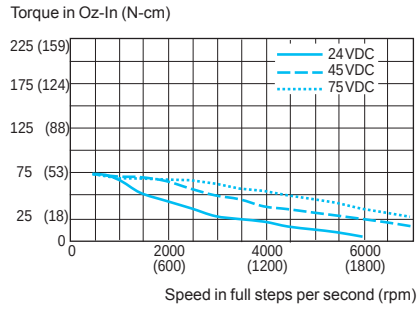
M-1719-1.5•



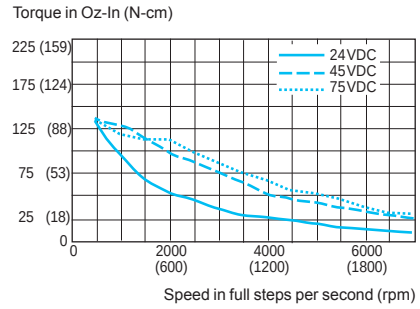
Stepper motors
1.8° 2-phase

Speed-torque curves

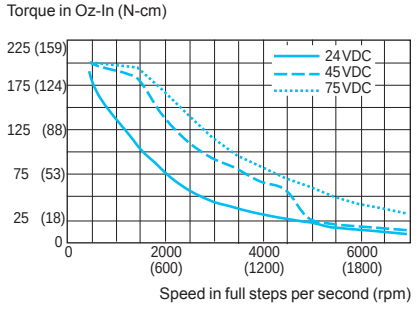
M-2218-2.4S



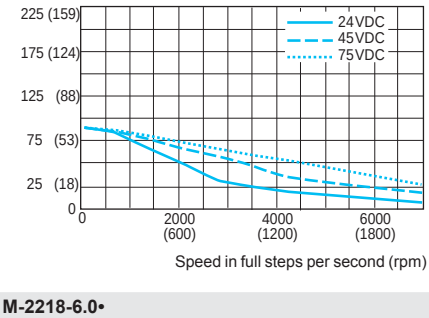
M-2222-2.4S



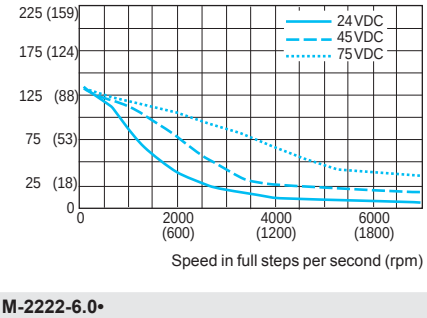
M-2231-2.4S



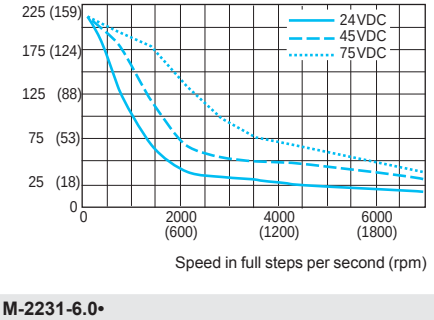
M-2218-3.0•



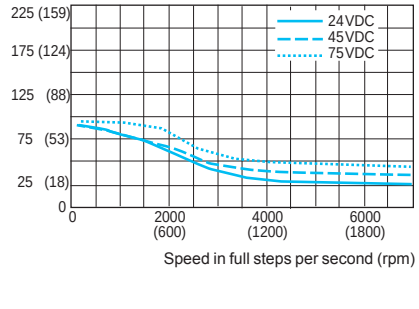
M-2222-3.0•



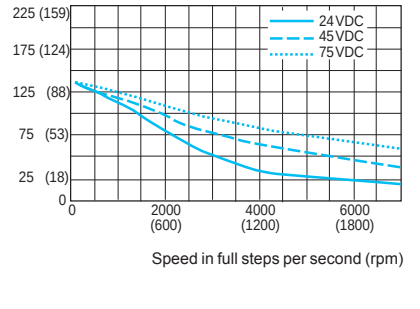
M-2231-3.0•



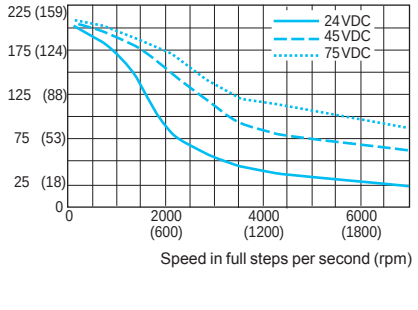
M-2218-6.0•



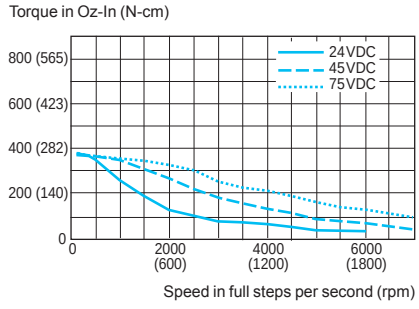
M-2222-6.0•



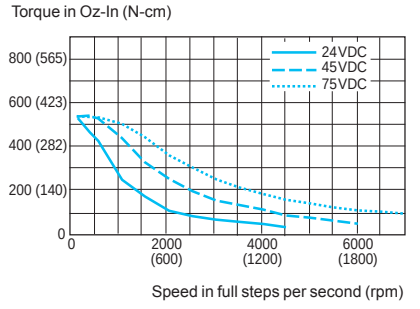
M-2231-6.0•



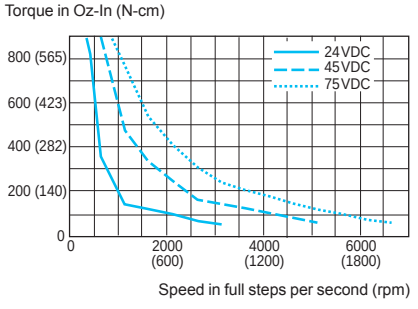
M-3424-6.3•



M-3431-6.3•



M-3447-6.3•



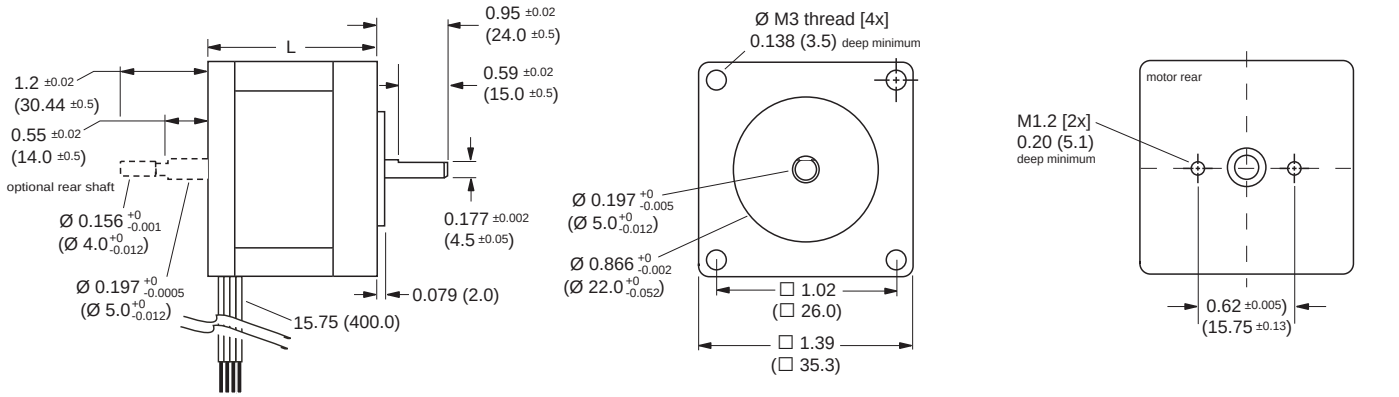
Stepper motors
1.8° 2-phase

References

Example:	M -	1	4	1	0	- 0.7 5	S
Motor type **M** = stepper motor	**M -**	1	4	1	0	- 0.7 5	S
Flange size **14** = NEMA14 (36 mm) **17** = NEMA17 (42 mm) **23** = NEMA23 (57 mm) **34** = NEMA34 (85 mm)	M -	**1**	**4**	1	0	- 0.7 5	S
Motor length **10** = NEMA14 single stack **13** = NEMA17 single stack **15** = NEMA17 double stack **19** = NEMA17 triple stack **18** = NEMA23 single stack **22** = NEMA23 double stack **31** = NEMA23 triple stack **24** = NEMA34 single stack **31** = NEMA34 double stack **47** = NEMA34 triple stack	M -	1	4	**1**	**0**	- 0.7 5	S
Phase current **0.75** = NEMA14 0.75 amp **1.5** = NEMA17 1.5 amp **2.4** = NEMA23 2.4 amp **3.0** = NEMA23 3.0 amp **6.0** = NEMA23 6.0 amp **6.3** = NEMA34 6.3 amp	M -	1	4	1	0	**- 0.7 5**	S
Shaft **S** = single shaft **D** = double shaft *(1)*							**S**
Optional encoder *(2)* Selecting the encoder option replaces the shaft designator in the part number **ES** = single-end optical encoder with index mark *(3)* **ED** = differential optical encoder with index mark *(3)* **100** = line count **200** = line count **250** = line count **400** = line count **500** = line count **1000** = line count *(3)*							**ES100**

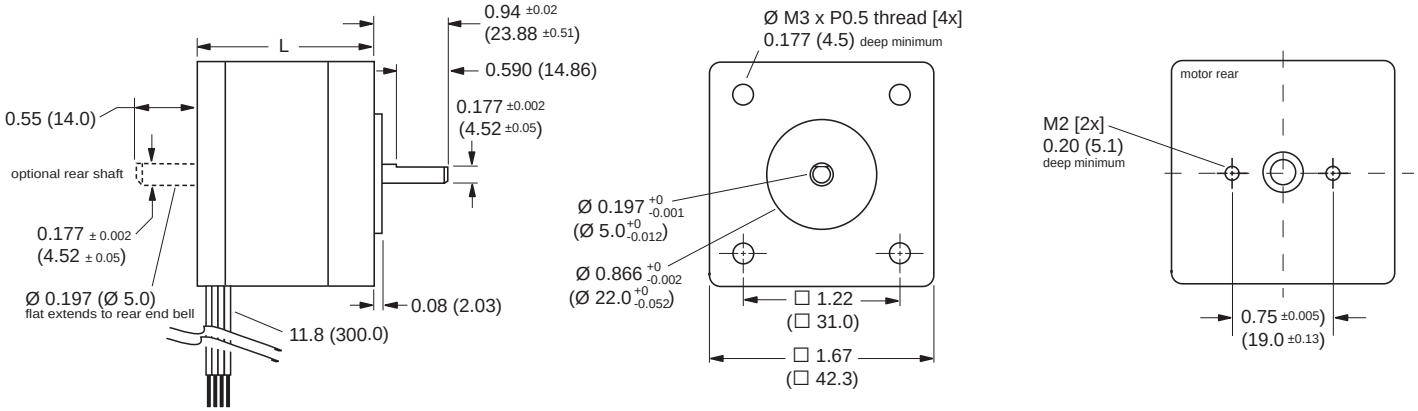
(1) Not available with 2.4amp NEMA23 motors.
(2) Not available for NEMA14 motors.
(3) All encoders have an index mark, except the 1000 line count version.

NEMA14, dimensions in inches (mm)



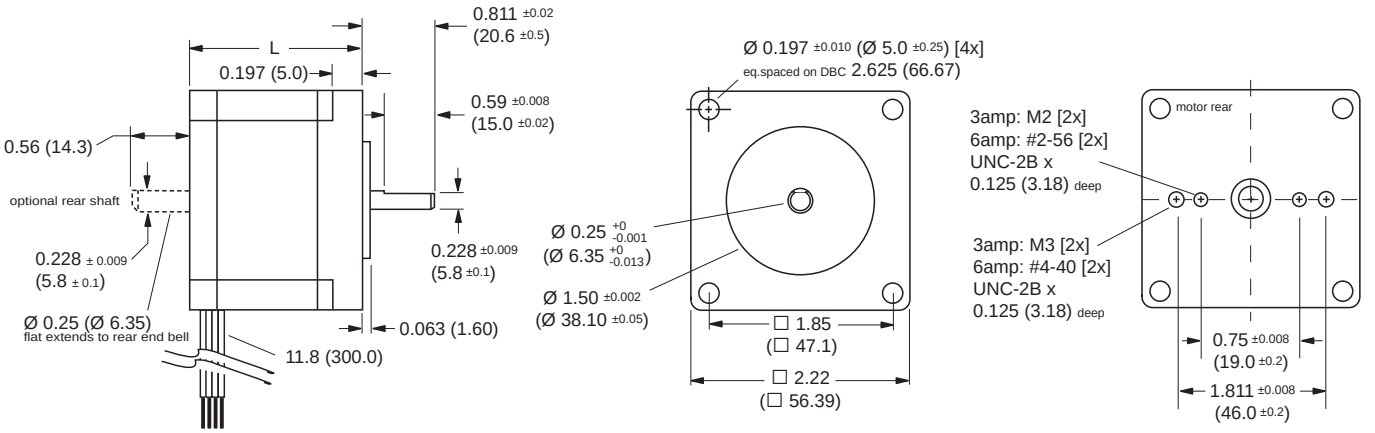
	L
M-1410-0.75•	1.02 (26)

NEMA17, dimensions in inches (mm)



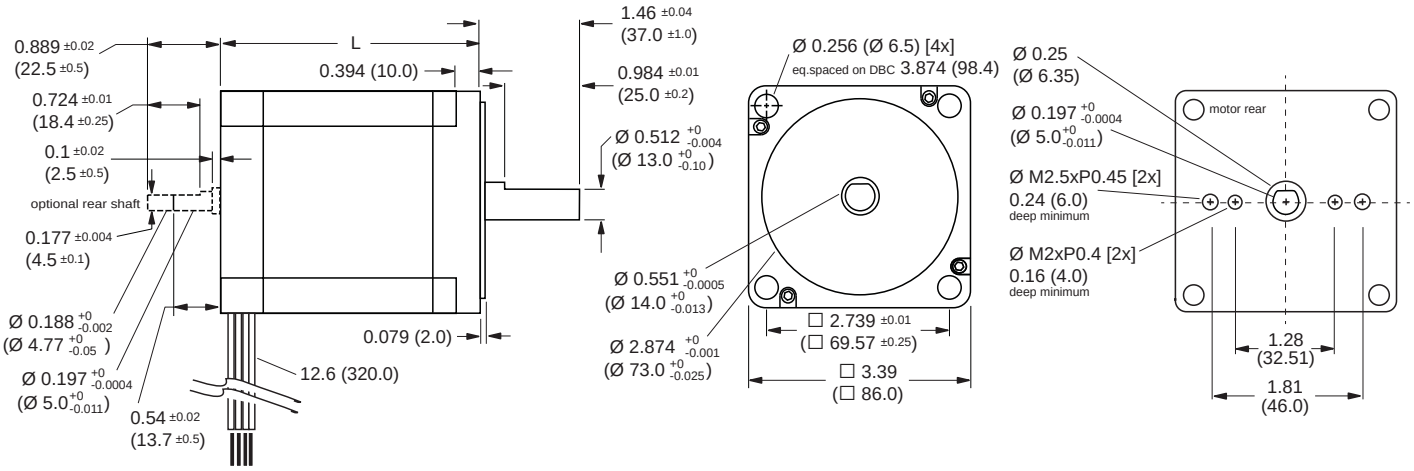
	L
M-1713-1.5•	1.34 (34)
M-1715-1.5•	1.57 (40)
M-1719-1.5•	1.89 (48)

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)

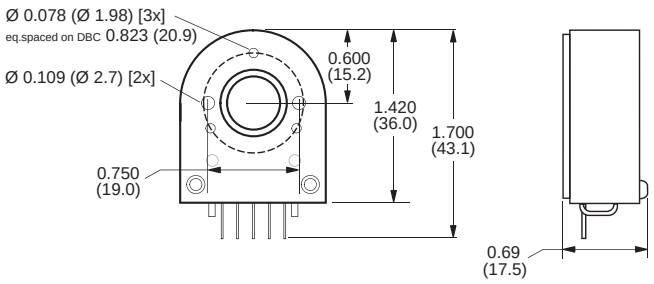
NEMA34, dimensions in inches (mm)



	L
M-3424-6.3•	2.48 (63)
M-3431-6.3•	3.15 (80)
M-3447-6.3•	4.72 (120)

Stepper motors
Encoders

Optical encoder, dimensions in inches (mm)



Encoder type	single-end	differential
Number of signals	3	5
Line counts	100, 200, 250, 400, 500 or 1000 *(1)*	

(1) All encoders have an index mark, except the 1000 line count version.

Encoder cables *(2)*	**Length feet (m)**	**Part number**
Pre-wired mating connector with other cable end open.		
■ For single-end optical encoder	1.0 (0.3)	**ES-CABLE-2**
■ For differential optical encoder	6.0 (1.8)	**ED-CABLE-6**

(2) Cable is not included with single-end encoders and must be ordered separately. Cable is included with differential encoders.

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