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CONVENTIONAL HYBRIDS

NEMA 23, 34 and 42 Frames



The H and E Series are both high efficiency, low loss hybrid step motors in conventional (round frame) configurations.

For increased torque and acceleration, E Series general purpose motors feature our patented Sigmax® technology.

Both H and E Series motors provide the high speed capability required for rapid traverse applications.

AGENCY APPROVAL

All NEMA 34 and 42 frame motors are UL 1004 recognized (E61960); Class B motor insulation (File E103510).

STANDARD OPTIONS

Our general purpose hybrid steppers allow you to tailor a motor to your in-plant or OEM application.

Select from terminal board connections (via conduit), MS connectors or flying lead connections in waterproof or standard enclosures. Options include shaft keyways or flats, oversized drive shaft, rear shaft extensions and various encoder options. Bipolar or unipolar phase sequencing is also available.

WIDE RANGE OF WINDINGS

General purpose step motors are available with a wide range of windings.

Use our A through E windings to duplicate or improve upon existing motor performance. They will directly replace a large number of OEM catalog step motors.

T and P windings are offered to optimize performance. T windings generate maximum low end torque, while P windings deliver an edge in torque at higher speeds.

FEATURES	BENEFITS
Torque Production Over Wide Speed Range	High quality, long life motor
Extensive Selection of Shaft, End Bell, Termination, Encoder, and Splashproof Options	An array of options to meet your needs
UL Recognized Models	Safety and acceptability
Wide Range of Industry and Standard Winding Configurations	Match motor performance to your application
Sigmax® Technology	Flux focusing increases torque
NEMA 23, 34, and 42 Frames	Broad selection to meet your application specific requirements
Two Year Warranty	High quality, dependable operation

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CONVENTIONAL HYBRID SELECTION OVERVIEW

General Purpose Conventional Hybrids		NEMA 23 (2.3" square frame) Holding torque range oz-in. (Nm)	Page	NEMA 34 (3.4" square frame) Holding torque range oz-in. (Nm)	Page	NEMA 42 (4.2" square frame) Holding torque range oz-in. (Nm)	Page
E Series-Sigmax® technology	1 stack	85-126 (0.60-0.89)	58	223-349 (1.58-1.90)	62	957-1378 (6.76-9.73)	69
	2 stacks	148-225 (1.05-1.59)	59	443-676 (3.13-4.75)	63	1805-2698 (12.75-19.06)	70
	3 stacks			656-995 (4.63-5.40)	63	2667-3958 (18.84-27.95)	71
	4 stacks			879-1300 (6.21-9.18)	64		
H-Series-standard hybrid	1/2 stack	36-51 (0.25-0.36)	58				
	1 stack	59-87 (0.41-0.61)	58	158-186 (1.21-1.71)	62	585-839 (4.13-5.93)	69
	2 stacks	103-156 (0.73-1.10)	59	314-471 (2.22-3.32)	63	1118-1652 (7.90-11.66)	70
	3 stacks			466-698 (3.29-4.93)	64	1529-2651 (10.80-18.72)	71
	4 stacks			624-916 (4.41-6.47)	64		
Special Purpose Conventional Hybrids							
E"J" Series-Sigmax technology-low inertia rotor	1 stack	77-108 (0.54-0.77)	75				
	2 stacks	139-196 (0.98-1.39)	75				
H"J" Series-standard hybrid-low inertia rotor	1 stack	54-77 (0.38-0.54)	75				
	2 stacks	99-141 (0.70-0.99)	75				

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CONVENTIONAL HYBRID STEP MOTORS INDEX

How to use this section

This section of the catalog deals with our extensive line of high performance hybrid step motors. If you need application assistance, please refer to pages 6 - 9. Our Selection Overview on page 30 will also prove helpful in finding the right step motor family for your application.

Or use the index at right to quickly locate information on the NEMA 23, 34, or 42 frame hybrid step motor that is best suited to your application.

General Purpose NEMA 23 Frame

Model Number Code	Page 55
Ratings & Characteristics	Page 58-59
Mounting Dimensions	Page 60
Connection Information	Page 76-78
Encoder Options	Page 79

General Purpose NEMA 34 Frame

Model Number Code	Page 61
Ratings & Characteristics	Page 62-64
Mounting Dimensions	Page 65-67
Connection Information	Page 76-78
Encoder Options	Page 80

General Purpose NEMA 42 Frame

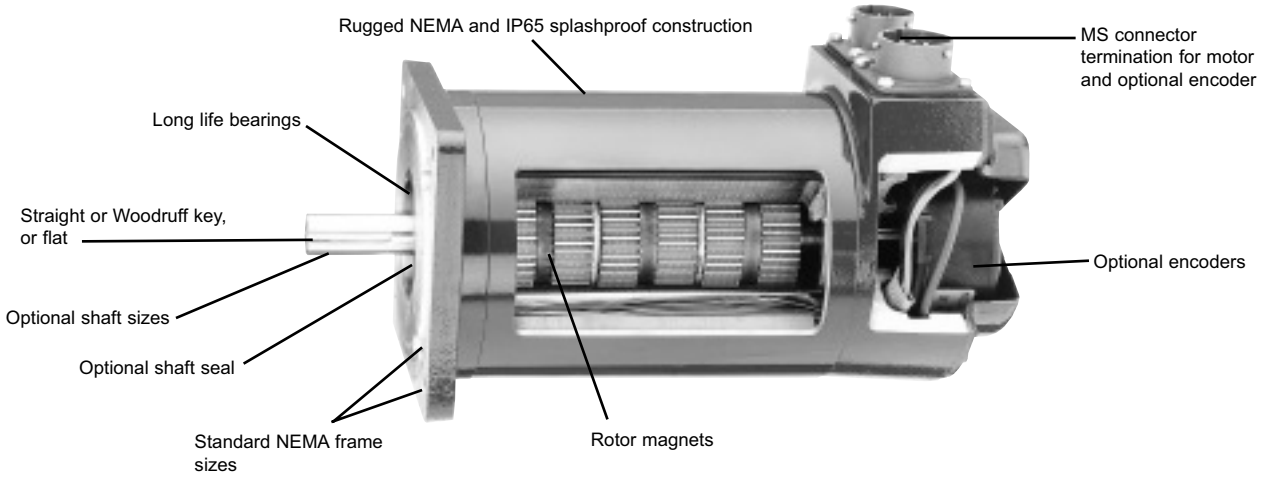
Model Number Code	Page 68
Ratings & Characteristics	Page 69-71
Mounting Dimensions	Page 72
Connection Information	Page 76-78
Encoder Options	Page 80

Special Purpose - NEMA 23 Frame

Model Number Code	Page 73
Ratings & Characteristics	Page 75

Technical Data

Page 76-81

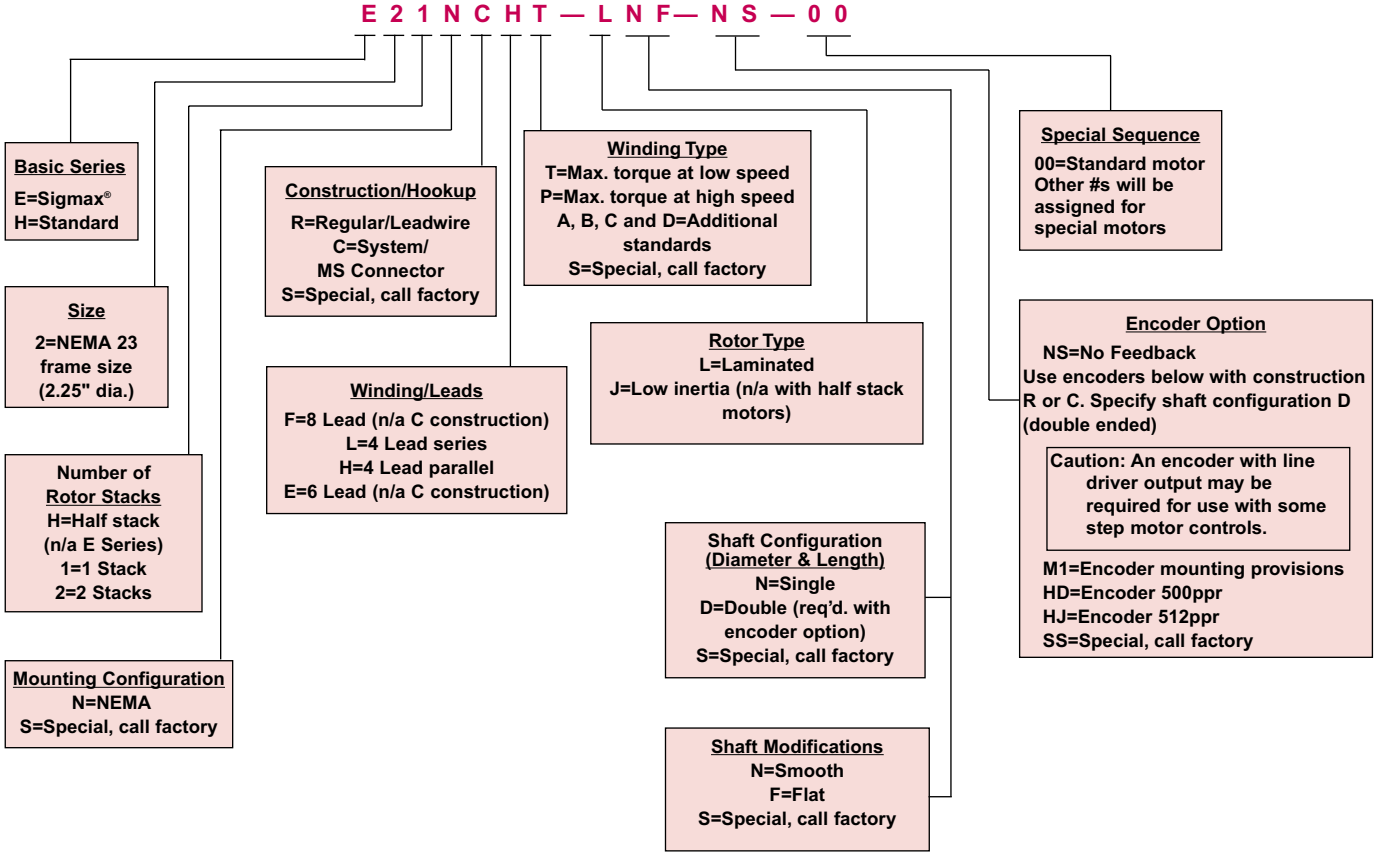


Sigmax® technology adds flux concentrating rare earth stator magnets for highest torque and acceleration

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GENERAL PURPOSE—CONVENTIONAL HYBRIDS
NEMA 23 FRAME (2.3" Dia.)

MODEL NUMBER CODE



The example model number above indicates an E series (Sigmax®) NEMA 23 frame motor with a one stack rotor. This motor is equipped with an MS connector on the end of a 12 inch cable for power, a bipolar parallel connection, a maximum torque at low speed winding and a single ended shaft with a flat.

HOW TO ORDER

Review the Motor Model Number code to assure that all options are designated. Connections, encoders and phasing diagrams start on page 76. Motor dimensions are on page 60.

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GENERAL PURPOSE—CONVENTIONAL HYBRIDS

NEMA 23 FRAME (2.3" Dia.)—Ratings and Characteristics

Review the Model Number Code, page 55, to assure that all options are designated. Connections, encoders and phasing diagrams start on page 76. Motor dimensions are on page 60. In addition to those below, motors with characteristics for specific performance requirements are offered. Contact factory for more details.

Rated currents are in descending order	Motor Model Number △1	Connection △2 Parallel	Connection △2 Series	Connection △2 Unipolar	Holding Torque △3 (2 phases on) oz-in (Nm) ±10%	Rated Current/ Phase △4 (amps DC)	Phase Resistance (ohms) ±10%	Phase Inductance △5 (mH) Typical	Detent Torque oz-in (Nm)	Thermal Resistance △6 (°C/watt)	Rotor Inertia oz-in-S² (kgm² x 10⁻³)	Weight lbs (kg)
Torque range: 36-51 oz-in. .25-.36 Nm **STANDARD H2H Series 1/2 rotor stack**	H2HNXHA-LXX-XX-00	•			51 (0.36)	4.9	0.22	0.5	1.6 (0.011)	7.1	0.0010 (0.007)	0.9 (0.41)
	H2HNXLA-LXX-XX-00		•		51 (0.36)	2.4	0.79	2.0				
	H2HNXEA-LXX-XX-00			•	36 (0.26)	3.5	0.41	0.5				
	H2HNXHT-LXX-XX-00	•			50 (0.36)	2.5	0.75	1.8				
	H2HNXLT-LXX-XX-00		•		50 (0.36)	1.26	2.89	7.3				
	H2HNXET-LXX-XX-00			•	36 (0.25)	1.78	1.46	1.8				
	H2HNXHB-LXX-XX-00	•			51 (0.36)	2.4	0.79	2.0				
	H2HNXLB-LXX-XX-00		•		51 (0.36)	1.22	3.05	8.1				
	H2HNXEB-LXX-XX-00			•	36 (0.26)	1.73	1.54	2.0				
Torque range: 85-126 oz-in. .60-.89 Nm **SIGMAX® E21 Series 1 rotor stack**	E21NXHC-LXX-XX-00	•			120 (0.85)	5.8	0.19	0.5	4.8 (0.034)	6.0	0.0015 (0.011)	1.2 (0.55)
	E21NXLC-LXX-XX-00		•		120 (0.85)	2.9	0.67	1.9				
	E21NXEC-LXX-XX-00			•	85 (0.60)	4.1	0.35	0.5				
	E21NXHA-LXX-XX-00	•			126 (0.89)	5.4	0.20	0.6				
	E21NXLA-LXX-XX-00		•		126 (0.89)	2.7	0.76	2.5				
	E21NXEA-LXX-XX-00			•	89 (0.63)	3.8	0.40	0.6				
	E21NXHT-LXX-XX-00	•			123 (0.87)	2.8	0.72	2.2				
	E21NXLT-LXX-XX-00		•		123 (0.87)	1.39	2.8	8.7				
	E21NXET-LXX-XX-00			•	87 (0.61)	1.97	1.42	2.2				
	E21NXHB-LXX-XX-00	•			123 (0.87)	1.41	2.73	8.5				
	E21NXLB-LXX-XX-00		•		123 (0.87)	0.71	10.8	33.9				
	E21NXEB-LXX-XX-00			•	87 (0.61)	1.0	5.42	8.5				
Torque range: 59-87 oz-in. .41-.61 Nm **STANDARD H21 Series 1 rotor stack**	H21NXHC-LXX-XX-00	•			83 (0.58)	5.8	0.19	0.6	2.8 (0.02)	6.0	0.0015 (0.011)	1.2 (0.55)
	H21NXLC-LXX-XX-00		•		83 (0.58)	2.9	0.67	2.2				
	H21NXEC-LXX-XX-00			•	59 (0.41)	4.1	0.35	0.6				
	H21NXHA-LXX-XX-00	•			87 (0.61)	5.4	0.21	0.7				
	H21NXLA-LXX-XX-00		•		87 (0.61)	2.7	0.76	2.9				
	H21NXEA-LXX-XX-00			•	61 (0.43)	3.8	0.40	0.7				
	H21NXHT-LXX-XX-00	•			85 (0.60)	2.8	0.72	2.5				
	H21NXLT-LXX-XX-00		•		85 (0.60)	1.39	2.8	10.2				
	H21NXET-LXX-XX-00			•	60 (0.42)	1.97	1.42	1.42				
	H21NXHB-LXX-XX-00	•			84 (0.60)	1.41	2.73	9.9				
	H21NXLB-LXX-XX-00		•		84 (0.60)	0.71	10.8	39.5				
	H21NXEB-LXX-XX-00			•	60 (0.42)	1.0	5.42	9.9				

All ratings typical and at 25°C unless otherwise noted.

△1 An "X" in the Model Number Code indicates an undefined option. Colored letter indicates winding. See How to Order and Model Number Code on page 55.

△2 Motor connections are determined by the Windings/Leads designation in the Model Number Code on page 55. Note that the F designation, although not shown in the above tables, is an 8-lead option...see Terminations, page 76. In addition to the lead wire termination, terminal board and MS connector hookup for parallel, series or unipolar operation is also available.

△3 With rated current applied. Windings at 130°C and motor unmounted and in still air at 40°C (without heat sink).

△4 Windings at 130°C and motor in still air at 40°C (without heat sink). Operation of these motors above rated current may cause demagnetization. Contact factory.

△5 Small signal inductance as measured with impedance bridge at 1kHz, 1 amp.

△6 Thermal resistance measured with motor hanging in still air (unmounted).

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GENERAL PURPOSE—CONVENTIONAL HYBRIDS

NEMA 23 FRAME (2.3" Dia.)—Ratings and Characteristics

Review the Model Number Code, page 55, to assure that all options are designated. Connections, encoders and phasing diagrams start on page 76. Motor dimensions are on page 60. In addition to those below, motors with characteristics for specific performance requirements are offered. Contact factory for more details.

Rated currents are in descending order	Motor Model Number △1	Connection △2 Parallel	Connection △2 Series	Connection △2 Unipolar	Holding Torque △3 (2 phases on) oz-in (Nm) ±10%	Rated Current/ Phase △4 (amps DC)	Phase Resistance (ohms) ±10%	Phase Inductance △5 (mH) Typical	Detent Torque oz-in (Nm)	Thermal Resistance △6 (°C/watt)	Rotor Inertia oz-in-S² (kgm² x 10⁻³)	Weight lbs (kg)
Torque range: 148-225 oz-in. 1.05-1.59 Nm **SIGMAX® E22 Series 2 rotor stacks**	E22NXHP-LXX-XX-00	•			210 (1.48)	6.7	0.19	0.5	9.6 (0.068)	4.4	0.0031 (0.022)	2.1 (0.95)
	E22NXLP-LXX-XX-00		•		210 (1.48)	3.4	0.68	2.1				
	E22NXEP-LXX-XX-00			•	148 (1.05)	4.7	0.35	0.5				
	E22NXHC-LXX-XX-00	•			218 (1.54)	6.4	0.21	0.6				
	E22NXLC-LXX-XX-00		•		218 (1.54)	3.2	0.73	2.5				
	E22NXEC-LXX-XX-00			•	154 (1.09)	4.5	0.38	0.6				
	E22NXHT-LXX-XX-00	•			223 (1.58)	5.0	0.33	1.1				
	E22NXLT-LXX-XX-00		•		223 (1.58)	2.5	1.2	4.5				
	E22NXET-LXX-XX-00			•	158 (1.12)	3.5	0.62	1.1				
	E22NXHB-LXX-XX-00	•			225 (1.59)	3.1	0.79	2.9				
	E22NXLB-LXX-XX-00		•		225 (1.59)	1.6	3.07	11.8				
	E22NXEB-LXX-XX-00			•	159 (1.12)	2.2	1.55	2.9				
	E22NXHD-LXX-XX-00	•			225 (1.59)	2.4	1.25	4.7				
	E22NXLD-LXX-XX-00		•		225 (1.59)	1.22	4.91	19.0				
	E22NXED-LXX-XX-00			•	159 (1.12)	1.72	2.47	4.7				
Torque range: 103-156 oz-in. .73-1.10 Nm **STANDARD H22 Series 2 rotor stacks**	H22NXHP-LXX-XX-00	•			146 (1.03)	6.7	0.19	0.6	4.6 (0.032)	4.4	0.0031 (0.022)	2.1 (0.95)
	H22NXLP-LXX-XX-00		•		146 (1.03)	3.4	0.68	2.4				
	H22NXEP-LXX-XX-00			•	103 (0.73)	4.7	0.35	0.6				
	H22NXHC-LXX-XX-00	•			151 (1.07)	6.4	0.21	0.7				
	H22NXLC-LXX-XX-00		•		151 (1.07)	3.2	0.73	2.9				
	H22NXEC-LXX-XX-00			•	107 (0.75)	4.5	0.38	0.7				
	H22NXHT-LXX-XX-00	•			155 (1.09)	5.0	0.33	1.3				
	H22NXLT-LXX-XX-00		•		155 (1.09)	2.5	1.2	5.1				
	H22NXET-LXX-XX-00			•	109 (0.77)	3.5	0.62	1.3				
	H22NXHB-LXX-XX-00	•			156 (1.10)	3.1	0.79	3.4				
	H22NXLB-LXX-XX-00		•		156 (1.10)	1.54	3.07	13.5				
	H22NXEB-LXX-XX-00			•	110 (0.78)	2.2	1.55	3.4				
	H22NXHD-LXX-XX-00	•			156 (1.10)	2.4	1.25	5.5				
	H22NXLD-LXX-XX-00		•		156 (1.10)	1.22	4.91	21.8				
	H22NXED-LXX-XX-00			•	110 (0.78)	1.72	2.47	5.5				

All ratings typical and at 25°C unless otherwise noted.

△1 An "X" in the Model Number Code indicates an undefined option. Colored letter indicates winding. See How to Order and Model Number Code on page 55.

△2 Motor connections are determined by the Windings/Leads designation in the Model Number Code on page 55. Note that the F designation, although not shown in the above tables, is an 8-lead option...see Terminations, page 76. In addition to the lead wire termination, terminal board and MS connector hookup for parallel, series or unipolar operation is also available.

△3 With rated current applied. Windings at 130°C and motor unmounted and in still air at 40°C (without heat sink).

△4 Windings at 130°C and motor in still air at 40°C (without heat sink). Operation of these motors above rated current may cause demagnetization. Contact factory.

△5 Small signal inductance as measured with impedance bridge at 1kHz, 1 amp.

△6 Thermal resistance measured with motor hanging in still air (unmounted).

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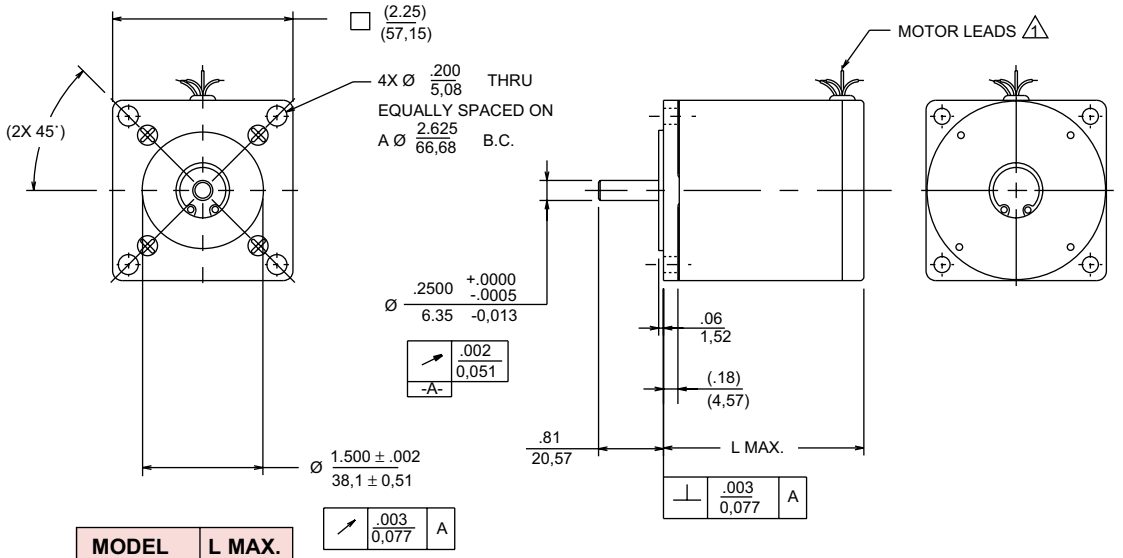
DIMENSIONS . . . GENERAL PURPOSE—CONVENTIONAL HYBRIDS

in. (metric dimensions for ref. only)
mm

NEMA 23 FRAME

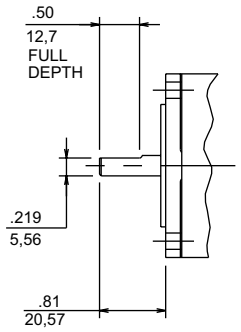
(See page 76 for Technical Data)

REGULAR CONSTRUCTION/LEADWIRE HOOKUP=R

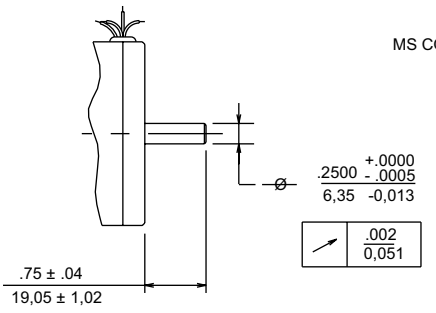


MODEL NUMBER	L MAX.
2HNR	1.56 39,63
21NR	2.06 52,33
22NR	3.06 77,73

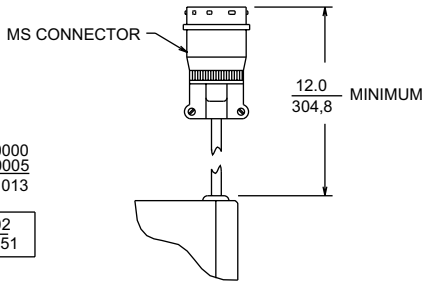
STANDARD OPTIONS



FLAT CONFIGURATION = F

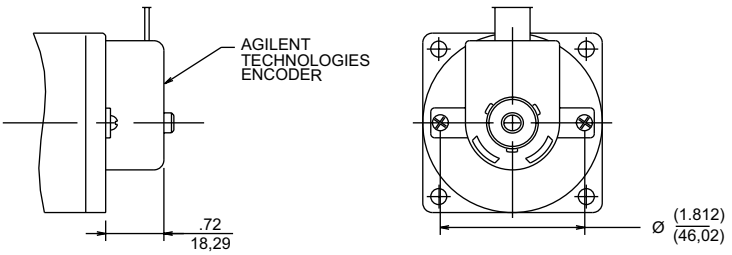


REAR SHAFT CONFIGURATION = D



SYSTEM CONSTRUCTION = C

ENCODER OPTION

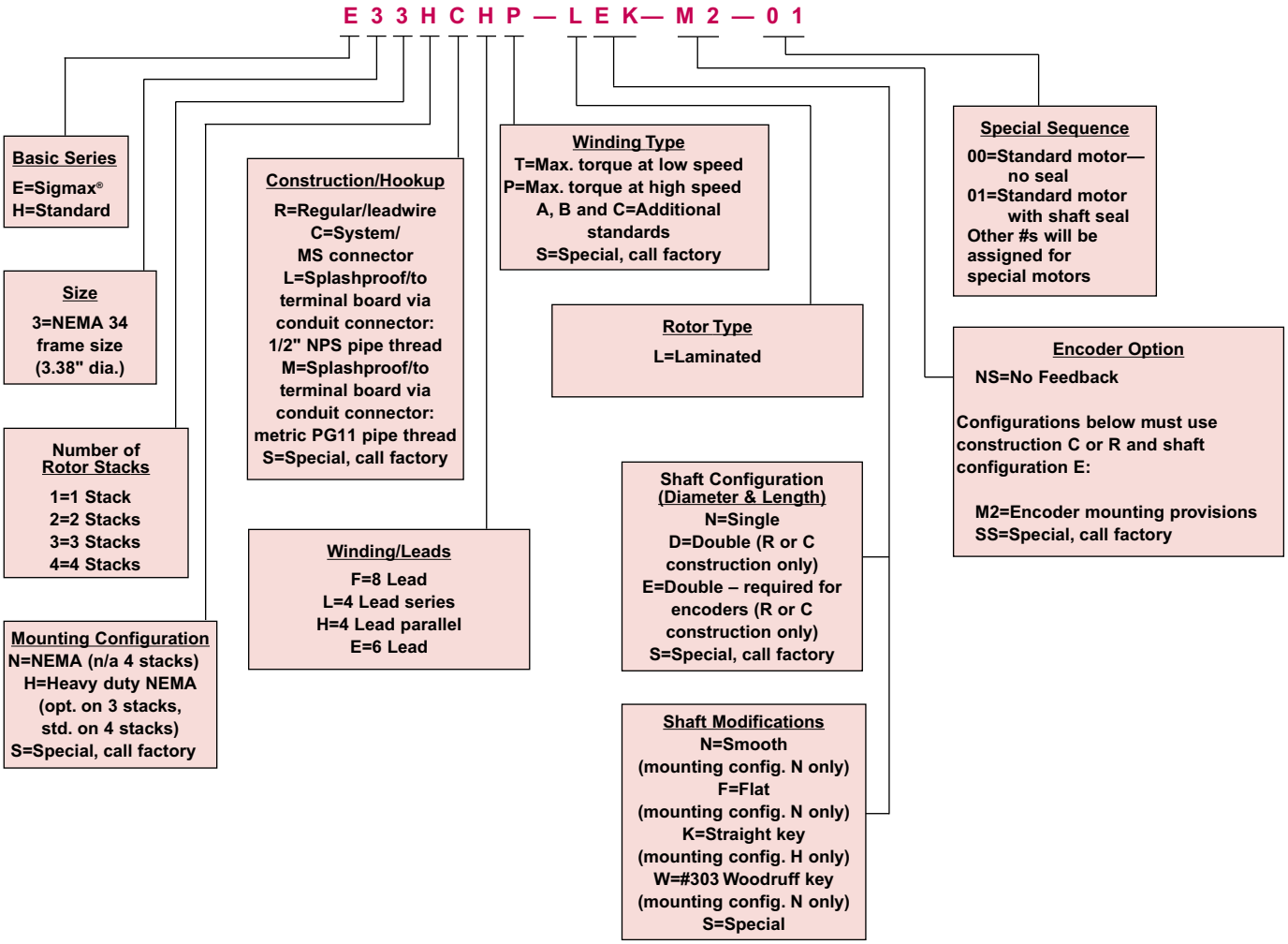


NOTE:

1. MOTOR LEADS: #22 AWG , 12.0 304.8 MINIMUM.

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MODEL NUMBER CODE



The example model number above indicates an E series (Sigmax®) NEMA 34 frame motor with a three stack rotor. This motor is equipped with heavy duty front end bell and shaft, and sealed system rear end bell with MS connectors. It also has a bipolar parallel connection, a maximum torque at high speed winding, a straight keyway, encoder mounting provisions and a shaft seal.

HOW TO ORDER

Review the Motor Model Number Code above to assure that all options are designated. Connections, encoders and phasing diagrams start on page 76. Motor dimensions start on page 65.

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GENERAL PURPOSE—CONVENTIONAL HYBRIDS

NEMA 34 FRAME (3.4" Dia.)—Ratings and Characteristics

Review the Model Number Code, page 61, to assure that all options are designated. Connections, encoders and phasing diagrams start on page 76. Motor dimensions start on page 65. In addition to those below, motors with characteristics for specific performance requirements are offered. Contact factory for more details.

Rated currents are in descending order	Motor Model Number △1	Connection △2 Parallel	Connection △2 Series	Connection △2 Unipolar	Holding Torque △3 (2 phases on) oz-in (Nm) ±10%	Rated Current/ Phase △4 (amps DC)	Phase Resistance (ohms) ±10%	Phase Inductance △5 (mH) Typical	Detent Torque oz-in (Nm)	Thermal Resistance △6 (°C/watt)	Rotor Inertia oz-in-S² (kgm² x 10⁻³)	Weight lbs (kg)
Torque range: 223-349 oz-in. 1.58-1.90 Nm **SIGMAX® E31 Series 1 rotor stack**	E31NXHP-LXX-XX-00	•			344 (2.43)	8.4	0.13	1.1	22 (0.16)	3.9	0.0083 (0.059)	3.2 (1.45)
	E31NXLP-LXX-XX-00		•		344 (2.43)	4.2	0.52	4.4				
	E31NXEP-LXX-XX-00			•	243 (1.72)	5.9	0.27	1.1				
	E31NXHA-LXX-XX-00	•			349 (2.47)	8.2	0.14	1.2				
	E31NXLA-LXX-XX-00		•		349 (2.47)	4.1	0.55	4.9				
	E31NXEA-LXX-XX-00			•	247 (1.74)	5.8	0.28	1.2				
	E31NXHB-LXX-XX-00	•			316 (2.23)	5.9	0.24	1.7				
	E31NXLB-LXX-XX-00		•		316 (2.23)	3.0	0.94	6.9				
	E31NXEB-LXX-XX-00			•	224 (1.58)	4.2	0.50	1.7				
	E31NXHT-LXX-XX-00	•			337 (2.38)	5.4	0.29	2.5				
	E31NXLT-LXX-XX-00		•		337 (2.38)	2.7	1.12	10.0				
	E31NXET-LXX-XX-00			•	238 (1.68)	3.8	0.59	2.5				
	E31NXHC-LXX-XX-00	•			316 (2.23)	3.0	0.94	6.9				
	E31NXLC-LXX-XX-00		•		316 (2.23)	1.48	3.73	27.6				
	E31NXEC-LXX-XX-00			•	223 (1.58)	2.1	1.89	6.9				
Torque range: 158-186 oz-in. 1.12-1.71 Nm **STANDARD H31 Series 1 rotor stack**	H31NXHP-LXX-XX-00	•			239 (1.69)	8.4	0.13	1.0	8.8 (0.062)	3.9	0.0083 (0.059)	3.2 (1.45)
	H31NXLP-LXX-XX-00		•		239 (1.69)	4.2	0.52	4.0				
	H31NXEP-LXX-XX-00			•	169 (1.20)	5.9	0.27	1.0				
	H31NXHA-LXX-XX-00	•			242 (1.71)	8.2	0.14	1.1				
	H31NXLA-LXX-XX-00		•		242 (1.71)	4.1	0.50	4.5				
	H31NXEA-LXX-XX-00			•	171 (1.21)	5.8	0.28	1.1				
	H31NXHB-LXX-XX-00	•			224 (1.58)	5.9	0.24	1.6				
	H31NXLB-LXX-XX-00		•		224 (1.58)	3.0	0.94	6.4				
	H31NXEB-LXX-XX-00			•	158 (1.12)	4.2	0.50	1.6				
	H31NXHT-LXX-XX-00	•			236 (1.66)	5.4	0.29	2.3				
	H31NXLT-LXX-XX-00		•		236 (1.66)	2.7	1.12	9.3				
	H31NXET-LXX-XX-00			•	167 (1.18)	3.8	0.59	2.3				
	H31NXHC-LXX-XX-00	•			224 (1.58)	3.0	0.94	6.4				
	H31NXLC-LXX-XX-00		•		224 (1.58)	1.48	3.73	25.8				
	H31NXEC-LXX-XX-00			•	158 (1.12)	2.1	1.89	6.4				

All ratings typical and at 25°C unless otherwise noted.

△1 An "X" in the Model Number Code indicates an undefined option. Colored letter indicates winding. See How to Order and Model Number Code on page 61.

△2 Motor connections are determined by the Windings/Leads designation in the Model Number Code on page 61. Note that the F designation, although not shown in the above tables, is an 8-lead option...see Terminations, page 76. In addition to the lead wire termination, terminal board and MS connector hookup for parallel, series or unipolar operation is also available.

△3 With rated current applied. Windings at 130°C and motor unmounted and in still air at 40°C (without heat sink).

△4 Windings at 130°C and motor in still air at 40°C (without heat sink). Operation of these motors above rated current may cause demagnetization. Contact factory.

△5 Small signal inductance as measured with impedance bridge at 1kHz, 1 amp.

△6 Thermal resistance measured with motor hanging in still air (unmounted).

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GENERAL PURPOSE—CONVENTIONAL HYBRIDS

NEMA 34 FRAME (3.4" Dia.)—Ratings and Characteristics (Con't)

Review the Model Number Code, page 61, to assure that all options are designated. Connections, encoders and phasing diagrams start on page 76. Motor dimensions start on page 65. In addition to those below, motors with characteristics for specific performance requirements are offered. Contact factory for more details.

Rated currents are in descending order	Motor Model Number [1]	Connection [2] Parallel	Series	Unipolar	Holding Torque [3] (2 phases on) oz-in (Nm) ±10%	Rated Current/ Phase [4] (amps DC)	Phase Resistance (ohms) ±10%	Phase Inductance [5] (mH) Typical	Detent Torque oz-in (Nm)	Thermal Resistance [6] (°C/watt)	Rotor Inertia oz-in-S² (kgm² x 10^{-3})	Weight lbs (kg)
Torque range: 443-673 oz-in. 3.13-4.75 Nm **SIGMAX® E32 Series 2 rotor stacks**	E32NXHP-LXX-XX-00	•			673 (4.75)	8.1	0.19	2.2	42 (0.3)	2.7	0.0170 (0.120)	5.3 (2.41)
	E32NXLP-LXX-XX-00		•		673 (4.75)	4.1	0.74	8.9				
	E32NXEP-LXX-XX-00			•	476 (3.36)	5.7	0.39	2.2				
	E32NXHA-LXX-XX-00	•			627 (4.43)	5.6	0.39	3.7				
	E32NXLA-LXX-XX-00		•		627 (4.43)	2.8	1.51	15.0				
	E32NXEA-LXX-XX-00			•	443 (3.13)	4.0	0.78	3.7				
	E32NXHT-LXX-XX-00	•			659 (4.66)	5.2	0.44	5.0				
	E32NXLT-LXX-XX-00		•		659 (4.66)	2.6	1.74	19.9				
	E32NXET-LXX-XX-00			•	466 (3.29)	3.7	0.89	5.0				
Torque range: 314-471 oz-in. 2.22-3.32 Nm **STANDARD H32 Series 2 rotor stacks**	H32NXHP-LXX-XX-00	•			471 (3.32)	8.1	0.19	2.4	18 (0.3)	2.7	0.0170 (0.120)	5.3 (2.41)
	H32NXLP-LXX-XX-00		•		471 (3.32)	4.1	0.74	9.6				
	H32NXEP-LXX-XX-00			•	333 (2.35)	5.7	0.39	2.4				
	H32NXHA-LXX-XX-00	•			445 (3.14)	5.6	0.39	4.1				
	H32NXLA-LXX-XX-00		•		445 (3.14)	2.8	1.51	16.2				
	H32NXEA-LXX-XX-00			•	314 (2.22)	4.0	0.78	4.1				
	H32NXHT-LXX-XX-00	•			463 (3.27)	5.2	0.44	5.4				
	H32NXLT-LXX-XX-00		•		463 (3.27)	2.6	1.74	21.6				
	H32NXET-LXX-XX-00			•	328 (2.31)	3.7	0.89	5.4				
Torque range: 656-995 oz-in. 4.63-5.40 Nm **SIGMAX® E33 Series 3 rotor stacks**	E33NXHC-LXX-XX-00	•			927 (6.55)	11.1	0.15	1.3	64 (0.45)	2.0	.0250 (0.176)	7.6 (3.45)
	E33NXLC-LXX-XX-00		•		927 (6.55)	5.5	0.59	5.3				
	E33NXEC-LXX-XX-00			•	656 (4.63)	7.8	0.29	1.3				
	E33NXHA-LXX-XX-00	•			940 (6.64)	8.6	0.23	2.3				
	E33NXLA-LXX-XX-00		•		940 (6.64)	4.3	0.87	9.1				
	E33NXEA-LXX-XX-00			•	664 (4.69)	6.1	0.46	2.3				
	E33NXHP-LXX-XX-00	•			995 (7.02)	7.9	0.26	3.1				
	E33NXLP-LXX-XX-00		•		995 (7.02)	4.0	1.02	12.6				
	E33NXEP-LXX-XX-00			•	703 (4.97)	5.6	0.54	3.1				
	E33NXHB-LXX-XX-00	•			939 (6.63)	5.4	0.55	5.7				
	E33NXLB-LXX-XX-00		•		939 (6.63)	2.7	2.17	22.9				
	E33NXEB-LXX-XX-00			•	664 (4.69)	3.8	1.11	5.7				
	E33NXHT-LXX-XX-00	•			975 (6.88)	5.1	0.61	7.1				
	E33NXLT-LXX-XX-00		•		975 (6.88)	2.6	2.41	28.2				
	E33NXET-LXX-XX-00			•	689 (4.87)	3.6	1.23	7.1				

All ratings typical and at 25°C unless otherwise noted.

[1] An "X" in the Model Number Code indicates an undefined option. Colored letter indicates winding. See How to Order and Model Number Code on page 61.

[2] Motor connections are determined by the Windings/Leads designation in the Model Number Code on page 61. Note that the F designation, although not shown in the above tables, is an 8-lead option...see Terminations, page 76. In addition to the lead wire termination, terminal board and MS connector hookup for parallel, series or unipolar operation is also available.

[3] With rated current applied. Windings at 130°C and motor unmounted and in still air at 40°C (without heat sink).

[4] Windings at 130°C and motor in still air at 40°C (without heat sink). Operation of these motors above rated current may cause demagnetization. Contact factory.

[5] Small signal inductance as measured with impedance bridge at 1kHz, 1 amp.

[6] Thermal resistance measured with motor hanging in still air (unmounted).

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GENERAL PURPOSE—CONVENTIONAL HYBRIDS

NEMA 34 FRAME (3.4" Dia.)—Ratings and Characteristics (Con't.)

Review the Model Number Code, page 61, to assure that all options are designated. Connections, encoders and phasing diagrams start on page 76. Motor dimensions start on page 65. In addition to those below, motors with characteristics for specific performance requirements are offered. Contact factory for more details.

Rated currents are in descending order	Motor Model Number △1	Connection △2 Parallel	Connection △2 Series	Connection △2 Unipolar	Holding Torque △3 (2 phases on) oz-in (Nm) ±10%	Rated Current/ Phase △4 (amps DC)	Phase Resistance (ohms) ±10%	Phase Inductance △5 (mH) Typical	Detent Torque oz-in (Nm)	Thermal Resistance △6 (°C/watt)	Rotor Inertia oz-in-S² (kgm² x 10⁻³)	Weight lbs (kg)
Torque range: 466-698 oz-in. 3.29-4.93 Nm **STANDARD** **H33 Series** **3 rotor stacks**	H33XXHC-LXX-XX-00	•			659 (4.65)	11.1	0.15	1.6	27 (0.19)	2.0	.0250 (0.176)	7.6 (3.45)
	H33XXLC-LXX-XX-00		•		659 (4.65)	5.5	0.59	6.3				
	H33XXEC-LXX-XX-00			•	466 (3.29)	7.8	0.29	1.6				
	H33XXHA-LXX-XX-00	•			666 (4.70)	8.6	0.23	2.7				
	H33XXLA-LXX-XX-00		•		666 (4.70)	4.3	0.87	10.8				
	H33XXEA-LXX-XX-00			•	471 (3.33)	6.1	0.46	2.7				
	H33XXHB-LXX-XX-00	•			666 (4.70)	5.4	0.55	6.8				
	H33XXLB-LXX-XX-00		•		666 (4.70)	2.7	2.17	27.2				
	H33XXEB-LXX-XX-00			•	471 (3.33)	3.8	1.11	6.8				
	H33XXHT-LXX-XX-00	•			687 (4.85)	5.1	0.61	8.4				
	H33XXLT-LXX-XX-00		•		687 (4.85)	2.6	2.41	33.6				
	H33XXET-LXX-XX-00			•	468 (3.43)	3.6	1.23	8.4				
	H33XXHP-LXX-XX-00	•			698 (4.93)	7.9	0.26	3.7				
	H33XXLP-LXX-XX-00		•		698 (4.93)	4.0	1.02	14.9				
	H33XXEP-LXX-XX-00			•	494 (3.49)	5.6	0.54	3.7				
Torque range: 879-1300 oz-in. 6.21-9.18 Nm **SIGMAX®** **E34 Series** **4 rotor stacks**	E34HXHA-LXX-XX-00	•			1253 (8.85)	8.1	0.29	3.6	83 (0.59)	1.7	0.0350 (0.247)	9.7 (4.41)
	E34HXLA-LXX-XX-00		•		1253 (8.85)	4.1	1.14	13.7				
	E34HXEA-LXX-XX-00			•	886 (6.26)	5.7	0.60	3.6				
	E34HXHP-LXX-XX-00	•			1300 (9.18)	7.7	0.33	4.4				
	E34HXLP-LXX-XX-00		•		1300 (9.18)	3.9	1.27	17.8				
	E34HXEP-LXX-XX-00			•	920 (6.49)	5.5	0.66	4.4				
	E34HXHT-LXX-XX-00	•			1243 (8.78)	5.2	0.71	8.7				
	E34HXLT-LXX-XX-00		•		1243 (8.78)	2.6	2.8	34.8				
	E34HXET-LXX-XX-00			•	879 (6.21)	3.7	1.43	8.7				
Torque range: 624-916 oz-in. 4.41-6.47 Nm **STANDARD** **H34 Series** **4 rotor stacks**	H34HXHA-LXX-XX-00	•			888 (6.27)	8.1	0.29	3.8	35 (0.25)	1.7	0.0350 (0.247)	9.7 (4.41)
	H34HXLA-LXX-XX-00		•		888 (6.27)	4.1	1.14	15.1				
	H34HXEA-LXX-XX-00			•	628 (4.44)	5.7	0.60	3.8				
	H34HXHP-LXX-XX-00	•			916 (6.47)	7.7	0.33	4.7				
	H34HXLP-LXX-XX-00		•		916 (6.47)	3.9	1.27	18.6				
	H34HXEP-LXX-XX-00			•	648 (4.57)	5.5	0.66	4.7				
	H34HXHT-LXX-XX-00	•			882 (6.23)	5.2	0.71	9.1				
	H34HXLT-LXX-XX-00		•		882 (6.23)	2.6	2.8	36.5				
	H34HXET-LXX-XX-00			•	624 (4.41)	3.7	1.43	9.1				

All ratings typical and at 25°C unless otherwise noted.

△1 An "X" in the Model Number Code indicates an undefined option. Colored letter indicates winding. See How to Order and Model Number Code on page 61.

△2 Motor connections are determined by the Windings/Leads designation in the Model Number Code on page 61. Note that the F designation, although not shown in the above tables, is an 8-lead option...see Terminations, page 76. In addition to the lead wire termination, terminal board and MS connector hookup for parallel, series or unipolar operation is also available.

△3 With rated current applied. Windings at 130°C and motor unmounted and in still air at 40°C (without heat sink).

△4 Windings at 130°C and motor in still air at 40°C (without heat sink). Operation of these motors above rated current may cause demagnetization. Contact factory.

△5 Small signal inductance as measured with impedance bridge at 1kHz, 1 amp.

△6 Thermal resistance measured with motor hanging in still air (unmounted).

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DIMENSIONS . . . GENERAL PURPOSE—CONVENTIONAL HYBRIDS

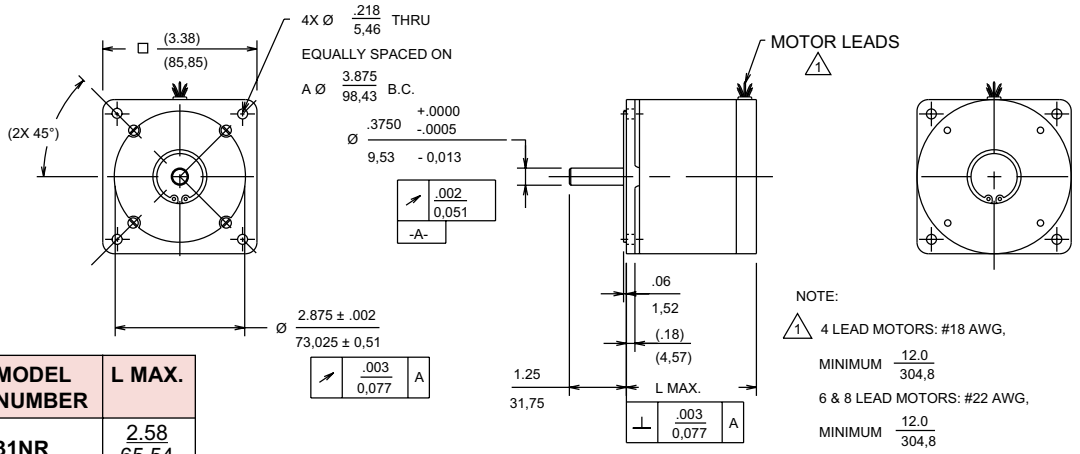
in. / mm (metric dimensions for ref. only)

NEMA 34 FRAME

(See page 76 for Technical Data)

REGULAR CONSTRUCTION/LEADWIRE HOOKUP = R

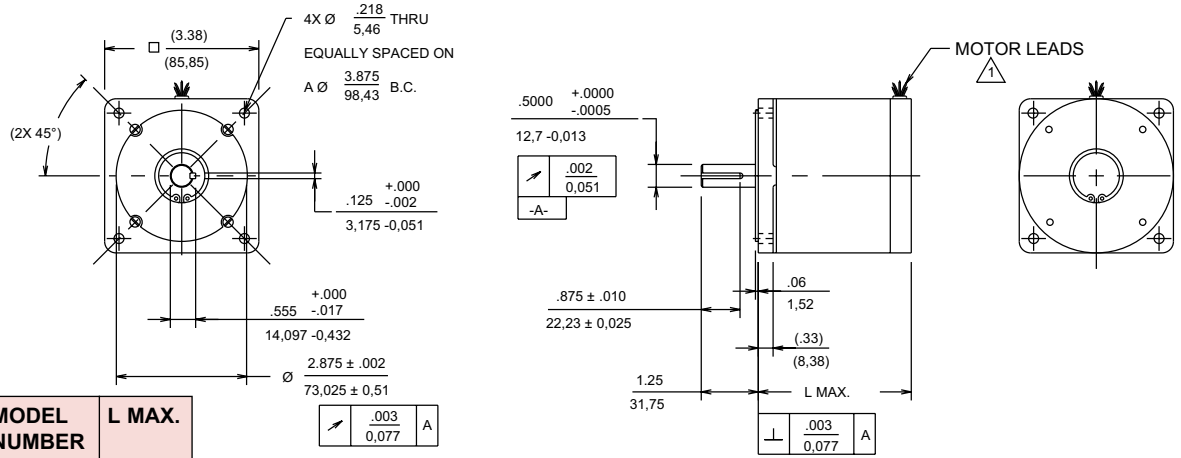
STANDARD NEMA FRONT END BELL = N



NOTE:
1 4 LEAD MOTORS: #18 AWG, MINIMUM 12.0 304,8
6 & 8 LEAD MOTORS: #22 AWG, MINIMUM 12.0 304,8

MODEL NUMBER	L MAX.
31NR	2.58 65,54
32NR	3.76 95,51
33NR	5.06 128,53

HEAVY DUTY NEMA FRONT END BELL = H

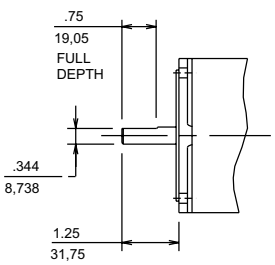


MODEL NUMBER	L MAX.
33HR	5.33 135,39
34HR	6.58 162,14

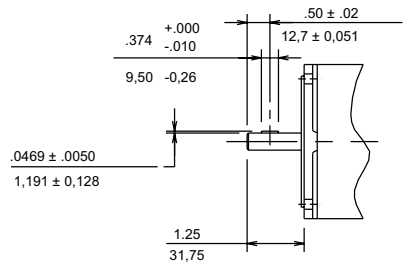
NOTE:
1 4 LEAD MOTORS: #18 AWG, 12.0 304,8 MINIMUM
6 & 8 LEAD MOTORS: #22 AWG, 12.0 304,8 MINIMUM

STANDARD FRONT SHAFT CONFIGURATIONS

NOTE: Not available with heavy duty



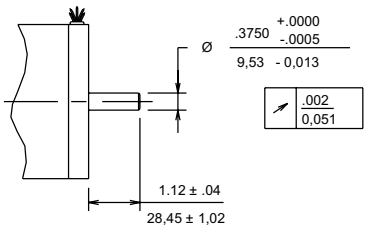
FLAT CONFIGURATION = F



#303 WOODRUFF KEY CONFIGURATION = W

STANDARD DOUBLE SHAFT CONFIGURATION

NOTE: Not available with splashproof



REAR SHAFT CONFIGURATION = D

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DIMENSIONS . . . GENERAL PURPOSE—CONVENTIONAL HYBRIDS

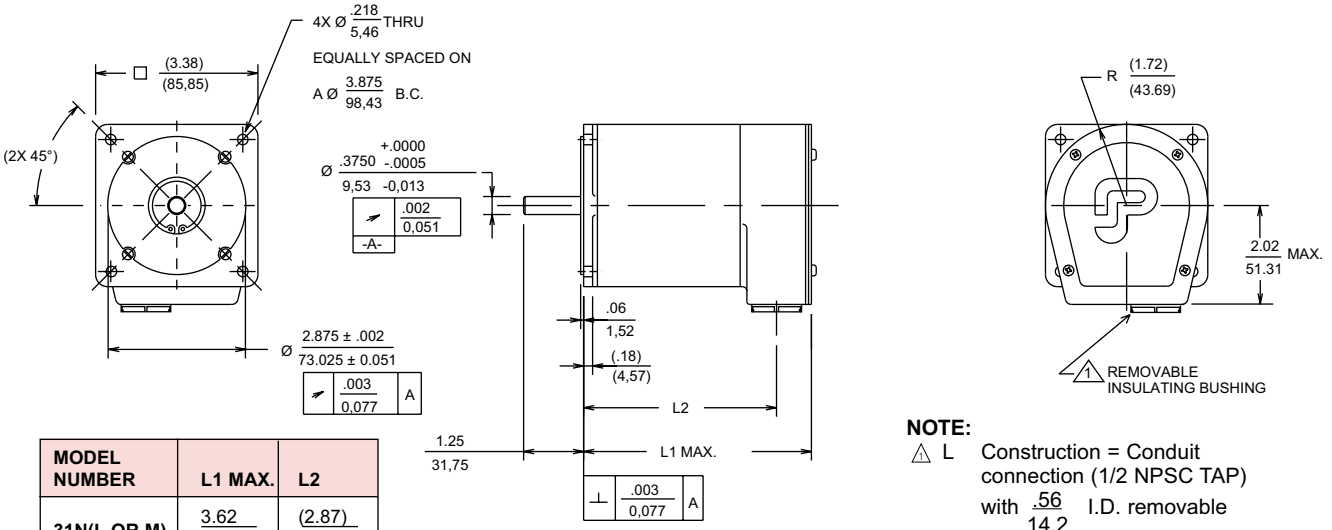
in. / mm (metric dimensions for ref. only)

NEMA 34 FRAME (Con't.)

(See page 76 for Technical Data)

SPLASHPROOF CONSTRUCTION/TERMINAL BOARD CONNECTIONS = L or M

STANDARD NEMA FRONT END BELL = N



MODEL NUMBER	L1 MAX.	L2
31N(L OR M)	3.62 / 91,95	(2.87) / (72,9)
32N(L OR M)	4.77 / 121,16	(4.02) / (102,11)
33N(L OR M)	6.05 / 153,67	(5.30) / (134,62)

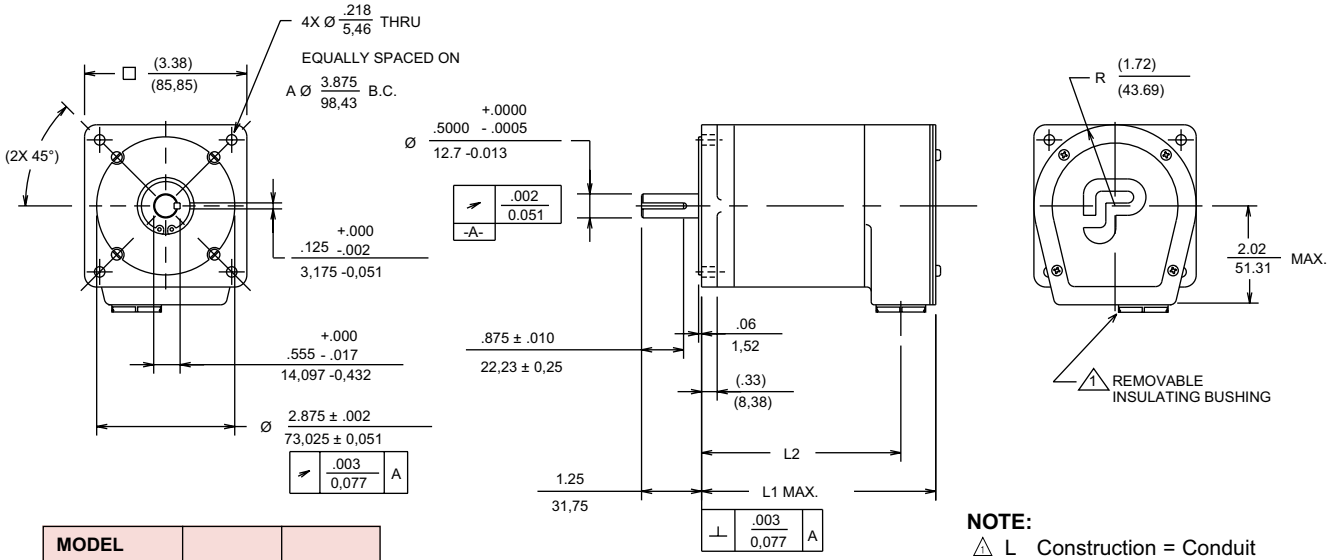
NOTE:

⚠ L Construction = Conduit connection (1/2 NPSC TAP) with .56 / 14,2 I.D. removable insulating bushing

M Construction = Conduit connection (PG 11 TAP). (No insulating bushing supplied)

2 Standard front shaft configuration options, refer to page 65.

HEAVY DUTY NEMA FRONT END BELL = H



MODEL NUMBER	L1 MAX.	L2
33H(L OR M)	6.73 / 170,94	(5.61) / (142,49)
34H(L OR M)	7.62 / 193,55	(6.86) / (174,24)

NOTE:

⚠ L Construction = Conduit connection (1/2 NPSC TAP) with .56 I.D. removable insulating bushing

M Construction = Conduit connection (PG 11 TAP). (No insulating bushing supplied)

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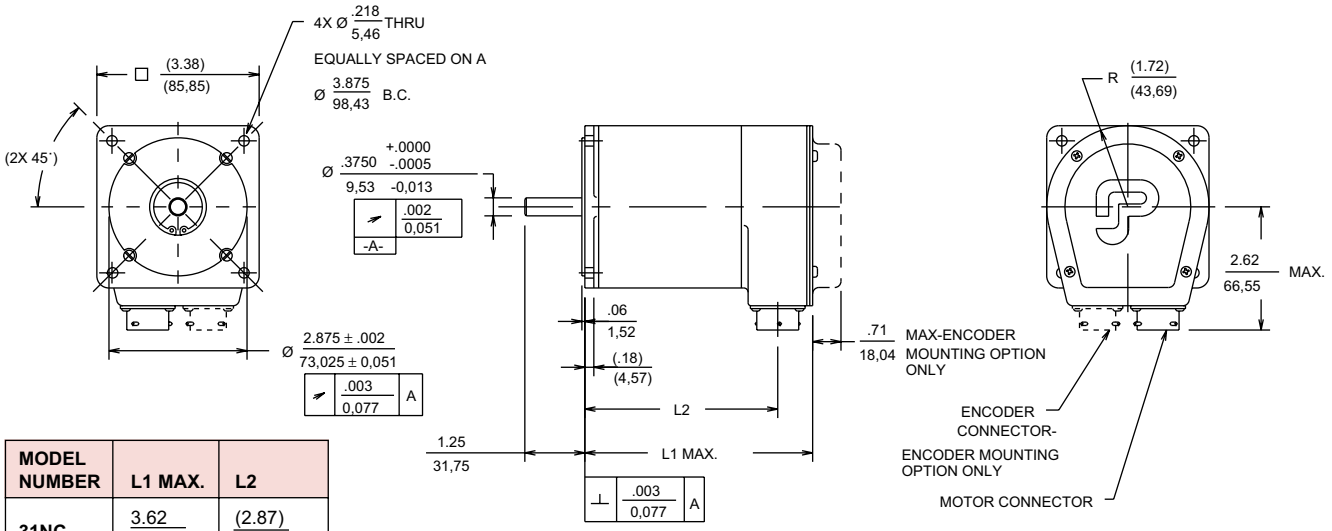
in. / mm (metric dimensions for ref. only)

NEMA 34 FRAME (Con't.)

(See page 76 for Technical Data)

SYSTEM CONSTRUCTION/MS CONNECTOR = C ENCODER OPTION

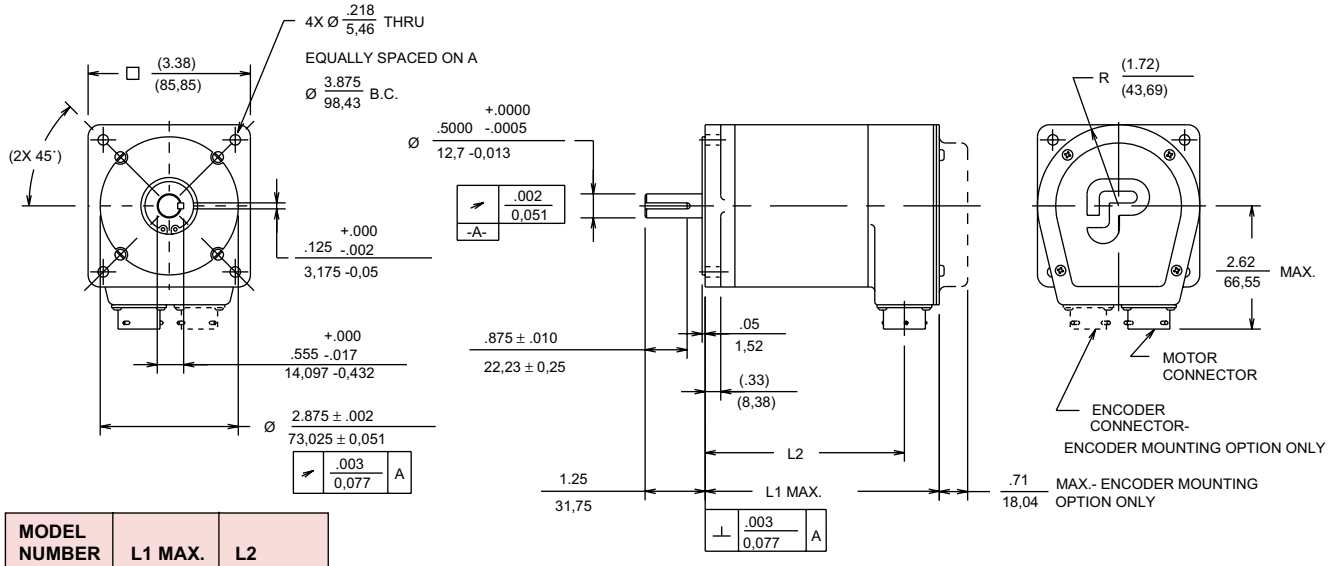
STANDARD NEMA FRONT END BELL = N



MODEL NUMBER	L1 MAX.	L2
31NC	3.62 / 91,95	(2.87) / (72,9)
32NC	4.77 / 121,16	(4.02) / (102,11)
33NC	6.05 / 153,67	(5.30) / (134,62)

NOTE: Standard front shaft configuration options, refer to page 65.

HEAVY DUTY NEMA FRONT END BELL = H

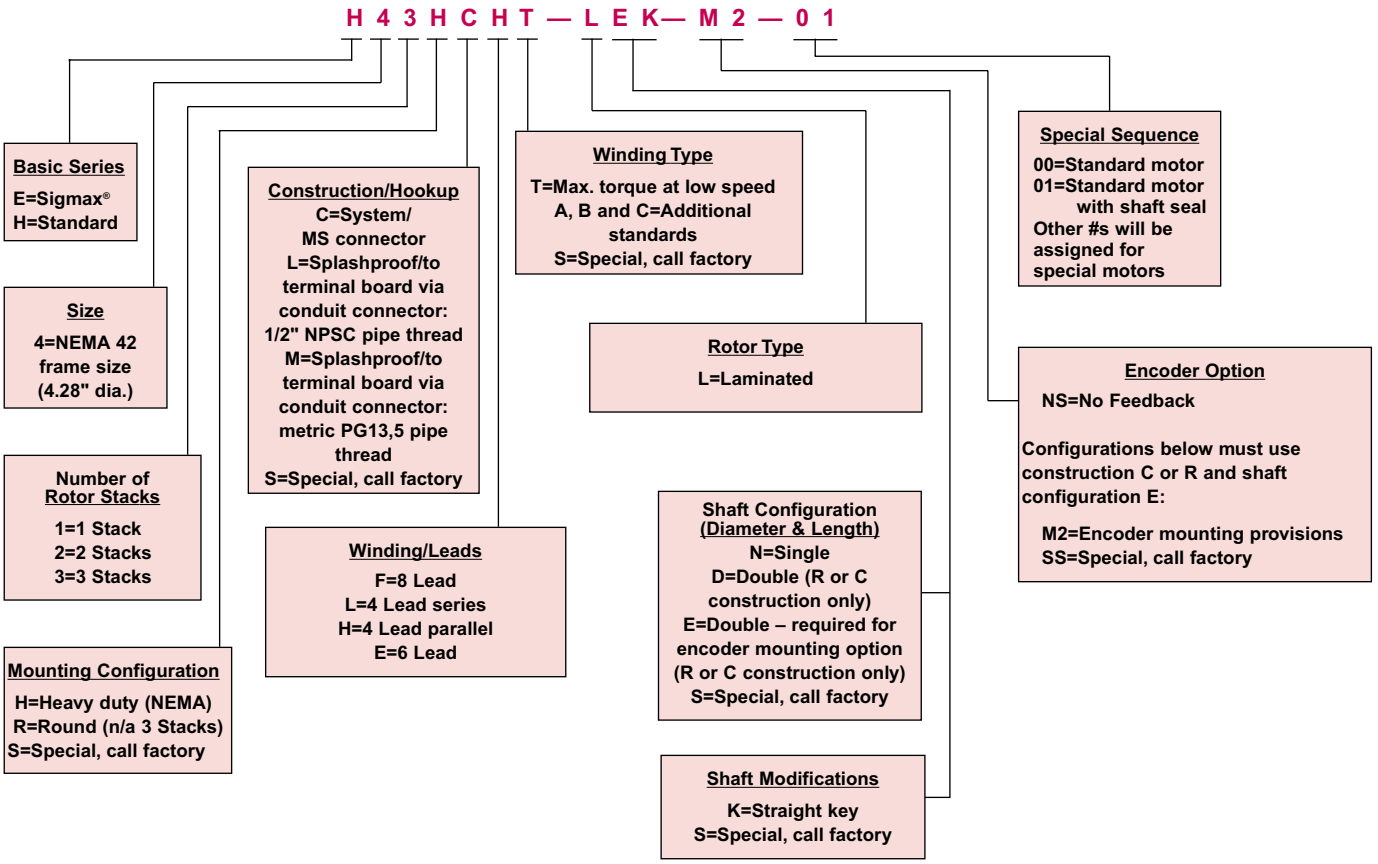


MODEL NUMBER	L1 MAX.	L2
33HC	6.73 / 170,94	(5.61) / (142,49)
34HC	7.62 / 193,55	(6.86) / (174,24)

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GENERAL PURPOSE—
CONVENTIONAL HYBRIDS
NEMA 42 FRAME (4.2" Dia.)

MODEL NUMBER CODE



The example model number above indicates a standard NEMA 42 frame motor with a three stack rotor. This motor is equipped with the standard heavy duty NEMA front end bell and shaft, and a sealed system rear end bell with MS connectors. It also has a bipolar parallel connection, a maximum torque at low speed winding, shaft seal, straight keyway and encoder mounting provisions.

HOW TO ORDER

Review the Motor Model Number Code to assure that all options are designated. Connections, encoders and phasing diagrams start on page 76. Motor dimensions are on page 72.

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GENERAL PURPOSE—CONVENTIONAL HYBRIDS

NEMA 42 FRAME (4.2" Dia.)—Ratings and Characteristics

Review the Model Number Code, page 68, to assure that all options are designated. Connections, encoders and phasing diagrams start on page 76. Motor dimensions are on page 72. In addition to those below, motors with characteristics for specific performance requirements are offered. Contact factory for more details.

Rated currents are in descending order	Motor Model Number △1	Connection △2 Parallel	Series	Unipolar	Holding Torque △3 (2 phases on) oz-in (Nm) ±10%	Rated Current/ Phase △4 (amps DC)	Phase Resistance (ohms) ±10%	Phase Inductance △5 (mH) Typical	Detent Torque oz-in (Nm)	Thermal Resistance △6 (°C/watt)	Rotor Inertia oz-in-S² (kgm² x 10^{-3})	Weight lbs (kg)
Torque range: 957-1378 oz-in. 6.76-9.73 Nm **SIGMAX® E41 Series 1 rotor stack**	E41HXHA-LXX-XX-00	•			1378 (9.73)	10.6	0.16	2.5	58 (0.41)	1.8	0.0800 (0.565)	10.9 (4.94)
	E41HXLA-LXX-XX-00		•		1378 (9.73)	5.3	0.64	10.0				
	E41HXEA-LXX-XX-00			•	974 (6.88)	7.5	0.32	2.5				
	E41HXHT-LXX-XX-00	•			1353 (9.55)	5.4	0.61	9.0				
	E41HXLT-LXX-XX-00		•		1353 (9.55)	2.7	2.41	36.1				
	E41HXET-LXX-XX-00			•	957 (6.76)	3.8	1.21	9.0				
	E41HXHB-LXX-XX-00	•			1377 (9.72)	5.3	0.64	10.0				
	E41HXLB-LXX-XX-00		•		1377 (9.72)	2.7	2.54	40.0				
	E41HXEB-LXX-XX-00			•	974 (6.88)	3.7	1.27	10.0				
Torque range: 585-839 oz-in. 4.13-5.93 Nm **STANDARD H41 Series 1 rotor stack**	H41HXHA-LXX-XX-00	•			839 (5.93)	10.6	0.16	3.1	31 (0.22)	1.8	0.0800 (0.565)	10.9 (4.94)
	H41HXLA-LXX-XX-00		•		839 (5.93)	5.3	0.64	12.4				
	H41HXEA-LXX-XX-00			•	593 (4.19)	7.5	0.32	3.1				
	H41HXHT-LXX-XX-00	•			828 (5.84)	5.4	0.61	11.2				
	H41HXLT-LXX-XX-00		•		828 (5.84)	2.7	2.41	44.6				
	H41HXET-LXX-XX-00			•	585 (4.13)	3.8	1.21	11.2				
	H41HXHB-LXX-XX-00	•			839 (5.92)	5.3	0.64	12.4				
	H41HXLB-LXX-XX-00		•		839 (5.92)	2.7	2.54	49.4				
	H41HXEB-LXX-XX-00			•	593 (4.19)	3.7	1.27	12.4				

All ratings typical and at 25°C unless otherwise noted.

△1 An "X" in the Model Number Code indicates an undefined option. Colored letter indicates winding. See How to Order and Model Number Code on page 68.

△2 Motor connections are determined by the Windings/Leads designation in the model Number Code on page 68. Note that the F designation, although not shown in the above tables, is an 8-lead option...see Terminations, page 76. In addition to the lead wire termination, terminal board and MS connector hookup for parallel, series or unipolar operation is also available.

△3 With rated current applied. Windings at 130°C and motor unmounted and in still air at 40°C (without heat sink).

△4 Windings at 130°C and motor in still air at 40°C (without heat sink). Operation of these motors above rated current may cause demagnetization. Contact factory.

△5 Small signal inductance as measured with impedance bridge at 1kHz, 1 amp.

△6 Thermal resistance measured with motor hanging in still air (unmounted).

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GENERAL PURPOSE—CONVENTIONAL HYBRIDS

NEMA 42 FRAME (4.2" Dia.)—Ratings and Characteristics (Con't.)

Review the Model Number Code, page 68, to assure that all options are designated. Connections, encoders and phasing diagrams start on page 76. Motor dimensions are on page 72. In addition to those below, motors with characteristics for specific performance requirements are offered. Contact factory for more details.

Rated currents are in descending order	Motor Model Number △1	Connection △2 Parallel	Connection △2 Series	Connection △2 Unipolar	Holding Torque △3 (2 phases on) oz-in (Nm) ±10%	Rated Current/ Phase △3 (amps DC)	Phase Resistance (ohms) ±10%	Phase Inductance △5 (mH) Typical	Detent Torque oz-in (Nm)	Thermal Resistance △6 (°C/watt)	Rotor Inertia oz-in-S² (kgm² x 10⁻³)	Weight lbs (kg)
Torque range: 1805-2698 oz-in. 12.75-19.06 Nm **SIGMAX® E42 Series 2 rotor stacks**	E42HXHC-LXX-XX-00	•			2698 (19.06)	14.7	0.12	2.7	81 (0.57)	1.3	0.1600 (1.129)	18.2 (8.26)
	E42HXLC-LXX-XX-00		•		2698 (19.06)	7.4	0.47	10.6				
	E42HXEC-LXX-XX-00			•	1908 (13.48)	10.4	0.24	2.7				
	E42HXHB-LXX-XX-00	•			2598 (18.34)	9.8	0.27	5.4				
	E42HXLB-LXX-XX-00		•		2598 (18.34)	4.9	1.07	21.7				
	E42HXEB-LXX-XX-00			•	1837 (12.97)	6.9	0.54	5.4				
	E42HXHT-LXX-XX-00	•			2552 (18.02)	7.9	0.41	7.8				
	E42HXLT-LXX-XX-00		•		2552 (18.02)	4.0	1.62	31.3				
	E42HXET-LXX-XX-00			•	1805 (12.75)	5.6	0.81	7.8				
	E42HXHA-LXX-XX-00	•			2693 (19.02)	5.9	0.74	16.6				
	E42HXLA-LXX-XX-00		•		2693 (19.02)	2.9	2.96	66.5				
	E42HXEA-LXX-XX-00			•	1904 (13.45)	4.1	1.48	16.6				
Torque range: 1118-1652 oz-in. 7.90-11.66 Nm **STANDARD H42 Series 2 rotor stacks**	H42HXHC-LXX-XX-00	•			1652 (11.66)	14.7	0.12	3.3	50 (0.35)	1.3	0.1600 (1.129)	18.2 (8.26)
	H42HXLC-LXX-XX-00		•		1652 (11.66)	7.4	0.47	13.3				
	H42HXEC-LXX-XX-00			•	1168 (8.25)	10.4	0.24	3.3				
	H42HXHB-LXX-XX-00	•			1604 (11.32)	9.8	0.27	6.8				
	H42HXLB-LXX-XX-00		•		1604 (11.32)	4.9	1.07	27.2				
	H42HXEB-LXX-XX-00			•	1134 (8.01)	6.9	0.54	6.8				
	H42HXHT-LXX-XX-00	•			1581 (11.17)	7.9	0.41	9.8				
	H42HXLT-LXX-XX-00		•		1581 (11.17)	4.0	1.62	39.2				
	H42HXET-LXX-XX-00			•	1118 (7.90)	5.6	0.81	9.8				
	H42HXHA-LXX-XX-00	•			1649 (11.65)	5.9	0.74	20.8				
	H42HXLA-LXX-XX-00		•		1649 (11.65)	2.9	2.96	83.4				
	H42HXEA-LXX-XX-00			•	1166 (8.24)	4.1	1.48	20.8				

All ratings typical and at 25°C unless otherwise noted.

△1 An "X" in the Model Number Code indicates an undefined option. Colored letter indicates winding. See How to Order and Model Number Code on page 68.

△2 Motor connections are determined by the Windings/Leads designation in the Model Number Code on page 68. Note that the F designation, although not shown in the above tables, is an 8-lead option...see Terminations, page 76. In addition to the lead wire termination, terminal board and MS connector hookup for parallel, series or unipolar operation is also available.

△3 With rated current applied. Windings at 130°C and motor unmounted and in still air at 40°C (without heat sink).

△4 Windings at 130°C and motor in still air at 40°C (without heat sink). Operation of these motors above rated current may cause demagnetization. Contact factory.

△5 Small signal inductance as measured with impedance bridge at 1kHz, 1 amp.

△6 Thermal resistance measured with motor hanging in still air (unmounted).

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GENERAL PURPOSE—CONVENTIONAL HYBRIDS

NEMA 42 FRAME (4.2" Dia.)—Ratings and Characteristics (Con't.)

Review the Model Number Code, page 68, to assure that all options are designated. Connections, encoders and phasing diagrams start on page 76. Motor dimensions are on page 72. In addition to those below, motors with characteristics for specific performance requirements are offered. Contact factory for more details.

Rated currents are in descending order	Motor Model Number △1	Connection △2 Parallel	Series	Unipolar	Holding Torque △3 (2 phases on) oz-in (Nm) ±10%	Rated Current/ Phase △4 (amps DC)	Phase Resistance (ohms) ±10%	Phase Inductance △5 (mH) Typical	Detent Torque oz-in (Nm)	Thermal Resistance △6 (°C/watt)	Rotor Inertia oz-in-S² (kgm² x 10^{-3})	Weight lbs (kg)
Torque range: 2667-3958 oz-in. 18.84-27.95 Nm **SIGMAX® E43 Series 3 rotor stacks**	E43HXHC-LXX-XX-00	•			3722 (26.64)	13.3	0.21	3.7	106 (0.75)	0.9	0.2400 (1.694)	25.7 (11.66)
	E43HXLC-LXX-XX-00		•		3722 (26.64)	6.7	0.84	14.7				
	E43HXEC-LXX-XX-00			•	2667 (18.84)	9.4	0.42	3.7				
	E43HXHB-LXX-XX-00	•			3958 (27.95)	12.5	0.24	4.8				
	E43HXLB-LXX-XX-00		•		3958 (27.95)	6.2	0.96	19.3				
	E43HXEB-LXX-XX-00			•	2799 (19.77)	8.8	0.48	4.8				
	E43HXHT-LXX-XX-00	•			3931 (27.76)	7.9	0.60	11.8				
	E43HXLT-LXX-XX-00		•		3931 (27.76)	4.0	2.38	47.0				
	E43HXET-LXX-XX-00			•	2780 (19.63)	5.6	1.19	11.8				
	E43HXHA-LXX-XX-00	•			3905 (27.58)	5.0	1.48	28.6				
	E43HXLA-LXX-XX-00		•		3905 (27.58)	2.5	5.9	114				
	E43HXEA-LXX-XX-00			•	2761 (19.50)	3.5	2.95	28.6				
Torque range: 1529-2651 oz-in. 10.80-18.72 Nm **STANDARD H43 Series 3 rotor stacks**	H43HXHC-LXX-XX-00	•			2163 (15.27)	13.3	0.21	1.3	70 (0.49)	0.9	0.2400 (1.694)	25.7 (11.66)
	H43HXLC-LXX-XX-00		•		2163 (15.27)	6.7	0.84	5.4				
	H43HXEC-LXX-XX-00			•	1529 (10.80)	9.4	0.42	1.3				
	H43HXHB-LXX-XX-00	•			2256 (15.93)	12.5	0.24	1.8				
	H43HXLB-LXX-XX-00		•		2256 (15.93)	6.2	0.96	7.0				
	H43HXEB-LXX-XX-00			•	1595 (11.26)	8.8	0.48	1.8				
	H43HXHT-LXX-XX-00	•			2651 (18.72)	7.9	0.60	16.8				
	H43HXLT-LXX-XX-00		•		2651 (18.72)	4.0	2.38	67.1				
	H43HXET-LXX-XX-00			•	1874 (13.24)	5.6	1.19	16.8				
	H43HXHA-LXX-XX-00	•			2336 (16.50)	5.0	1.48	40.8				
	H43HXLA-LXX-XX-00		•		2336 (16.50)	2.5	5.9	163				
	H43HXEA-LXX-XX-00			•	1864 (13.16)	3.5	2.95	40.8				

All ratings typical and at 25°C unless otherwise noted.

△1 An "X" in the Model Number Code indicates an undefined option. Colored letter indicates winding. See How to Order and Model Number Code on page 68.

△2 Motor connections are determined by the Windings/Leads designation in the Model Number Code on page 68. Note that the F designation, although not shown in the above tables, is an 8-lead option...see Terminations, page 76. In addition to the lead wire termination, terminal board and MS connector hookup for parallel, series or unipolar operation is also available.

△3 With rated current applied. Windings at 130°C and motor unmounted and in still air at 40°C (without heat sink).

△4 Windings at 130°C and motor in still air at 40°C (without heat sink). Operation of these motors above rated current may cause demagnetization. Contact factory.

△5 Small signal inductance as measured with impedance bridge at 1kHz, 1 amp.

△6 Thermal resistance measured with motor hanging in still air (unmounted).

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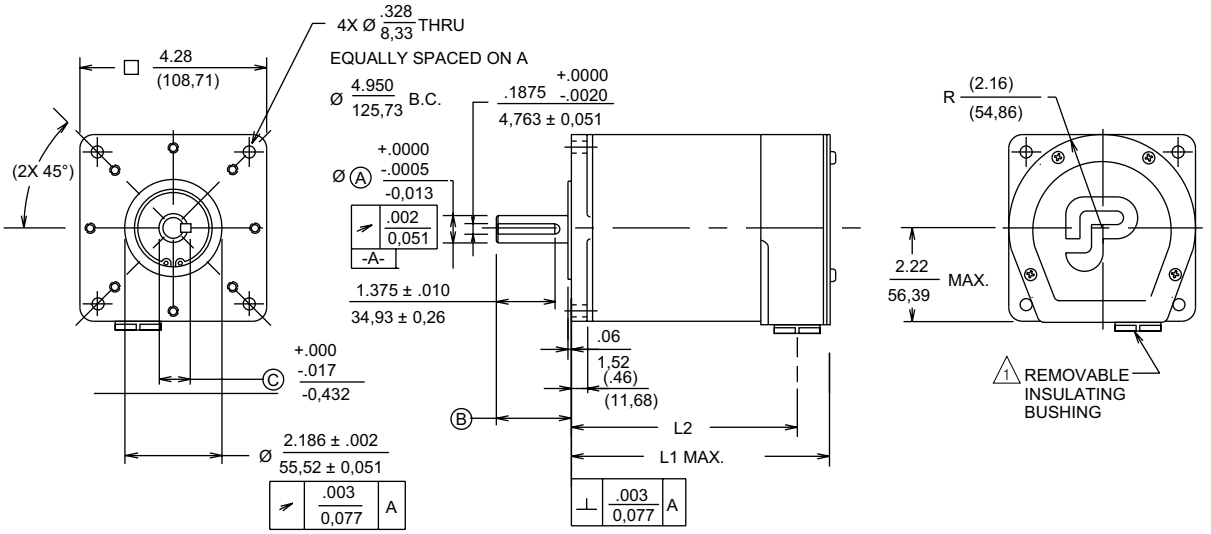
DIMENSIONS . . . GENERAL PURPOSE—CONVENTIONAL HYBRIDS

in. / mm (metric dimensions for ref. only)

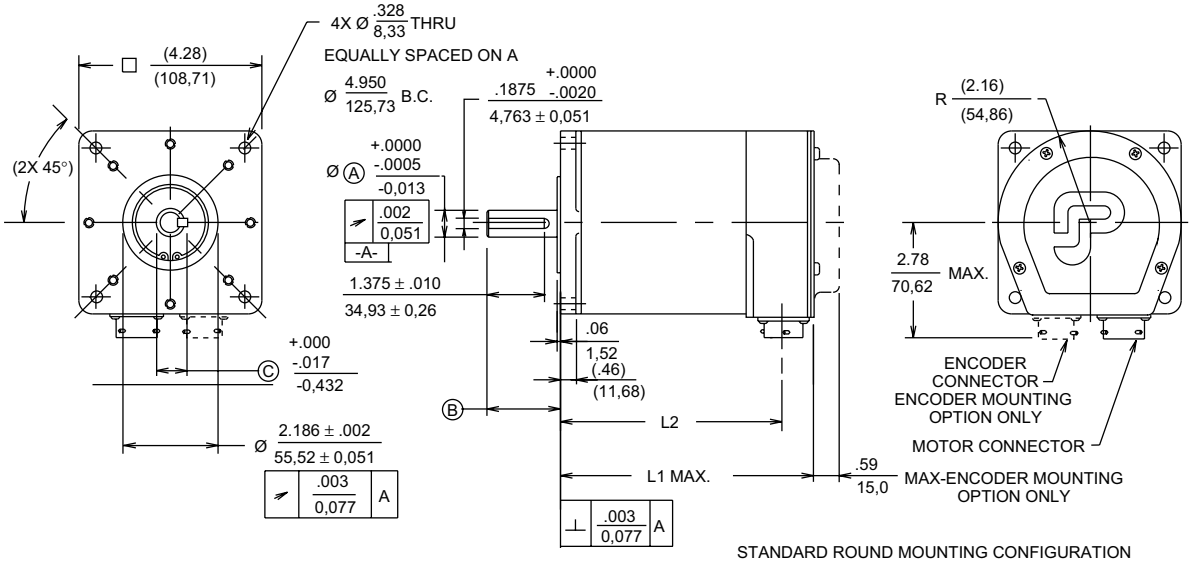
NEMA 42 FRAME

(See page 76 for Technical Data)

SPLASHPROOF CONSTRUCTION/TERMINAL BOARD CONNECTIONS=L or M

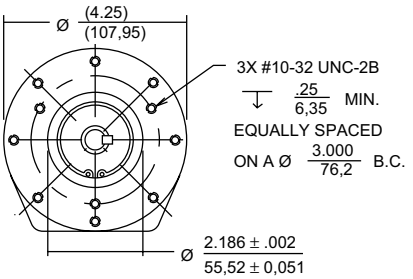


SYSTEM CONSTRUCTION/MS CONNECTOR=C and ENCODER OPTION



MODEL NUMBER	L1 MAX.	L2	A	B	C
41H(C, L, OR M)	5.61 / 142, 5	(4.85) / (123,19)	.6250 / 15,875	1.75 / 44,45	.705 / 17,91
42H(C, L, OR M)	8.04 / 204,22	(7.29) / (185,17)	.6250 / 15,875	2.19 / 55,63	.705 / 17,91
43H(C, L, OR M)	10.56 / 268,23	(9.81) / (249,18)	.7500 / 19,05	2.19 / 55,63	.830 / 21,09

STANDARD ROUND MOUNTING CONFIGURATION
NOTE: NOT AVAILABLE ON 3 STACK MOTOR



ROUND MOUNTING CONFIGURATION = R

NOTE:

⚠1 L Construction = Conduit Connection (1/2 NPSC TAP) with .56 I.D. removable insulating bushing

M Construction = Conduit Connection (PG 13,5 TAP) (No insulating bushing supplied)

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SPECIAL PURPOSE HYBRIDS



Our special purpose hybrid step motors include low inertia rotor hybrids for your special applications. The following pages provide technical and application data to simplify your selection process. Features and benefits, ratings and characteristics are provided for NEMA 23 frame sizes.

Feature	Benefit
Two Year Warranty	High quality, dependable operation
Wide Range of Industry Standard and Special Winding Configurations	Match motor performance to your application
Sigmax® Flux Focusing Technology	Flux focusing increases torque
Extensive Selection of Shaft, End Bell, Termination, Encoder, and Splashproof Options	An array of options to meet your needs
Optional Low Inertia Rotor - NEMA 23 Frame Only	Produces the highest acceleration rate

SPECIAL GENERAL PURPOSE—CONVENTIONAL HYBRIDS NEMA 23 FRAME (2.3" Dia.)

MODEL NUMBER CODE

E 2 1 N C H T — L N F — N S — 0 0

Basic Series
E=Sigmax®
H=Standard

Size
2=NEMA 23 frame size (2.25" dia.)

Number of Rotor Stacks
H=Half Stack (na/ E Series)
1=1 Stack
2=2 Stacks

Mounting Configuration
N=NEMA
S=Special, call factory

Construction/Hookup
R=Regular/Leadwire
C=System/ MS Connector
S=Special, call factory

Winding/Leads
F=8 Lead (n/a C construction)
L=4 Lead Series
H=4 Lead Parallel
E=6 Lead (n/a C construction)

Winding Type
T=Max. torque at low speed
P=Max. torque at high speed
A, B, C and D=Additional standards
S=Special, call factory

Rotor Type
L=Laminated
n/a with E Series motors
J=Low inertia, n/a with half stack motors

Shaft Configuration (Diameter & Length)
N=Single
D=Double (req'd with encoder option)
S=Special, call factory

Shaft Modifications
N=Smooth
F=Flat
S=Special, call factory

Special Sequence
00=Standard motor
Other #s will be assigned for special motors

Encoder Option
NS=No Feedback
Use below encoders with Construction R or C. Specify Shaft Configurations D (double ended)

Caution: An encoder with line driver output may be required for use with some step motor controls.

M1=Encoder Mounting Provisions
HD=Encoder 500ppr
HJ=Encoder 512ppr
SS=Special, call factory

The example above indicates an E series (Sigmax®) NEMA 23 frame motor with one rotor stack. This motor is equipped with an MS connector on the end of a 12 inch cable for power, a bipolar parallel connection, a maximum torque winding and a single ended shaft with a flat.

HOW TO ORDER

Review the Motor Model Number code to assure that all options are designated. Connections, encoders and phasing diagrams start on page 76. Motor dimensions are on page 60.

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SPECIAL PURPOSE

CONVENTIONAL HYBRIDS WITH LOW INERTIA ROTORS E "J" AND H "J" Series



NEMA 23 FRAME SIZE

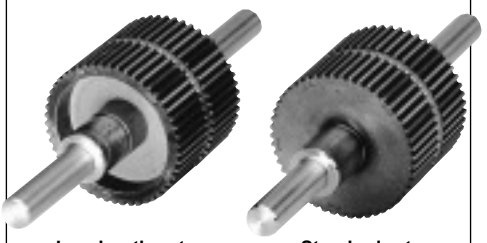
- Unique hollow rotor construction
- Rapid start/stop and acceleration characteristics
- Very high torque to inertia
- Winding configurations for unipolar and bipolar drivers
- Industry standard mounting

These H and E Series motors employ special hollow, low mass rotors to achieve the industry's highest torque to inertia ratios.

Use low inertia motors for applications requiring exceptionally rapid start/stop, point to point positioning, and acceleration capabilities.

This high acceleration capability makes the low inertia motors most effective for operation below 2,000 RPM. See the ratings and characteristics on the following pages to determine whether your application can benefit from low inertia step motors.

Both standard hybrid and Sigmax® technology motors are offered to meet a broad range of performance requirements.



Low inertia rotor **Standard rotor**

ROTOR INERTIA CHARACTERISTICS

Single and double stack motors are available with both standard and low inertia rotors. Choose low inertia to produce the highest acceleration rates possible. Choose standard to generate maximum torque.

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SPECIAL PURPOSE—CONVENTIONAL HYBRIDS WITH LOW INERTIA ROTORS

NEMA 23 FRAME (2.3" Dia.)—Ratings and Characteristics

Review the Model Number Code, page 73, to assure that all options are designated. Connections, encoders and phasing diagrams start on page 76. Motor dimensions are on page 60. In addition to those below, motors with characteristics for specific performance requirements are offered. Contact factory for more details.

	Motor Model Number [1]	Connection [2] Parallel	Series	Unipolar	Holding Torque [3] (2 phases on) oz-in (Nm) ±10%	Rated Current/ Phase [4] (amps DC)	Phase Resistance (ohms) ±10%	Phase Inductance [5] (mH) Typical	Detent Torque oz-in (Nm)	Thermal Resistance [6] (°C/watt)	Rotor Inertia oz-in-S² (kgm² x 10⁻³)	Weight lbs (kg)
Torque range: 77-108 oz-in. .54-.77 Nm	E21NXHT-JXX-XX-00	•			108 (0.77)	2.8	0.72	2.2	4.5 (0.032)	6.0	0.0012	1.1
SIGMAX® E21 Series 1 rotor stack	E21NXLT-JXX-XX-00		•		108 (0.77)	1.39	2.8	9.0			(0.008)	(0.50)
	E21NXET-JXX-XX-00			•	77 (0.54)	1.97	1.42	2.2				
Torque range: 54-77 oz-in. .38-.54 Nm	H21NXHT-JXX-XX-00	•			77 (0.54)	2.8	0.72	2.1	1.8 (0.019)	6	0.0012	1.1
STANDARD H21Series 1 rotor stack	H21NXLT-JXX-XX-00		•		77 (0.54)	1.39	2.8	8.4			(0.008)	(0.50)
	H21NXET-JXX-XX-00			•	54 (0.38)	1.97	1.42	2.1				
Torque range: 139-196 oz-in. .98-1.39 Nm	E22NXHT-JXX-XX-00	•			196 (1.39)	5.0	0.33	1.2	9.2 (0.065)	4.4	0.0023	2.0
SIGMAX® E22 Series 2 rotor stacks	E22NXLT-JXX-XX-00		•		196 (1.39)	2.5	1.2	4.6			(0.016)	(0.91)
	E22NXET-JXX-XX-00			•	139 (0.98)	3.5	0.62	1.2				
Torque range: 99-141 oz-in. .70-.99 Nm	H22NXHT-JXX-XX-00	•			141 (0.99)	5.0	0.33	1.3	4.4 (0.031)	4.4	0.0023	2.0
STANDARD H22 Series 2 rotor stacks	H22NXLT-JXX-XX-00		•		141 (0.99)	2.5	1.2	5.0			(0.016)	(0.91)
	H22NXET-JXX-XX-00			•	99 (0.70)	3.5	0.62	1.3				

All ratings typical and at 25°C unless otherwise noted.

[1] An "X" in the Model Number Code indicates an undefined option. Colored letter indicates winding. See How to Order and Model Number Code on page 73.

[2] Motor connections are determined by the Windings/Leads designation in the Model Number Code on Page 73. Note that the F designation, although not shown in the above tables, is an 8-lead option...see Terminations, page 76. In addition to the lead wire termination, terminal board and MS connector hookup for parallel, series or unipolar operation is also available.

[3] With rated current applied. Windings at 130°C and motor unmounted and in still air at 40°C (without heat sink).

[4] Windings at 130°C and motor in still air at 40°C (without heat sink). Operation of these motors above rated current may cause demagnetization. Contact factory.

[5] Small signal inductance as measured with impedance bridge at 1kHz, 1 amp.

[6] Thermal resistance measured with motor hanging in still air (unmounted).

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CONVENTIONAL HYBRIDS TECHNICAL DATA

- Hybrid motor power connections
- Phase sequencing tables
- Synchronous motor power connections
- Encoder options

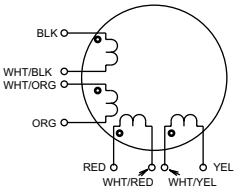
HYBRID MOTOR POWER CONNECTIONS

FLYING LEADS, TERMINAL BOARD OR MS CONNECTOR

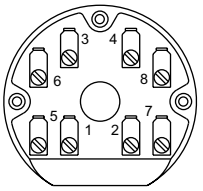
Four winding designations; F, E, L or H may be specified in the Model Number Code. For all motor terminations, refer to the step motor controller connection diagram to assure that proper connections are made. Consult our application engineers for assistance if necessary.

DESIGNATION F . . . 8 flying leads, 8 terminals or MS connector

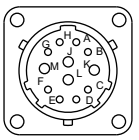
The 8 lead motor is the most versatile configuration. It may be connected by the user in choice of 8 lead, 4 lead (series or parallel) or 6 lead configuration.



8-Lead Configuration



Terminal Board
NEMA 34 and 42



MS Connector
NEMA 34 and 42

CONNECTION	DRIVER CONNECTION	LEAD COLOR	TERMINAL #	MS PIN OUT
4-LEAD BIPOLAR	A	BLACK (BLK)	1	A
SERIES	$\overline{A}$	ORANGE (ORG)	3	B
	B	RED	2	C
	$\overline{B}$	YELLOW (YEL)	4	D
	NONE	WHT/BLK & WHT/ORG	6 & 5	E & F
	NONE	WHT/RED & WHT/YEL	8 & 7	G & H
4-LEAD BIPOLAR	A	BLK & WHT/ORG	1 & 5	A & F
PARALLEL	$\overline{A}$	ORG & WHT/BLK	3 & 6	B & E
	B	RED & WHT/YEL	2 & 7	C & H
	$\overline{B}$	YEL & WHT/RED	4 & 8	D & G
6-LEAD UNIPOLAR	A	BLACK (BLK)	1	A
	B	ORANGE (ORG)	3	B
	C	RED	2	C
	D	YELLOW (YEL)	4	D
	+V	WHT/BLK & WHT/ORG	6 & 5	E & F
	+V	WHT/RED & WHT/YEL	8 & 7	G & H
GROUND[3]		GREEN/YELLOW		M

MOTOR POWER CONNECTOR
MS3122E14-12P

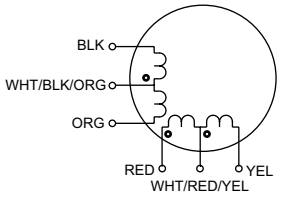
SUGGESTED MATING CONNECTOR	
PAC SCI P.N.	MS P.N.
SZ00009	MS3116F14-12S

NOTE:
1. MS Pins J, K, L not used. Pin M is ground.
2. See phase sequencing tables, page 78.
3. Only the NEMA 23 flying lead motors DO NOT have the grn/yel ground wire.

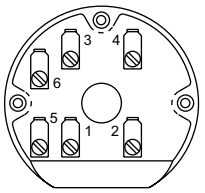
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DESIGNATION E . . . 6 flying leads, 6 terminals or MS connector

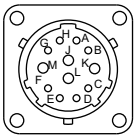
The 6 lead motor is normally used with unipolar drives. In some cases, the 6 lead motor can be used in a 4 lead series configuration for use with bipolar drives.



6-Lead Configuration



Terminal Board
NEMA 34 and 42



MS Connector
NEMA 34 and 42

CONNECTION	DRIVER CONNECTION	LEAD COLOR	TERMINAL #	MS PIN OUT
6-LEAD UNIPOLAR	A	BLACK (BLK)	1	A
	B	ORANGE (ORG)	3	B
	C	RED	2	C
	D	YELLOW (YEL)	4	D
	+V	WHT/BLK/ORG	5	J
	+V	WHT/RED/YEL	6	L
4-LEAD BIPOLAR	A	BLACK (BLK)	1	A
SERIES	$\overline{A}$	ORANGE (ORG)	3	B
	B	RED	2	C
	$\overline{B}$	YELLOW (YEL)	4	D
	NONE	WHT/BLK/ORG	5	J
	NONE	WHT/RED/YEL	6	L
GROUND		GREEN/YELLOW		M

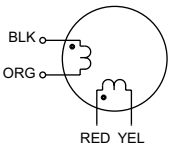
MOTOR POWER CONNECTOR
MS3122E14-12P

SUGGESTED MATING CONNECTOR	
PAC SCI P.N.	MS P.N.
SZ00009	MS3116F14-12S

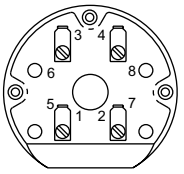
NOTE:
1. Terminals 7 and 8 are not used.
2. MS Pins E, F, G, H, K not used.
3. See phase sequencing tables, page 78.

DESIGNATION L or H. . . 4 flying leads, 4 terminals or MS connector

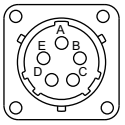
The 4 lead motor is for use with bipolar drives.



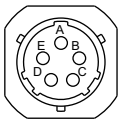
4-Lead Configuration



Terminal Board



MS Connector
NEMA 34 and 42



MS Connector
NEMA 23

CONNECTION	DRIVER CONNECTION	LEAD COLOR	TERMINAL #	MS PIN OUT
4-LEAD BIPOLAR	A	BLACK	1	A
	$\overline{A}$	ORANGE	3	B
	B	RED	2	C
	$\overline{B}$	YELLOW	4	D
GROUND		GREEN/YEL		E

MOTOR POWER CONNECTOR	
NEMA 34 & 42	NEMA 23
MS3122E14-5P	MS3121F14-5P

SUGGESTED MATING CONNECTOR NEMA 23, 34 & 42	
PAC SCI P.N.	MS P.N.
SZ00007	MS3116F14-5S

NOTE:
1. Terminals 5, 6, 7 and 8 are not used.
2. See phase sequencing tables, page 78.

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PHASE SEQUENCING TABLES

NOTE: Direction of rotation as viewed from mounting end of motor.

DRIVER CONNECTION

	STEP	A	$\overline{A}$	B	$\overline{B}$
CCW ↓	1	+	–	0	0
	2	+	–	+	–
	3	0	0	+	–
	4	–	+	+	–
	5	–	+	0	0
	6	–	+	–	+
	7	0	0	–	+
↑ CW	8	+	–	–	+

BIPOLAR HALF STEP
PHASE SEQUENCING

DRIVER CONNECTION

	STEP	A	$\overline{A}$	B	$\overline{B}$
CCW ↓	1	+	–	–	+
	2	–	+	–	+
	3	–	+	+	–
	4	+	–	+	–
↑ CW	1	+	–	–	+

BIPOLAR FULL STEP
PHASE SEQUENCING

	STEP	A	B	C	D
CCW ↓	1	GND	0	GND	0
	2	0	GND	GND	0
	3	0	GND	0	GND
	4	GND	0	0	GND
↑ CW	1	GND	0	GND	0

UNIPOLAR FULL STEP
PHASE SEQUENCING

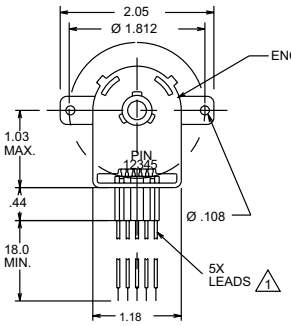
NOTES:
1. 0 = OFF OR OPEN.
2. + = POSITIVE CURRENT FLOW.
3. – = NEGATIVE CURRENT FLOW.

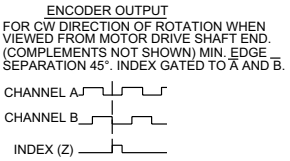
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NEMA 23 ENCODER OPTION

The standard encoder offered on the NEMA 23 motor is the Agilent Technologies HEDS 5600 series.

NON-LINE DRIVER ENCODER



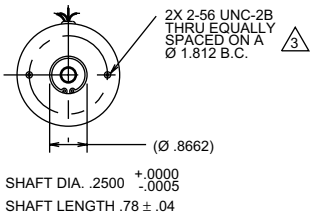


PIN	COLOR	FUNCTION
1	BLACK	GROUND
2	BLUE	Z
3	WHITE	A
4	RED	+5V
5	BROWN	B

PARAMETERS 2	NON-LINE DRIVER	
TYPE	INCREMENTAL	
ENCODER OPTION	HD	HJ
PULSES PER REVOLUTION	500	512
SUPPLY VOLTAGE	+5V ± 10% @ 85 mA MAX.	
OUTPUT FORMAT	DUAL CHANNEL QUADRATURE AND INDEX	
OUTPUT TYPE	SQUARE WAVE TTL COMPATIBLE	
FREQUENCY RESPONSE:		
DATA	100 kHz	
INDEX	100 kHz	
ROTOR INERTIA	5 x 10^{-7} lb-in-S^2	
WEIGHT	0.08 lb.	

ENCODER MOUNTING PROVISION ONLY = M1

FOR AGILENT TECHNOLOGIES HEDS 5600 SERIES OR SIMILAR.



NOTES:

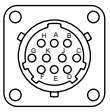
1. Leads are terminated with Agilent Technologies HEDS-8903 connector.
2. TYPICAL @ 25° C
3. Max. thread engagement of mounting screw not to exceed .200".

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NEMA 34, NEMA 42 ENCODER OPTIONS

ENCODER MS CONNECTOR

ALL NEMA 34 AND NEMA 42 MOTORS WITH SYSTEM CONSTRUCTION MAY BE SPECIFIED WITH AN INTEGRAL OPTICAL ENCODER.



ENCODER CONNECTOR

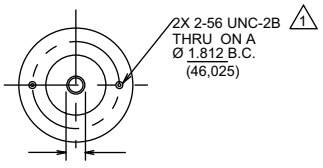
PIN	FUNCTION
A	CHANNEL A
B	CHANNEL $\overline{A}$
C	CHANNEL B
D	CHANNEL $\overline{B}$
E	CHANNEL Z
F	CHANNEL $\overline{Z}$
G	+ 5 VDC
H	5 VDC RTN
K	N/C
J	N/C

MOTOR FEEDBACK CONNECTOR
MS3122E12-10P

SUGGESTED MATING CONNECTOR	
PAC SCI P.N.	MS P.N.
SZ00008	MS3116F12-10S

ENCODER MOUNTING PROVISION ONLY = M2

FOR AGILENT TECHNOLOGIES HED 5600 SERIES MODULAR ENCODER OR SIMILAR



SHAFT DIA. .3148 $^{+.0000}_{-.0005}$
(8,000 $^{-0,013}$)

SHAFT LENGTH .625 ± .030
(15,875 ± 1,016)

NOTES:

1. ENCODER MOUNTS TO MOTOR ENDBELL.
2. MAX. THREAD ENGAGEMENT OF MOUNTING SCREW NOT TO EXCEED .200".

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SHAFT LOAD AND BEARING FATIGUE LIFE (L_{10})

Bearings are the only wearing component of a step motor. PacSci uses heavy duty, long life bearings to assure you the maximum useful life from every step motor you purchase.

The N-mount is a standard NEMA front end bell for all NEMA 23 and many NEMA 34 frame size motors.

The H-mount is a heavy duty NEMA configuration, provided as standard on certain stack lengths in NEMA 34 and all NEMA 42 frame sizes. H-mount is an option on 3-stack NEMA 34 motors. Consult motor Model Number Codes for more information.

SHAFT LOADING

Motor	Max. Radial Force (Lb.) [1]	Max. Axial Force (Lb.)
2" N-Mount	19	65
3" N-Mount	35	180
3" H-Mount	96	180
4" H & R-Mount	140	400
Powermax II [2]	20	13

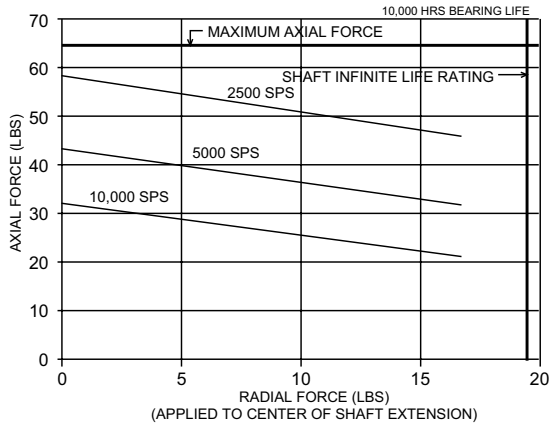
NOTES:

[1] The max. radial forces shown reflect the following assumptions:
a. Radial forces are slowly applied in a reversed manner.
b. Motors are operated at 1 * E-series torque.
c. Infinite fatigue life with 99% reliability.
d. Safety factor = 2.

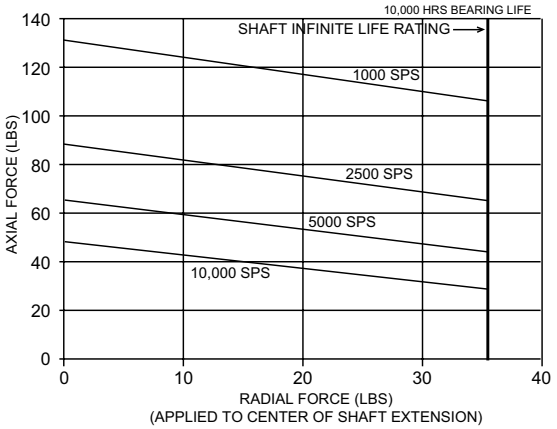
[2] These designs do not have a locked front bearing. They may be operated up to the maximum radial and axial loads and achieve an L-10 life of 10,000 hours at speeds up to 10,000 steps per second. Without a locked front bearing, loads in excess of those shown will overcome the bearing preload. Designs with a locked front bearing withstand much higher inward axial loads.

L-10 BEARING LIFE

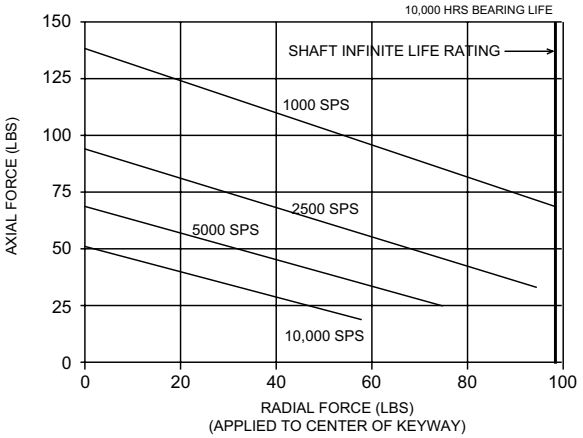
2" N-MOUNT (round motor)



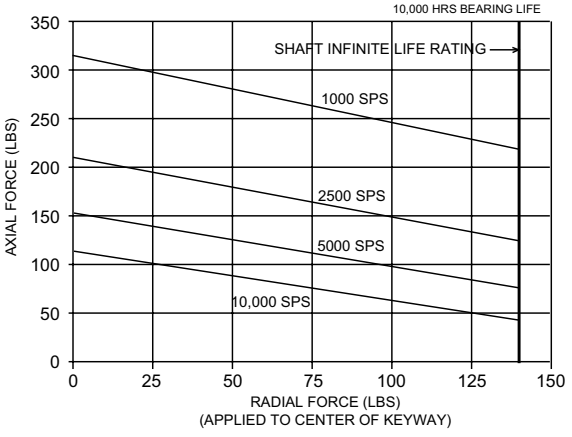
3" N-MOUNT



3" H-MOUNT



4" H & R-MOUNT



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