

MAE™ Stepper Motors



Stepper Motors

PennEngineering Motion Technologies offers a wide range of MAE brand stepper motor solutions. The Y series hybrid stepper motors contain AlNiCo magnets and are well suited for high speed operation. The N series hybrid stepper motors feature neodymium magnets and exhibit excellent torque/rotor inertia characteristics for superior acceleration. The S series hybrid stepper motors feature neodymium magnets and are optimized for maximum torque as well as microstepping capability for smooth operation and fine positioning.

Motors may be customized with value added features including, but not limited to: gearboxes, encoders, shaft details, leadwire-connector assemblies, and more.

All specifications shown are typical at 20° C unless otherwise noted.

Shaft extensions

All motors can be supplied with single or double ended shaft.

Rotation

The motor rotation can run clockwise or counterclockwise, depending on the commutation.

Operating temperature

Ambient operating temperature: -20°C to +40°C.

Number of leads

Refer to specifications of individual models for standard lead wire configuration. Motors can be supplied with 4, 6, or 8 leads upon request; however, rated current and torque may be reduced.

Angular accuracy

Standard angular accuracy is $\pm 5\%$. Angular accuracy is defined as the deviation from a theoretical position, in percentage of one step, after any number of steps.

Holding torque

The values of holding torque of the different models are indicated in the data charts. Holding torque is measured with two phases each supplied at the rated current.

Specifications and approvals

Motors are manufactured according to EN 60034-1: 1995-02. Motors with drive voltage higher than or equal to 120 V are suitable to be fitted on machines equipped with additional insulation or when the motor itself has the grounding through its clamping screws.

Stepper Motors

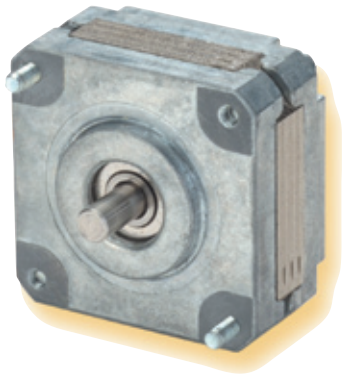
- Accurate open loop control for high performance positioning applications
- Excellent low speed torque
- Simple, rugged construction for high reliability and long service life
- Smooth, quiet operation
- Standard NEMA frame sizes
- Precision honed stators and ground rotors for tight air gap and maximum performance



Get same day shipment of sample motors for models listed in this bulletin.

PennEngineering Motion Technologies offers a complete line of PITTMAN® and MAE™ brand brush, brushless, and stepper motors which can be customized to meet your exact requirements.

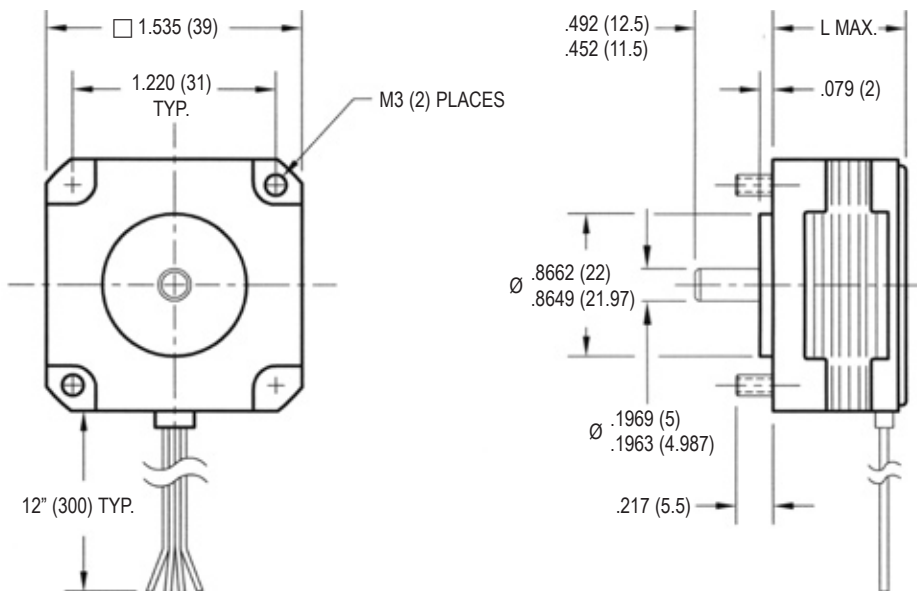
SIZE 16 STEPPER MOTOR DATA



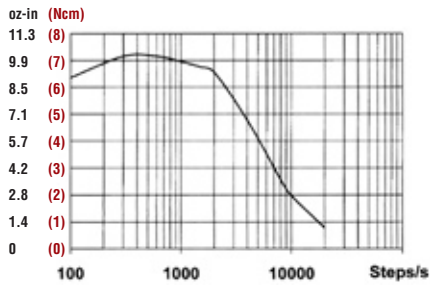
- Step angle: 1.8°
- NEMA 17 mounting configuration
- AlNiCo magnets for high speed operation
- Additional windings and customization options available
- CE approved

Specification	Units	Y 20 1607	
		0030	0060
Rated Phase Current	A	0.30	0.60
Phase Resistance	Ω	20	6.6
Phase Inductance	mH	23	8.5
Holding Torque Unipolar	oz-in	—	—
	Ncm	—	—
Holding Torque Bipolar	oz-in	10	12
	Ncm	7.0	8.7
Detent Torque	oz-in	1.4	1.4
	Ncm	1.0	1.0
Rotor Inertia	oz-in-s ² x10 ⁻⁴	1.6	1.6
	g-cm ²	11	11
Motor Weight (Mass)	lb	0.33	0.33
	kg	0.15	0.15
Maximum Voltage	V	40	40
Motor Length (Max)	in	0.81	0.81
	mm	20.5	20.5
Std. Leadwire Config. ⁽¹⁾	—	1	1
Std. No. of Leads	—	4	4

Available through the MotionExpress program.
 (1) For standard leadwire configuration see page 18.

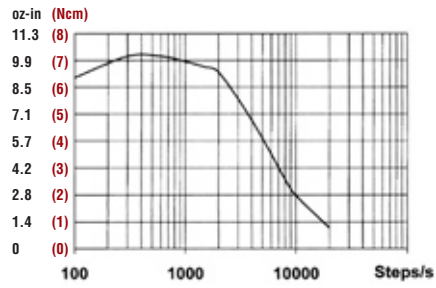


Y 20 1607 0030



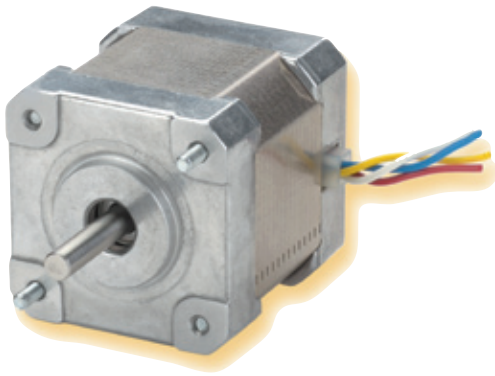
Drive: Bipolar chopper, 36V, 0.3A/Phase

Y 20 1607 0060



Drive: Bipolar chopper, 36V, 0.6A/Phase

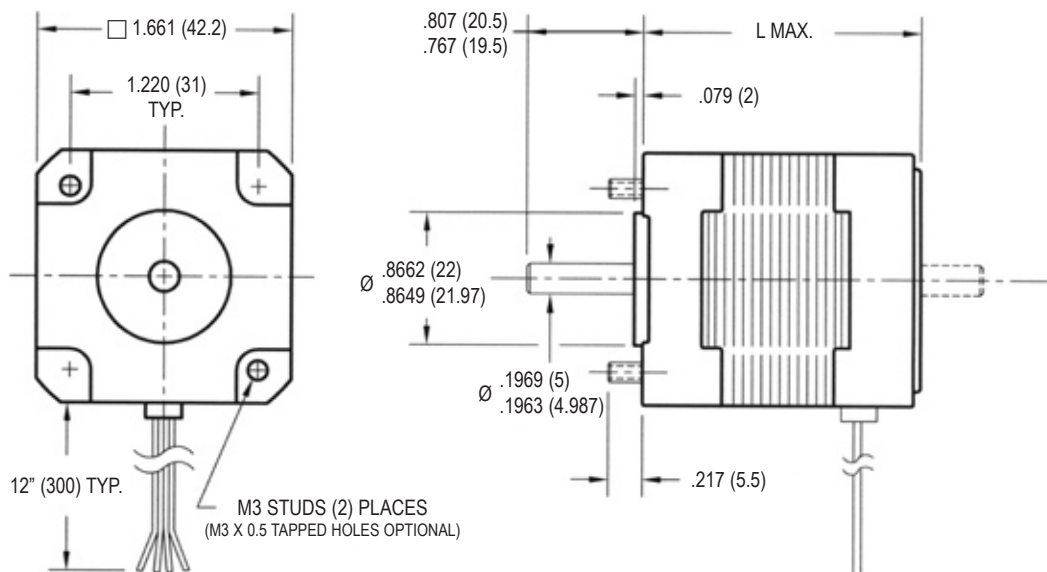
SIZE 17 STEPPER MOTOR DATA



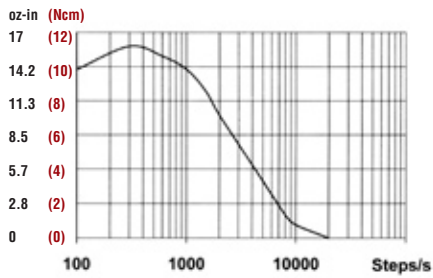
- Step angle: 1.8°
- NEMA 17 mounting configuration
- AlNiCo magnets for high speed operation
- Additional windings and customization options available
- CE approved

Specification	Units	Y 20 1713				Y 20 1717	Y 20 1718	
		0033 ✓	0040	0100 ✓	0150	0100	0090 ✓	0230
Rated Phase Current	A	0.33	0.40	1.00	1.5	1.00	0.90	2.30
Phase Resistance	Ω	23.9	15.6	5.6	1.0	4.6	4.2	0.72
Phase Inductance	mH	29.8	11.9	8.5	1.2	10.6	5.8	0.83
Holding Torque Unipolar	oz-in	—	15.9	—	—	—	—	—
	Ncm	—	11.2	—	—	—	—	—
Holding Torque Bipolar	oz-in	19.4	20.5	20.0	18.4	32.7	41.1	41.1
	Ncm	13.7	14.5	14.0	13.0	23.1	29.0	29.0
Detent Torque	oz-in	2.4	2.4	2.4	2.4	2.4	6.4	6.4
	Ncm	1.7	1.7	1.7	1.7	1.7	4.5	4.5
Rotor Inertia	oz-in-s ² x10 ⁻⁴	2.5	2.5	2.5	2.5	4.5	5.1	5.1
	g-cm ²	18	18	18	18	32	36	36
Motor Weight (Mass)	lb	0.4	0.4	0.4	0.4	0.7	0.7	0.7
	kg	0.2	0.2	0.2	0.2	0.3	0.3	0.3
Maximum Voltage	V	40	40	40	40	40	40	40
Motor Length (Max)	in	1.34	1.34	1.34	1.34	1.69	1.81	1.81
	mm	34	34	34	34	43	46	46
Std. Leadwire Config. ⁽¹⁾	—	2	2	2	2	2	2	2
Std. No. of Leads	—	4	4	4	4	4	4	4

✓ Available through the MotionExpress program.
 (1) For standard leadwire configuration see page 18.

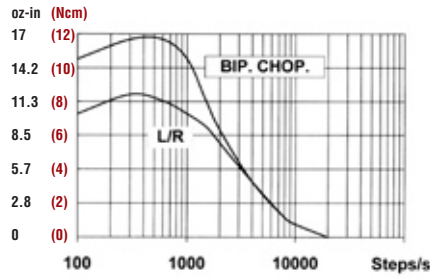


Y 20 1713 0033



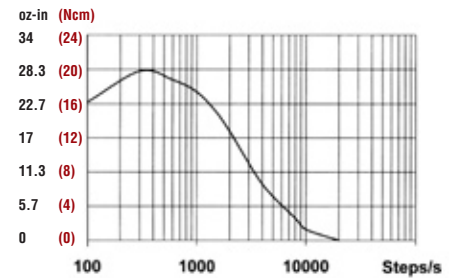
Drive: Bipolar chopper, 36V, 0.33A/Phase

Y 20 1713 0040



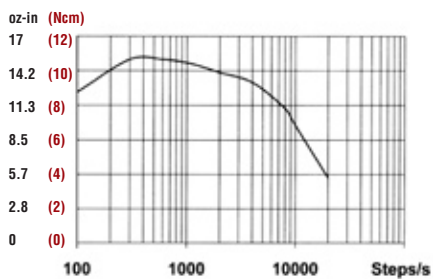
Drive: Bipolar chopper, Series 36V, 0.29A/Phase
Drive: Unipolar L/R, 36V, RS=70ohm

Y 20 1713 0100



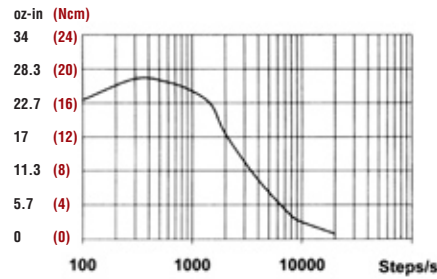
Drive: Bipolar chopper, 36V, 1A/Phase

Y 20 1713 0150



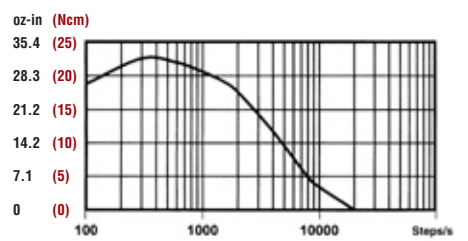
Drive: Bipolar chopper, 36V, 1.5A/Phase

Y 20 1717 0100



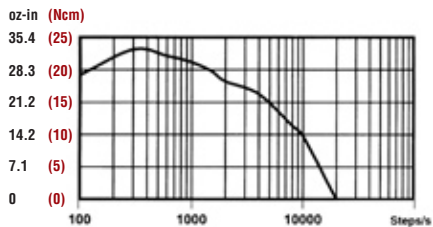
Drive: Bipolar chopper, 36V, 1A/Phase

Y 20 1718 0090



Drive: Bipolar chopper, 36V, 0.9A/Phase

Y 20 1718 0230



Drive: Bipolar chopper, 36V, 2.3A/Phase

SIZE 23 STEPPER MOTOR DATA



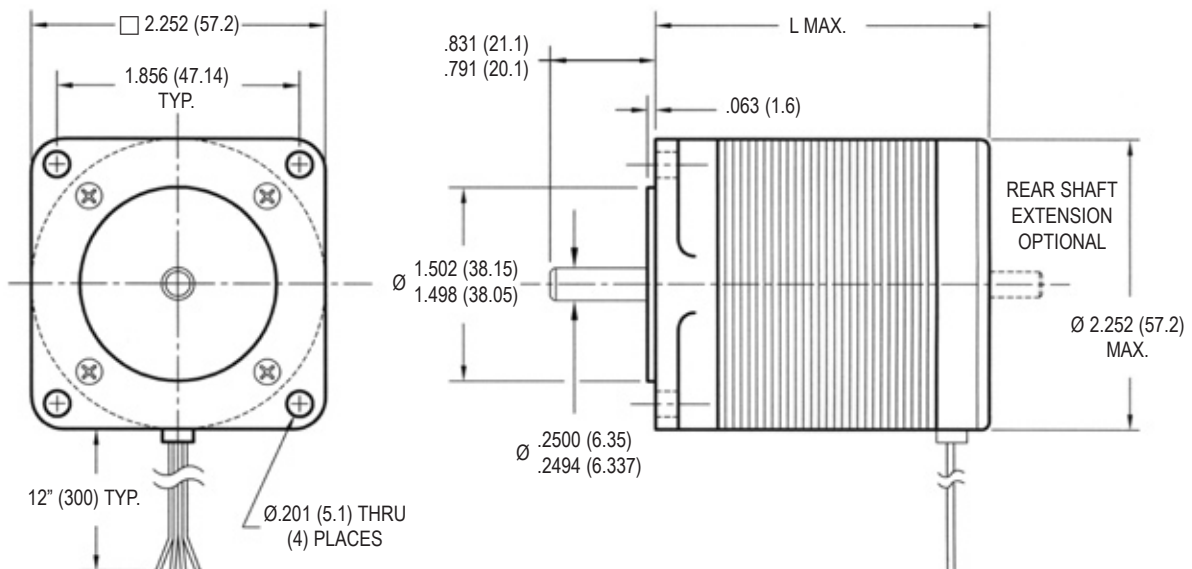
- Step angle: 1.8°
- NEMA 23 mounting configuration
- AlNiCo magnets for high speed operation
- Additional windings and customization options available
- CE approved

Specification	Units	Y 20 2215				Y 20 2220			Y 20 2226			
		0033	0100	0150 ✓	0220	0044	0100 ✓	0210 ✓	0160 ✓	0190 ✓	0250	0470
Rated Phase Current ⁽¹⁾	A	0.33	1.00	1.50	2.20	0.44	1.00	2.10	1.60	1.90	2.50	4.70
Phase Resistance ⁽¹⁾	Ω	33.8	3.4	1.5	0.7	23.0	5.0	1.1	2.6	1.8	1.1	0.33
Phase Inductance ⁽¹⁾	mH	54.6	3.8	1.5	1.2	39.2	8.0	1.7	4.7	3.3	4.0	0.5
Holding Torque Unipolar	oz-in	—	38	35	—	74	75	74	123	126	—	123
	Ncm	—	27	25	—	52	53	52	87	89	—	87
Holding Torque Bipolar	oz-in	45	48	47	44	92	98	91	154	160	161	154
	Ncm	32	34	33	31	65	69	64	109	113	114	109
Detent Torque	oz-in	4.8	4.8	4.8	4.8	7.5	7.5	7.5	12.0	12.0	12.0	12.0
	Ncm	3.4	3.4	3.4	3.4	5.3	5.3	5.3	8.5	8.5	8.5	8.5
Rotor Inertia	oz-in-s ² x10 ⁻⁴	7.9	7.9	7.9	7.9	17.6	17.6	17.6	28	28	28	28
	g-cm ²	56	56	56	56	124	124	124	200	200	200	200
Motor Weight (Mass)	lb	0.75	0.75	0.75	0.75	1.1	1.1	1.1	1.5	1.5	1.5	1.5
	kg	0.34	0.34	0.34	0.34	0.50	0.50	0.50	0.70	0.70	0.70	0.70
Maximum Voltage	V	75	75	75	75	75	75	75	75	75	75	75
Motor Length (Max)	in	1.57	1.57	1.57	1.57	2.05	2.05	2.05	2.64	2.64	2.64	2.64
	mm	40	40	40	40	52	52	52	67	67	67	67
Std. Leadwire Config. ⁽²⁾	—	1	5	5	1	5	5	5	5	5	3	5
Std. No. of Leads	—	4	8	8	4	8	8	8	8	8	4	8

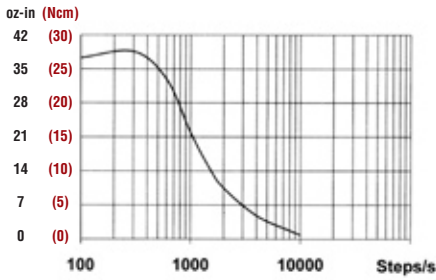
✓ Available through the MotionExpress program.

(1) Current, resistance, and inductance shown for 8 lead motors are characteristics of a unipolar connection from center tap to end. See page 18 for conversion factors to determine bipolar connection characteristics.

(2) For standard leadwire configuration see page 18.

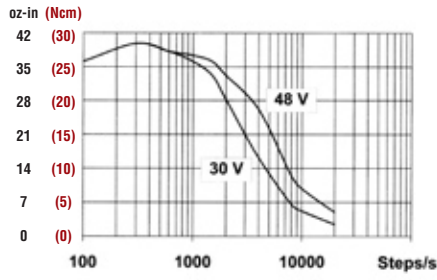


Y 20 2215 0033



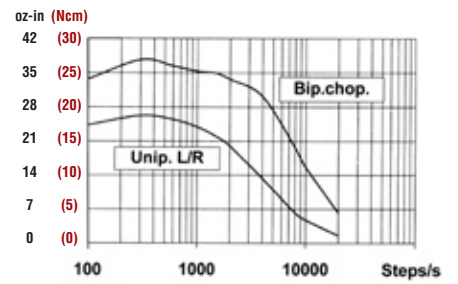
Drive: Bipolar chopper, 36V, 0.33A/Phase

Y 20 2215 0100



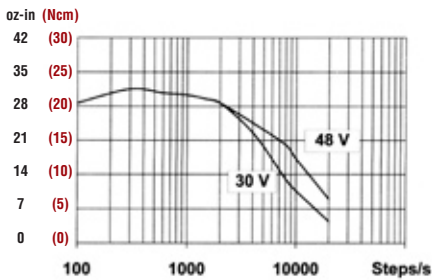
Drive: Bipolar chopper, Parallel, 1.5A/Phase

Y 20 2215 0150



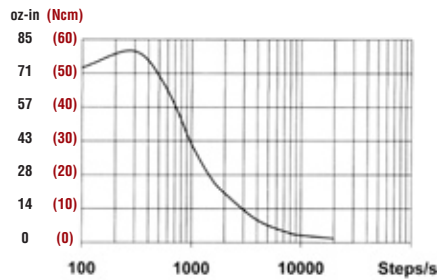
Drive: Bipolar chopper, 48V, 2.2A/Phase
Drive: Unipolar L/R, 36V, RS=22ohm

Y 20 2215 0220



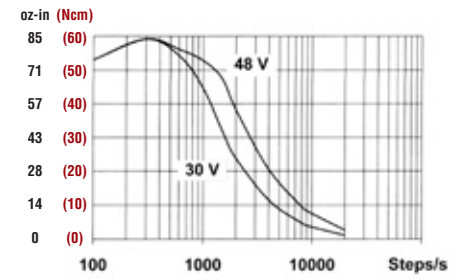
Drive: Bipolar chopper, 2.2A/Phase

Y 20 2220 0044



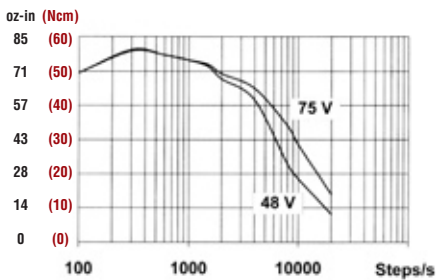
Drive: Bipolar chopper, Parallel, 36V, 0.62A/Phase

Y 20 2220 0100



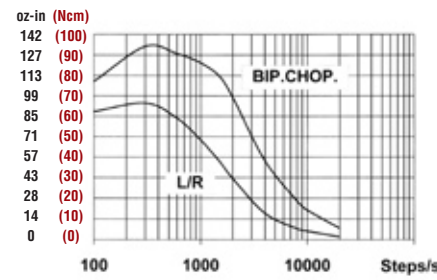
Drive: Bipolar chopper, Parallel, 1.5A/Phase

Y 20 2220 0210



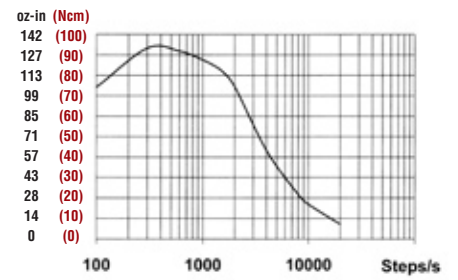
Drive: Bipolar chopper, Parallel, 3A/Phase

Y 20 2226 0160



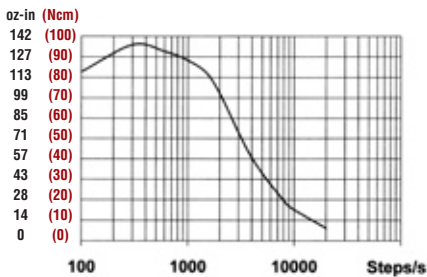
Drive: Bipolar chopper, Parallel, 48V, 2.3A/Phase
Drive: Unipolar L/R, 36V, RS=18ohm

Y 20 2226 0190



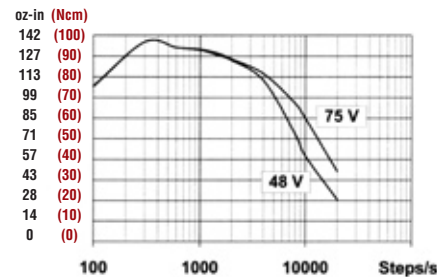
Drive: Bipolar chopper, Parallel, 48V, 2.7A/Phase

Y 20 2226 0250



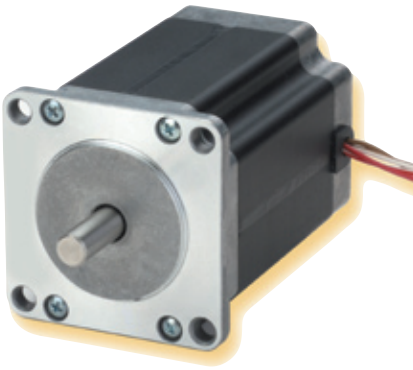
Drive: Bipolar chopper, 48V, 2.5A/Phase

Y 20 2226 0470



Drive: Bipolar chopper, Parallel, 6.7A/Phase

SIZE 23 HIGH PERFORMANCE STEPPER MOTOR DATA



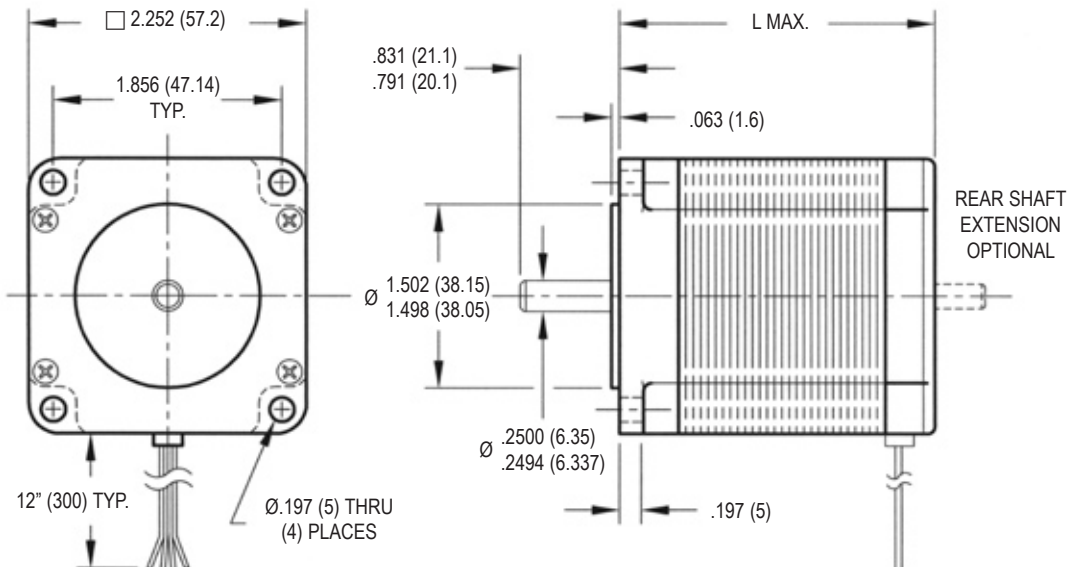
- Step angle: 1.8°
- NEMA 23 mounting configuration
- Neodymium magnets for maximum torque
- Optimized for microstep operation
- Additional windings and customization options available
- CE approved

Specification	Units	S 20 2216		S 20 2221			S 20 2231	
		0100 ✓	0210	0100	0210	0300 ✓	0210	0300 ✓
Rated Phase Current ⁽¹⁾	A	1.00	2.10	1.00	2.10	3.00	2.10	3.00
Phase Resistance ⁽¹⁾	Ω	4.6	1.0	6.2	1.4	0.7	2.0	1.1
Phase Inductance ⁽¹⁾	mH	4.6	2.1	8.8	3.9	0.9	6.5	1.7
Holding Torque Unipolar	oz-in	52	—	106	—	106	—	177
	Ncm	37	—	75	—	75	—	125
Holding Torque Bipolar	oz-in	67	67	139	139	139	228	231
	Ncm	47	47	98	98	98	161	163
Detent Torque	oz-in	3.0	3.0	5.7	5.7	5.7	9.6	9.6
	Ncm	2.1	2.1	4.0	4.0	4.0	6.8	6.8
Rotor Inertia	oz-in-s ² x10 ⁻⁴	11	11	31	31	31	48	48
	g-cm ²	77	77	220	220	220	340	340
Motor Weight (Mass)	lb	1.1	1.1	1.5	1.5	1.5	2.2	2.2
	kg	0.50	0.50	0.70	0.70	0.70	1.0	1.0
Maximum Voltage	V	75	75	75	75	75	75	75
Motor Length (Max)	in	1.61	1.61	2.17	2.17	2.17	3.09	3.09
	mm	41	41	55	55	55	78.5	78.5
Std. Leadwire Config. ⁽²⁾	—	6	4	7	4	7	4	7
Std. No. of Leads	—	8	4	8	4	8	4	8

✓ Available through the MotionExpress program.

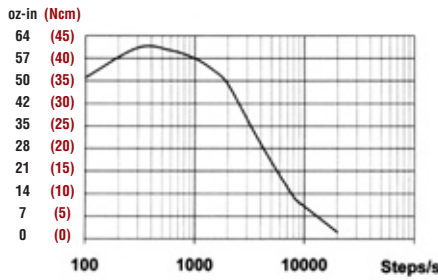
(1) Current, resistance, and inductance shown for 8 lead motors are characteristics of a unipolar connection from center tap to end. See page 18 for conversion factors to determine bipolar connection characteristics.

(2) For standard leadwire configuration see page 18.



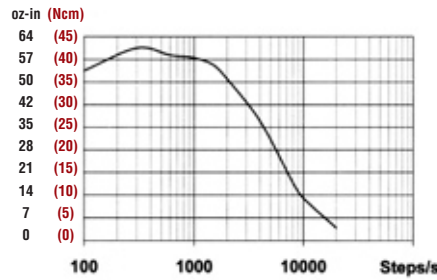
PULL-OUT TORQUE CURVES

S 20 2216 0100



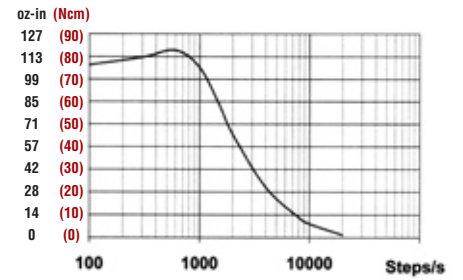
Drive: Bipolar chopper, Parallel, 36V, 1.4A/Phase

S 20 2216 0210



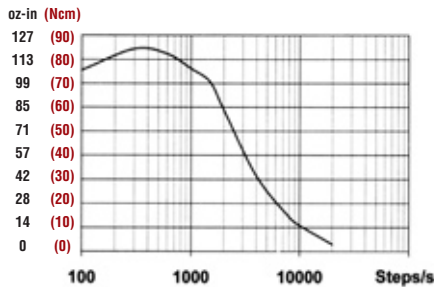
Drive: Bipolar chopper, Parallel, 2.1A/Phase

S 20 2221 0100



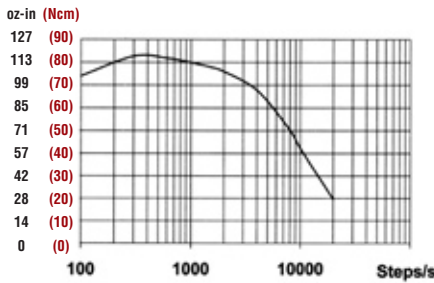
Drive: Bipolar chopper, Parallel, 36V, 1.4A/Phase

S 20 2221 0210



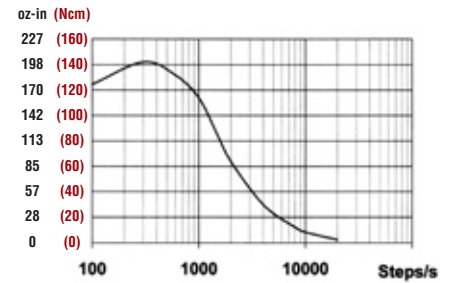
Drive: Bipolar chopper, 36V, 2.1A/Phase

S 20 2221 0300



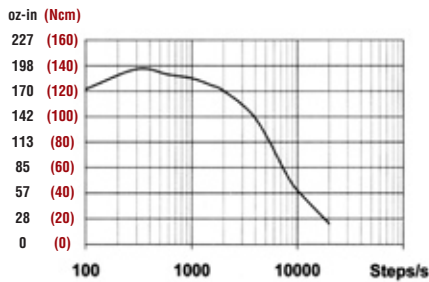
Drive: Bipolar chopper, Parallel, 60V, 4.2A/Phase

S 20 2231 0210



Drive: Bipolar chopper, 36V, 2.1A/Phase

S 20 2231 0300



Drive: Bipolar chopper, Parallel, 60V, 4.2A/Phase

SIZE 34 STEPPER MOTOR DATA



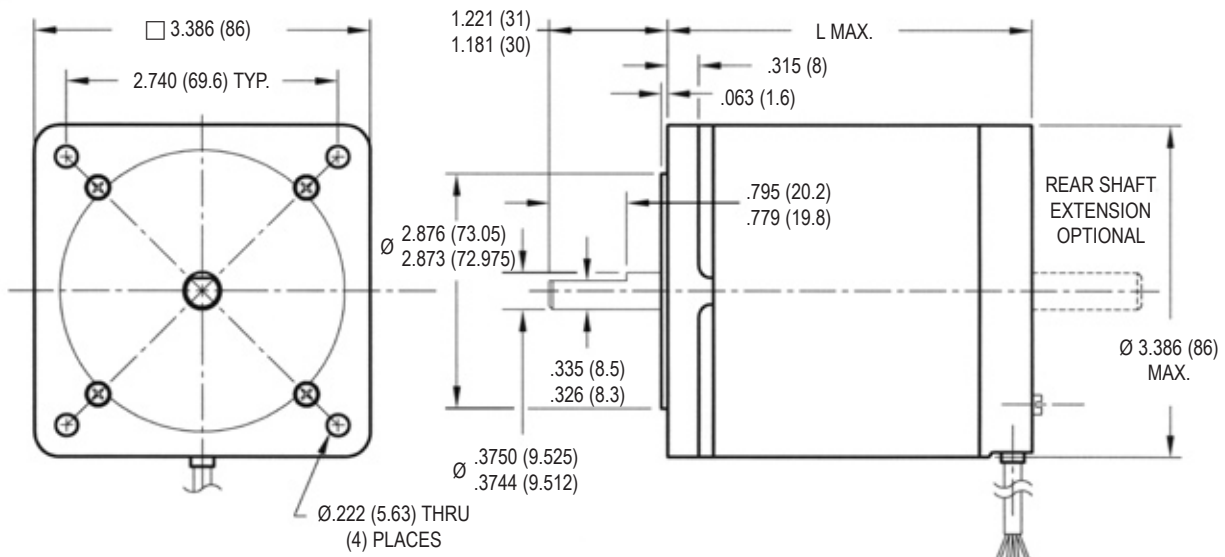
- Step angle: 1.8°
- NEMA 34 mounting configuration
- Neodymium magnets for maximum torque
- Protection class: IP 55
- Additional windings and customization options available
- CE approved

Specification	Units	N 20 3426			N 20 3438		N 20 3451	
		0140	0280	0430 ✓	0280	0430 ✓	0350 ✓	0640 ✓
Rated Phase Current ⁽¹⁾	A	1.40	2.80	4.30	2.80	4.30	3.50	6.40
Phase Resistance ⁽¹⁾	Ω	5.0	1.3	0.55	1.7	0.75	1.5	0.50
Phase Inductance ⁽¹⁾	mH	21.0	5.1	2.1	7.7	3.5	8.5	2.5
Holding Torque Unipolar	oz-in	326	326	326	538	538	878	878
	Ncm	230	230	230	380	380	620	620
Holding Torque Bipolar	oz-in	397	397	397	680	680	1076	1076
	Ncm	280	280	280	480	480	760	760
Detent Torque	oz-in	12	12	12	18	18	33	33
	Ncm	8.5	8.5	8.5	13	13	23	23
Rotor Inertia	oz-in-s ² x10 ⁻⁴	93	93	93	170	170	255	255
	g-cm ²	660	660	660	1200	1200	1800	1800
Motor Weight (Mass)	lb	3.5	3.5	3.5	5.3	5.3	7.9	7.9
	kg	1.6	1.6	1.6	2.4	2.4	3.6	3.6
Maximum Voltage	V	90	90	90	90	90	140	140
Motor Length (Max)	in	2.64	2.64	2.64	3.70	3.70	4.92	4.92
	mm	67	67	67	94	94	125	125
Std. Leadwire Config. ⁽²⁾	—	5	5	5	5	5	5	5
Std. No. of Leads	—	8	8	8	8	8	8	8

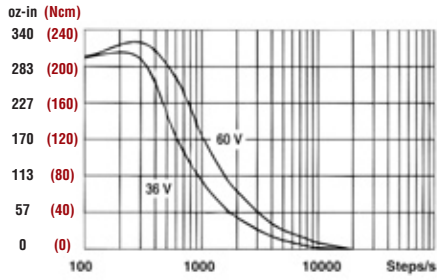
✓ Available through the MotionExpress program.

(1) Current, resistance, and inductance shown for 8 lead motors are characteristics of a unipolar connection from center tap to end. See page 18 for conversion factors to determine bipolar connection characteristics.

(2) For standard leadwire configuration see page 18.

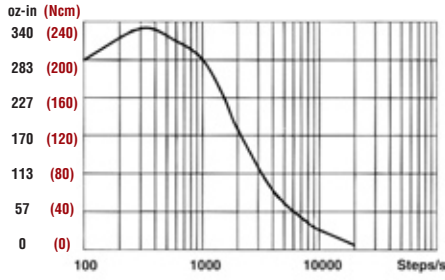


N 20 3426 0140



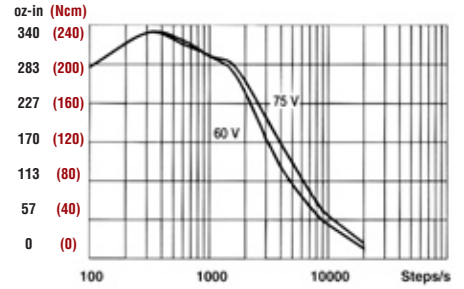
Drive: Bipolar chopper, Parallel, 2A/Phase

N 20 3426 0280



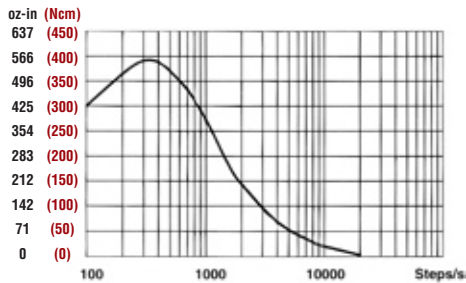
Drive: Bipolar chopper, Parallel, 60V, 4A/Phase

N 20 3426 0430



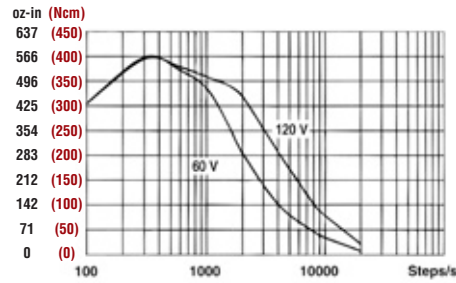
Drive: Bipolar chopper, Parallel, 6A/Phase

N 20 3438 0280



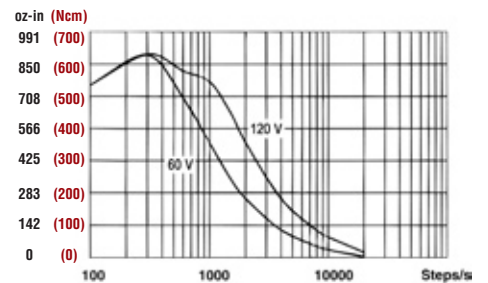
Drive: Bipolar chopper, Parallel, 60V, 4A/Phase

N 20 3438 0430



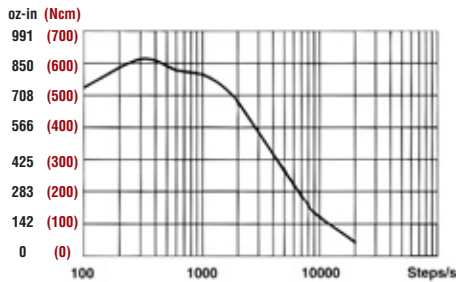
Drive: Bipolar chopper, Parallel, 6A/Phase

N 20 3451 0350



Drive: Bipolar chopper, Parallel, 5A/Phase

N 20 3451 0640



Drive: Bipolar chopper, Parallel, 120V, 9A/Phase

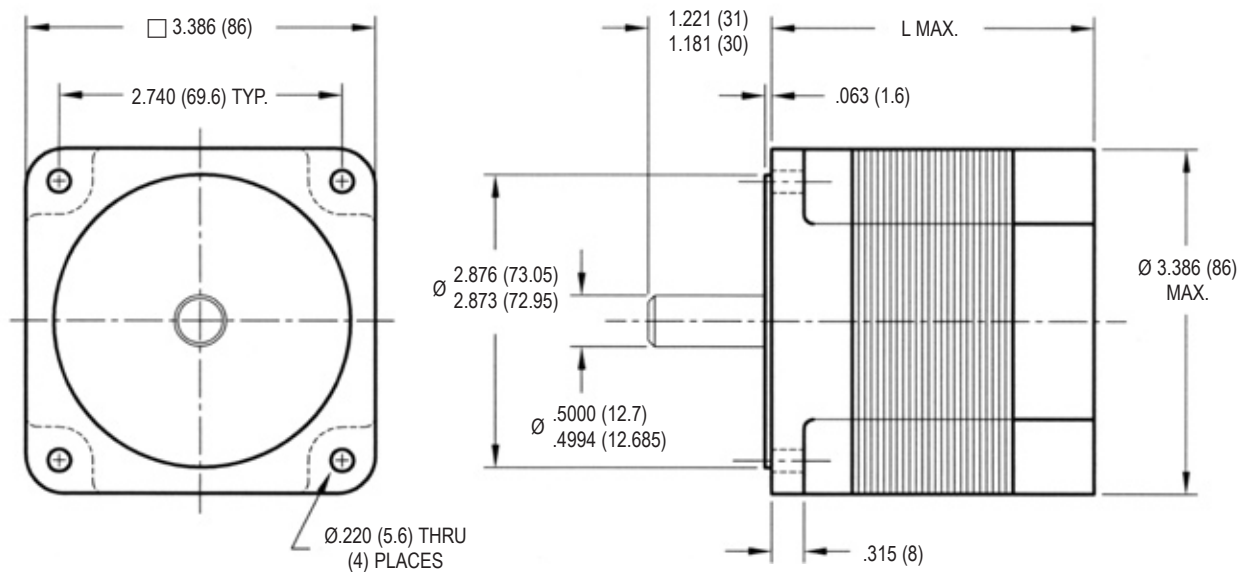
SIZE 34 HIGH PERFORMANCE STEPPER MOTOR DATA



- Step angle: 1.8°
- NEMA 34 mounting configuration
- Neodymium magnets for maximum torque
- Optimized for microstep operation
- Additional windings and customization options available
- CE approved

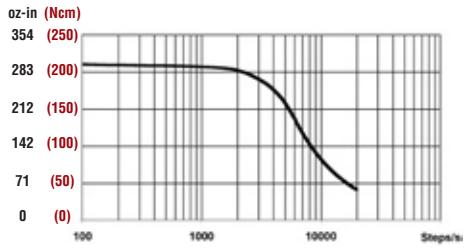
Specification	Units	S 20 3425	S 20 3432	S 20 3447
		0600	0600	0900
Rated Phase Current	A	6.00	6.00	9.00
Phase Resistance	Ω	0.30	0.35	0.20
Phase Inductance	mH	1.6	2.5	1.5
Holding Torque Unipolar	oz-in	—	—	—
	Ncm	—	—	—
Holding Torque Bipolar	oz-in	467	708	1416
	Ncm	330	500	1000
Detent Torque	oz-in	38	27	59
	Ncm	27	19	42
Rotor Inertia	oz-in-s ² x10 ⁻⁴	283	368	736
	g-cm ²	2000	2600	5200
Motor Weight (Mass)	lb	4.4	6.6	9.9
	kg	2.0	3.0	4.5
Maximum Voltage	V	90	90	90
Motor Length (Max)	in	2.44	3.15	4.72
	mm	62	80	120
Std. Leadwire Config. ⁽¹⁾	—	1	1	1
Std. No. of Leads	—	4	4	4

(1) For standard leadwire configuration see page 18.



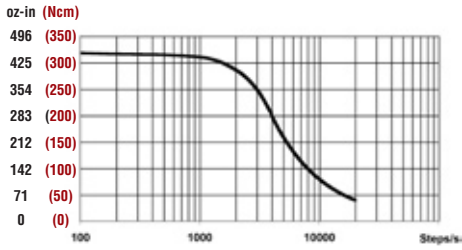
PULL-OUT TORQUE CURVES

S 20 3425 0600



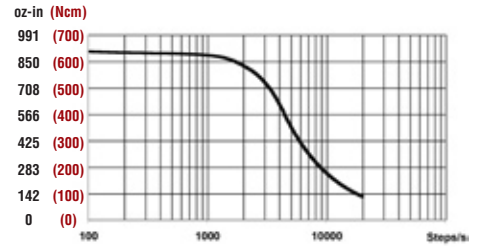
Drive: Bipolar chopper, 60V, 6A/Phase

S 20 3432 0600



Drive: Bipolar chopper, 60V, 6A/Phase

S 20 3447 0900



Drive: Bipolar chopper, 60V, 9A/Phase

SIZE 42 STEPPER MOTOR DATA



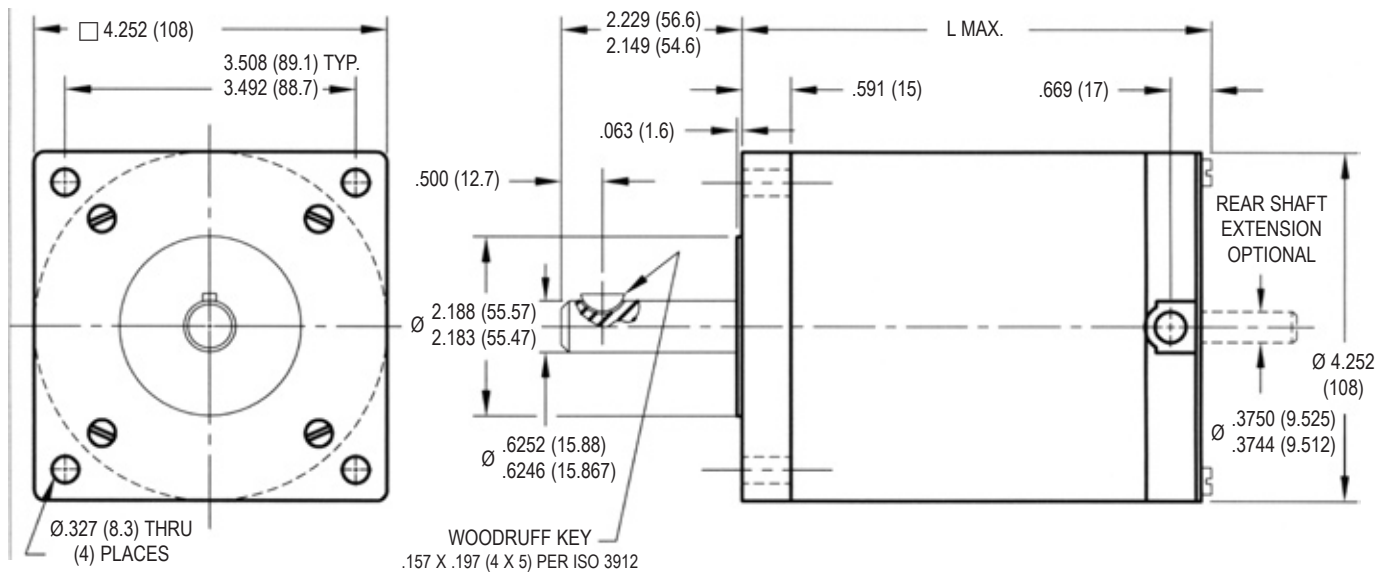
- Step angle: 1.8°
- NEMA 42 mounting configuration
- AlNiCo magnets for high speed operation
- Additional windings and customization options available
- CE approved

Specification	Units	Y 20 4270		Y 20 4288	
		0340	0710	0900	0890
Rated Phase Current ⁽¹⁾	A	3.40	7.10	9.00	8.90
Phase Resistance ⁽¹⁾	Ω	1.1	0.30	0.34	0.31
Phase Inductance ⁽¹⁾	mH	6.3	2.0	2.7	2.3
Holding Torque Unipolar	oz-in	1130	1175	1450	1614
	Ncm	798	830	1024	1140
Holding Torque Bipolar	oz-in	1402	1459	1798	2018
	Ncm	990	1030	1270	1425
Detent Torque	oz-in	99	99	99	92
	Ncm	70	70	70	65
Rotor Inertia	oz-in-s ² x10 ⁻⁴	779	779	779	1175
	g-cm ²	5500	5500	5500	8300
Motor Weight (Mass)	lb	16	16	16	23
	kg	7.3	7.3	7.3	10.5
Maximum Voltage	V	140	140	140	140
Motor Length (Max)	in	7.05	7.05	8.90	8.90
	mm	179	179	226	226
Std. Leadwire Config. ⁽²⁾	—	5	5	5	5
Std. No. of Leads	—	8	8	8	8

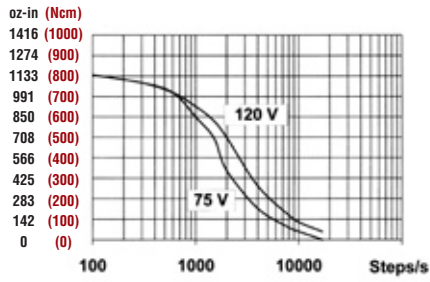
Available through the MotionExpress program.

(1) Current, resistance, and inductance shown for 8 lead motors are characteristics of a unipolar connection from center tap to end. See page 18 for conversion factors to determine bipolar connection characteristics.

(2) For standard leadwire configuration see page 18.

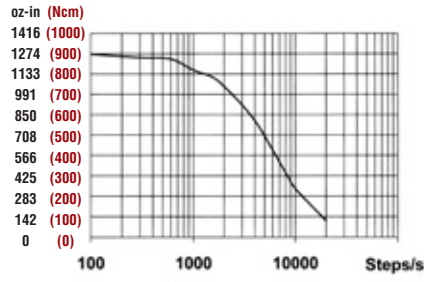


Y 20 4270 0340



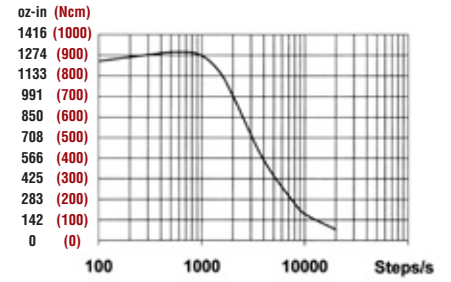
Drive: Bipolar chopper, Parallel, 4.8A/Phase

Y 20 4270 0710



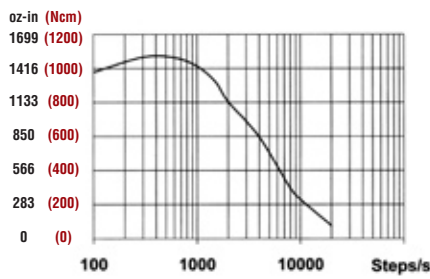
Drive: Bipolar chopper, Parallel, 140V, 10A/Phase

Y 20 4270 0900



Drive: Bipolar chopper, Parallel, 140V, 12A/Phase

Y 20 4288 0890



Drive: Bipolar chopper, Parallel, 140V, 12A/Phase

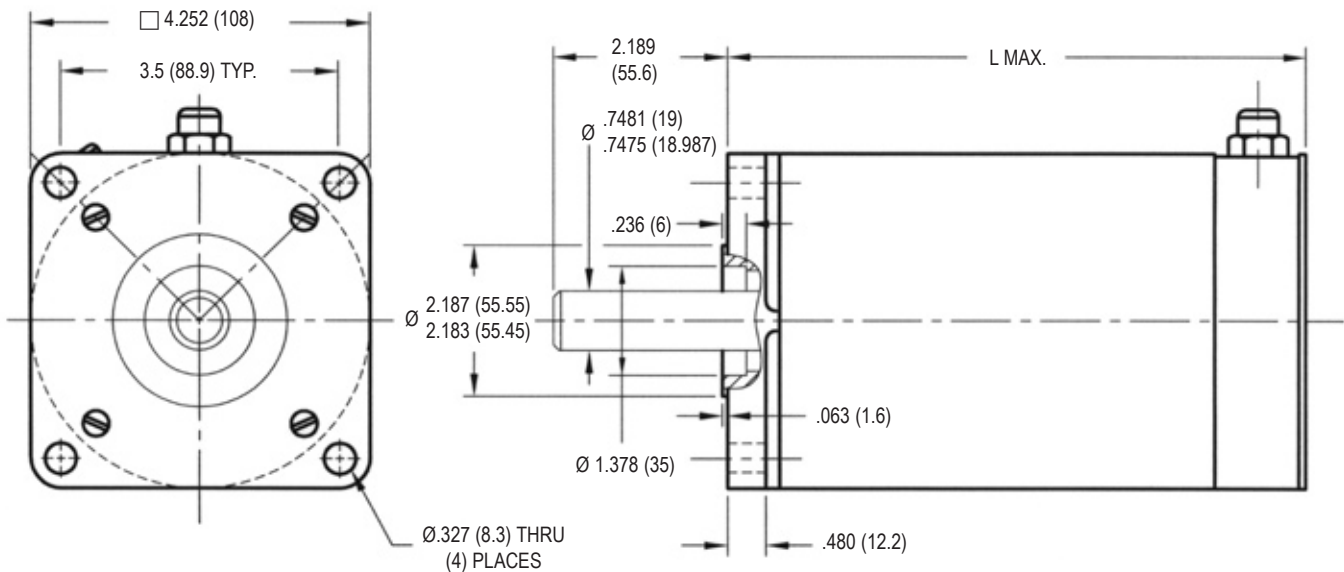
SIZE 42 HIGH PERFORMANCE STEPPER MOTOR DATA



- Step angle: 1.8°
- NEMA 42 mounting configuration
- Neodymium magnets for maximum torque
- Optimized for microstep operation
- Additional windings and customization options available
- CE approved

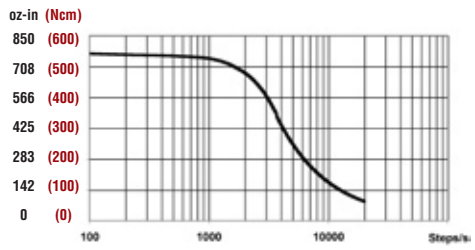
Specification	Units	N 20 4255		N 20 4277		N 20 4297	
		0700	1200 ✓	1200 ✓	1400 ✓		
Rated Phase Current	A	7.00	12.00	12.00	14.00		
Phase Resistance	Ω	0.34	0.48	0.48	0.65		
Phase Inductance	mH	5.5	9.0	9.0	12		
Holding Torque Unipolar	oz-in	—	—	—	—		
	Ncm	—	—	—	—		
Holding Torque Bipolar	oz-in	1204	2407	2407	3186		
	Ncm	850	1700	1700	2250		
Detent Torque	oz-in	85	127	127	170		
	Ncm	60	90	90	120		
Rotor Inertia	oz-in-s ² x10 ⁻⁴	736	1402	1402	2124		
	g-cm ²	5200	9900	9900	15000		
Motor Weight (Mass)	lb	13	20	20	25		
	kg	6.1	9.2	9.2	11.5		
Maximum Voltage	V	140	140	140	140		
Motor Length (Max)	in	5.51	7.68	7.68	9.76		
	mm	140	195	195	248		
Std. Leadwire Config. ⁽¹⁾	—	2	2	2	2		
Std. No. of Leads	—	4	4	4	4		

✓ Available through the MotionExpress program.
 (1) For standard leadwire configuration see page 18.



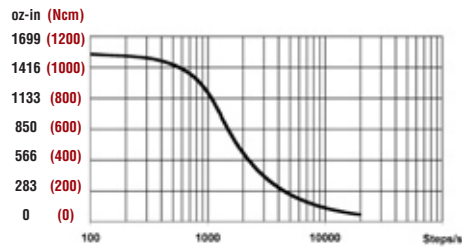
PULL-OUT TORQUE CURVES

N 20 4255 0700



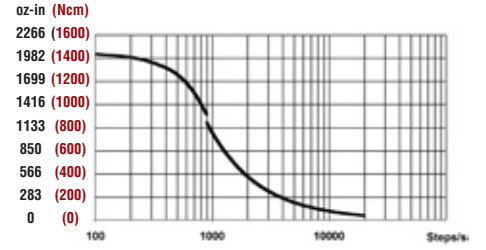
Drive: Bipolar chopper, 140V, 7A/Phase

N 20 4277 1200



Drive: Bipolar chopper, 140V, 12A/Phase

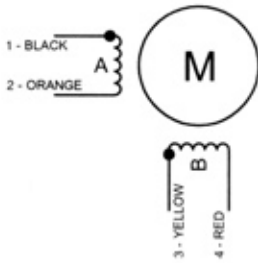
N 20 4297 1400



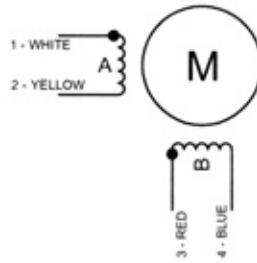
Drive: Bipolar chopper, 140V, 14A/Phase

STANDARD LEADWIRE CONFIGURATION

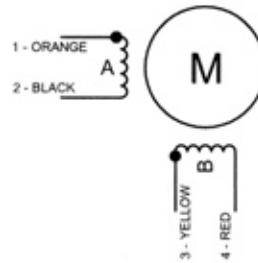
CONFIGURATION #1



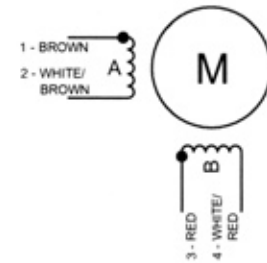
CONFIGURATION #2



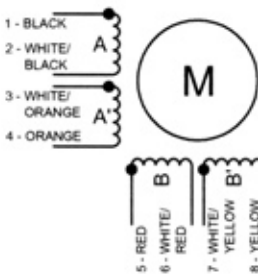
CONFIGURATION #3



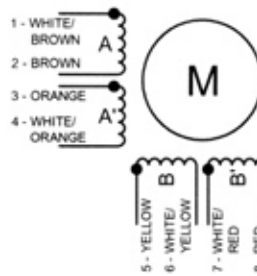
CONFIGURATION #4



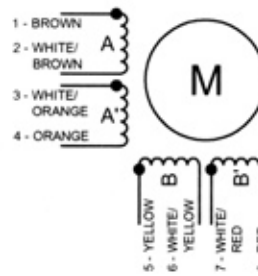
CONFIGURATION #5



CONFIGURATION #6



CONFIGURATION #7



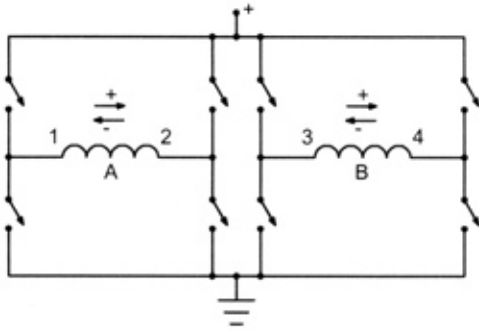
CONNECTION-DEPENDENT RATINGS FOR 8 LEAD MOTORS

Stepper motors supplied with 8 leads provide maximum flexibility and allow the user to decide what connection method is most suitable for their application. Some of the motor phase characteristics are dependent on the connection method chosen for the windings.

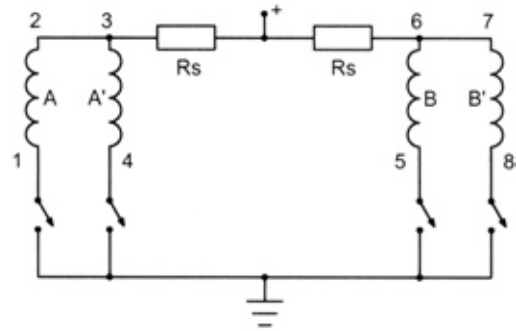
The values for current, resistance, and inductance shown in the data tables for 8 lead motors assume a unipolar connection and measure from the center tap to the end of one winding. To determine the phase characteristics for other connection methods, multiply the given unipolar ratings by the conversion factors listed in the chart below that correspond to the chosen connection method.

	Unipolar Connection	Bipolar Series Connection	Bipolar Parallel Connection
Rated Phase Current	1	0.7	1.4
Phase Resistance	1	2	0.5
Phase Inductance	1	4	1

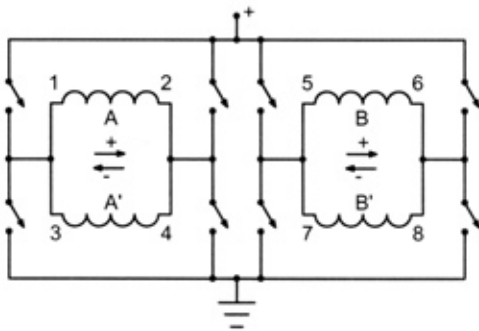
BIPOLAR



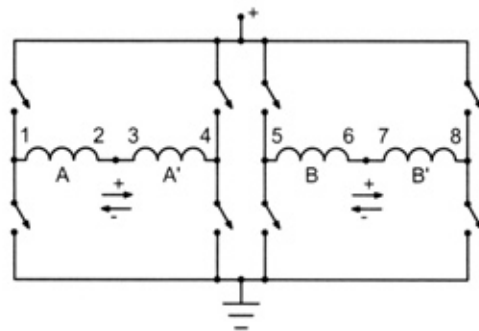
UNIPOLAR



BIPOLAR (PARALLEL)



BIPOLAR (SERIES)



STEP SEQUENCES

FULL STEP OPERATION

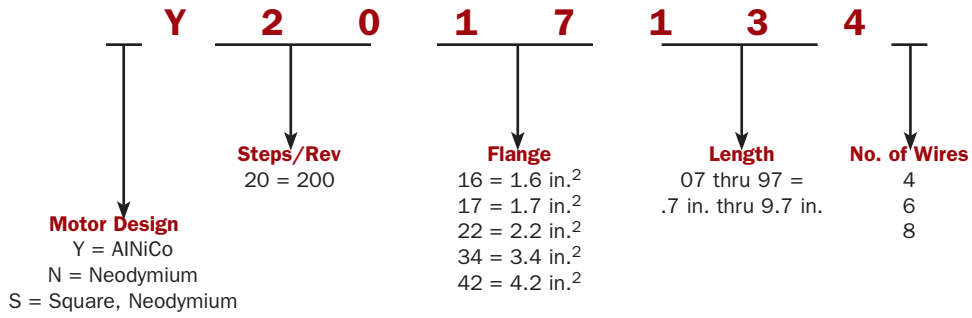
One Phase On					
Unipolar				Bipolar	
	A	A'	B	B'	
1	+	0	0	0	1 0 +
2	0	0	+	0	2 - 0
3	0	+	0	0	3 0 -
4	0	0	0	+	4 + 0
1	+	0	0	0	1 0 +

Two Phases On					
Unipolar				Bipolar	
	A	A'	B	B'	
1	+	0	0	+	1 + -
2	+	0	+	0	2 + +
3	0	+	+	0	3 - +
4	0	+	0	+	4 - -
1	+	0	0	+	1 + -

HALF STEP OPERATION

	Unipolar				Bipolar	
	A	A'	B	B'	A	B
1	+	0	0	+	1	+
2	+	0	0	0	2	0
3	+	0	+	0	3	-
4	0	0	+	0	4	0
5	0	+	+	0	5	-
6	0	+	0	0	6	0
7	0	+	0	+	7	+
8	0	0	0	+	8	0
1	+	0	0	+	1	+

PART NUMBER DESCRIPTION



The part number description above may also contain a factory assigned suffix of up to seven additional characters. When ordering, please specify the part number according to the system. For first time orders, omit the factory assigned suffix, but specify the winding designation and any additional customization requests.

Specifications subject to change without notice.

