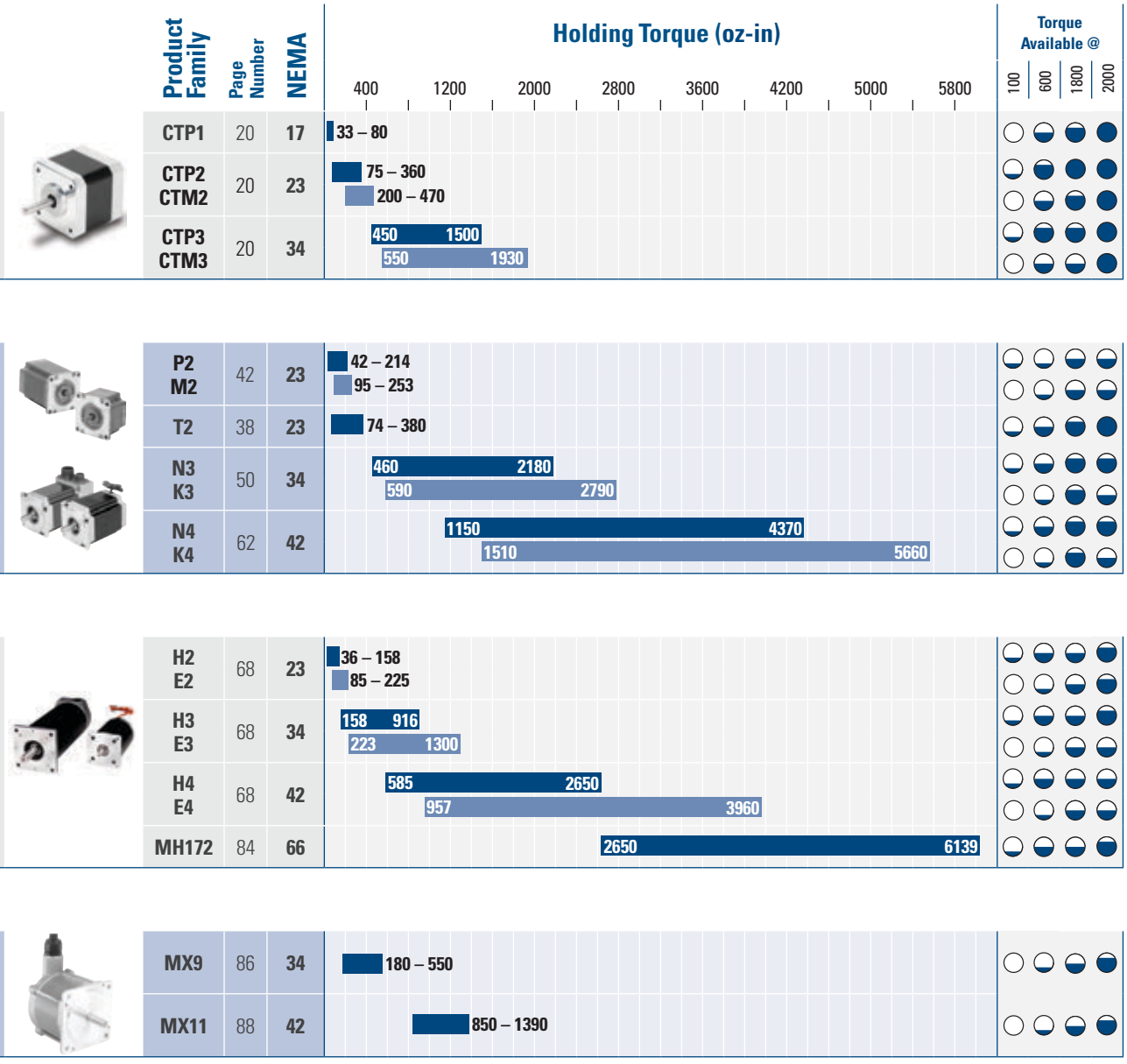
Kollmorgen Stepper Motor Overview

Kollmorgen offers a comprehensive range of stepper motor products including continous torque, high torque and hybrid options to meet a wide range of application requirements. For other Kollmorgen stepper products or information not included in this catalog go to www.kollmorgen.com.



Product Family	Page Number	Features				Standard Options								Family Features
		NEMA	UL Recognized	CE Mark	SIGMAX® Technology	Integral Connectoin	Leaded	Terminal Box	MS Connector	IP Sealing	Encoders	Rear Shaft	Low Inertia	
CTP1	20	17	•	•			•			40		•		• High torque standard CTP models • Enhanced CTM SIGMAX models produce up to 25% more torque in same package • Large bearings provide high thrust and radial loads • High Volume, low cost • Minimum Quantities
CTP2 CTM2	20	23	• •	• •	•		• •			40		• •		
CTP3 CTM3	20	34	• •	• •	•		• •			40		• •		
P2 M2	42	23	• •	• •	•	• •	• •			40 40	• •	• •	• •	• High torque standard hybrid stepper motor • Enhanced M and K SIGMAX models provide up to 25% more torque in same package • Low detent torque for smoother microstepping • Bipolar and unipolar winding • Large array of options
T2	38	23	•	•			•	•	•	40	•	•		
K3 N3	50	34	• •	• •	•		• •	• •	• •	65[1] 65[1]	• •	• •		
K4 N4	62	42	• •	• •	•		• •	• •	• •	65[1] 65[1]	• •	• •		
H2 E2	68	23	• •	• •	•		• •		• •	40 40	• •	• •	• •	• High efficiency, low loss hybrid designs in a conventional round frame • Enhanced E SIGMAX models provide up to 25% more torque in the same package • Torque produced over a wide speed range • Large array of options • E2, H2 offer high axial loading
H3 E3	68	34	• •	• •	•		• •		• •	65[1] 65[1]	• •	• •		
H4 E4	68	42	• •	• •	•		• •		• •	65[2] 65[2]	• •	• •		
MH172	84	66						•		40	•	•		
MX9	86	34	•							40		•		• Standard hybrid stepper motor • Meets Explosion proof UL Class 1, Division 1 Group D requirements • Up to 150% rated torque reserve capacity (MX9) and 200% for {MX11}
MX11	88	42	•							40		•		

Notes: 1. Requires shaft seal and connection option other than leaded (Meets IP40 otherwise)
2. Requires shaft seal option (Meets IP40 otherwise)

CTP/CTM Series Stepper Motor Overview

Kollmorgen has combined high performance stepper motor designs with world wide manufacturing capabilities to create the new CT Series Stepper Motors.

All CT Series Stepper Motors incorporate innovative cooling technology (patent pending), high torque magnetic designs, rugged bearings, and high voltage insulation systems. These features provide high torque motors, which support large mechanical loads, and can be used with all drives. In addition, CTM Maximum Series Stepper Motors use patened enhancing technology to increase efficiency and provide even more torque at all speeds.

Outstanding performance is only part of the CT story. CT Series motors are available in the most popular sizes (17, 23, and 34), and are available in a variety of lengths, windings and shafts.

Custom Motors

Kollmorgen routinely provides motors with many types of modifications. Please contact us with your specific requirements.

Shaft Modifications

A variety of motor output shaft modifications can be supplied. These include special flats and keyways, lengths, diameters, through holes and similar changes which may be needed to allow mounting of leadscrews, timing belts, pulleys or gears.

Electrical Modifications

Motors can be supplied with a number of electrical modifications, including: nonstandard lead lengths, electrical connectors and special windings.

CT Series Stepper Motors . . . run cooler, produce more torque, and support higher shaft loads than any other stepper motor.

CTM Series motors incorporate patented enhancing magnets in the stator to provide 25% more torque at all speeds. The increased power output comes from higher efficiency. This allows the use of smaller drives and power supplies. Available in size 23 and size 34 motors.

All CT motors utilize high torque magnetic designs that feature a large rotor diameter, small air gap, high energy rotor magnets and computer controlled windings. This provides maximum torque in the smallest package.

- Lower Energy Usage
- Faster Machines
- Lower System Cost
- More Compact Machines

High Voltage Insulation
Inset molded insulation system encases the stator, eliminating joints and gaps that can fail. Reliability and voltage ratings are increased. CT Series motors can be used with all standard drives, as well as high voltage high performance drives.

- Faster design cycles knowing CT Series motors work with all drives.
- Higher reliability

Cooling Shell (patent pending)
Aluminum shell and aluminum end-caps quickly remove heat from the motor. This allows for higher current and torque ratings, especially when the motor is mounted. CT motors produce the same torque at lower temperatures for longer life.

- Faster, higher throughput machines
- Reduced size
- Longer life

Large Bearing System
To accommodate high thrust loads and high side loading, CT Series motors feature large bearings.

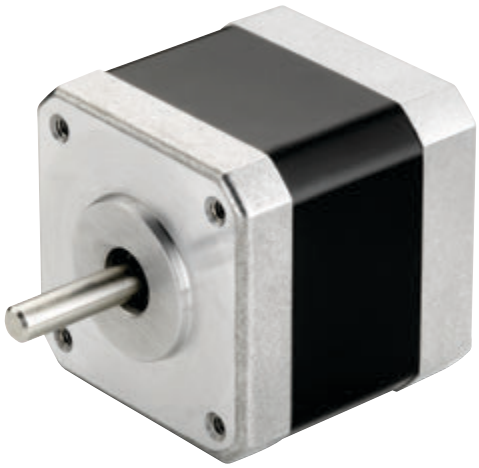
Size 23 & 34 motors have the front bearing retained with a snap ring. And, the rear bearing is mounted in an O-ring to prevent spinout and minimize motor noise.

- Lower machine costs. Loads can be directly mounted on motor shaft eliminating couplings and load support bearings.
- Excellent for leadscrew applications
- Longer life

CTP/CTM Series Stepper Motors

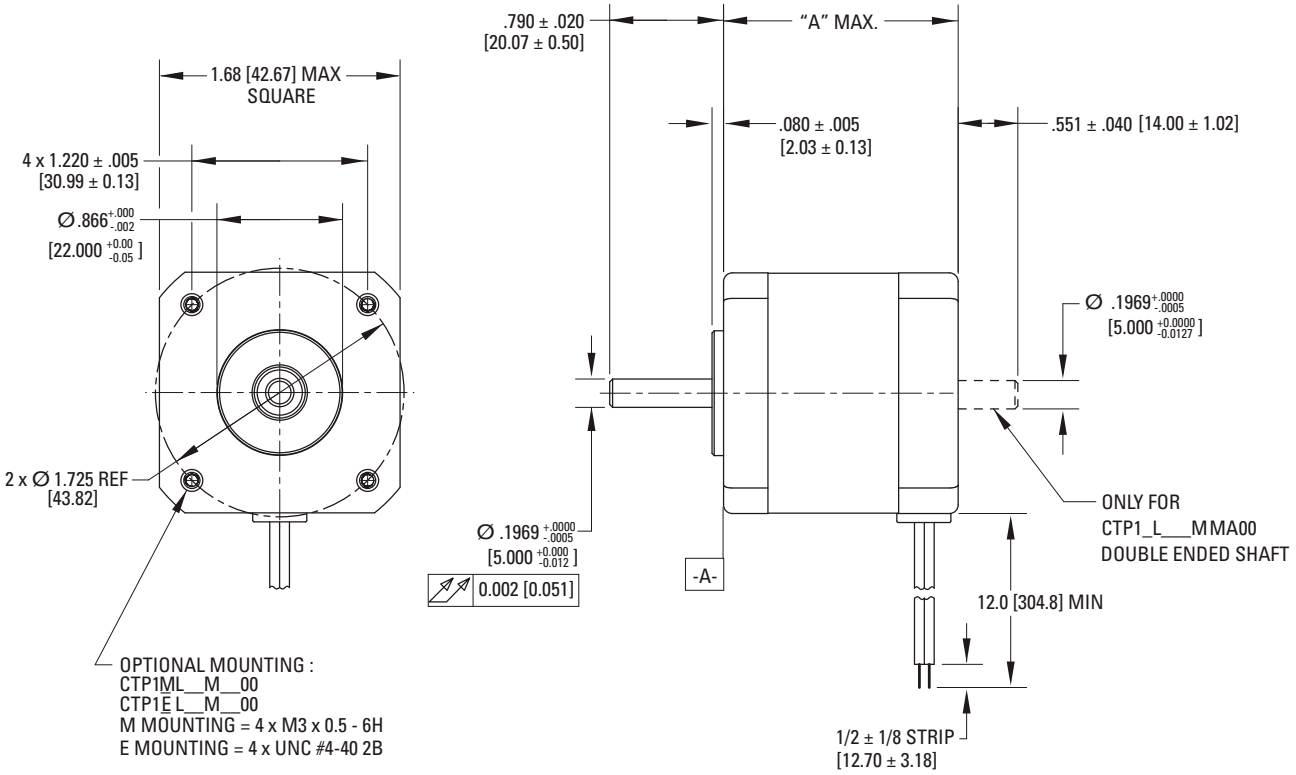
General Specifications

- NEMA Sizes 17, 23, 34
- CTM Enhanced Series - Maximum Torque and Efficiency (not available in size 17)
- Excellent for use with leadscrews
- RoHS Compliant
- Unipolar or Bipolar windings
- Features: leadwire connection, NEMA through holes
- Options: Rear shaft & encoder mounting holes
- Custom Motors



Parameter	CTP1	CTM2/ CTP2	CTM3/ CTP3
NEMA frame size	17	23	34
Phases	2 and 4		
Full Steps per Revolution	200		
Step Angle (degrees)	1.8		
Step Accuracy % (of one full step, no load)	+/- 5	+/- 3	+/- 3
Operating Temperature	-20° C to +40° C		
Insulation Class	Class B, 130° C		
Insulation Voltage (Vdc)	80	340	
Insulation Resistance	100 Megohms		

CTP1 Outline Drawings

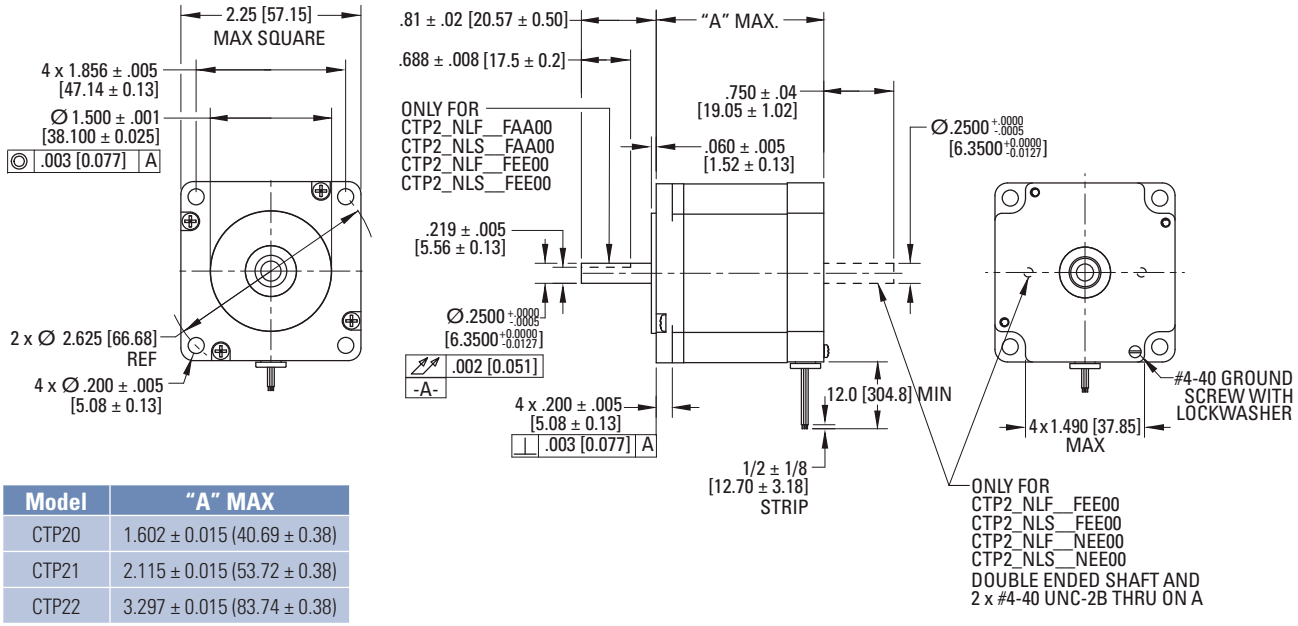


Dimensions in inches [mm]

Model	"A" MAX
CTP10	1.350 ± 0.015 (34.3 ± 0.38)
CTP11	1.590 ± 0.015 (40.4 ± 0.38)
CTP12	1.900 ± 0.015 (48.3 ± 0.38)

CTP/CTM Series Stepper Motors

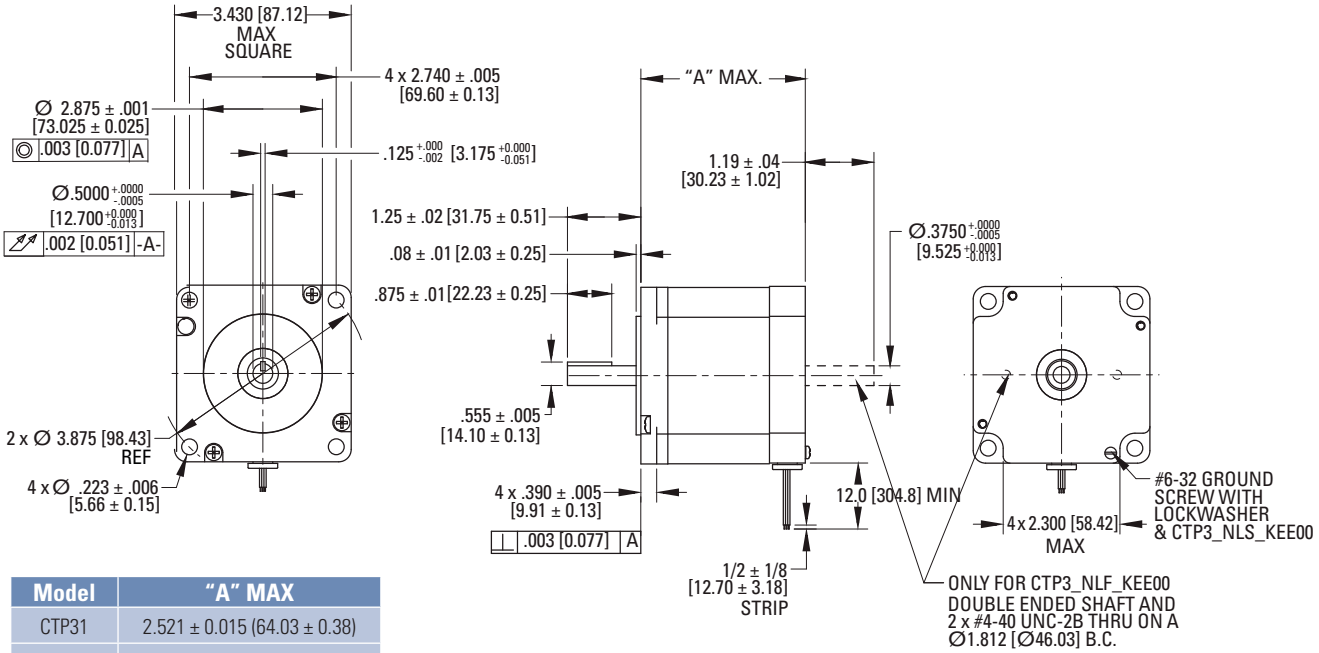
CTP2 / CTM2 Outline Drawings



Model	"A" MAX
CTP20	1.602 ± 0.015 (40.69 ± 0.38)
CTP21	2.115 ± 0.015 (53.72 ± 0.38)
CTP22	3.297 ± 0.015 (83.74 ± 0.38)

Dimensions in inches [mm]

CTP3 / CTM3 Outline Drawings



Model	"A" MAX
CTP31	2.521 ± 0.015 (64.03 ± 0.38)
CTP32	3.782 ± 0.015 (96.06 ± 0.38)
CTP33	5.403 ± 0.015 (128.09 ± 0.38)

Dimensions in inches [mm]

CTP1 Performance Data

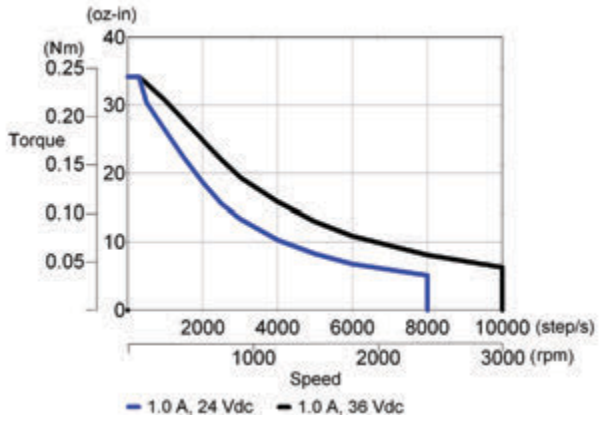
Motor Model Number		Config.		Holding Torque (2 phases on)	Rated Current/ Phase	Phase Resistance	Phase Inductance	Detent Torque	Thermal Resistance	Rotor Inertia	Weight	Shaft Loading*	
		Series	Unipolar	oz-in (Nm) +/-10%	Amps DC	Ohms +/-10%	mH Typical	oz-in (Nm)	Mounted °C/Watt	oz-in-s^2 (kg-m^2 x10^{-3})	lb (kg)	Radial Force lb (N)	Axial Force lb (N)
Short Stack	CTP10xxF16	•		43 (0.30)	1.6	2.15	3.0	2.0 (0.014)	6.21	0.00051 (0.0036)	0.45 (0.20)	15 (67)	Push 6.0 (27)
	CTP10xxF10	•			1.0	5.25	7.7						
	CTP10xxF06	•			0.63	12.8	18						
	CTP10xxF04	•			0.40	30.5	42						Pull 15 (67)
	CTP10xxS12		•	33 (0.23)	1.2	3.38	2.4						
	CTP10xxS08		•		0.80	8.04	5.5						
	CTP10xxS05		•		0.50	19.4	13						
	CTP10xxS03		•		0.33	47.1	31						
1 Stack	CTP11xxF17	•		62 (0.44)	1.7	2.12	4.2	2.5 (0.018)	5.44	0.00075 (0.0053)	0.57 (0.26)	15 (67)	Push 6.0 (27)
	CTP11xxF11	•			1.1	5.19	11						
	CTP11xxF07	•			0.68	12.5	26						
	CTP11xxF04	•			0.44	30.4	60						Pull 15 (67)
	CTP11xxS13		•	49 (0.35)	1.3	3.31	3.4						
	CTP11xxS09		•		0.85	8.02	8.0						
	CTP11xxS06		•		0.55	18.9	18						
	CTP11xxS03		•		0.35	48.1	47						
2 Stack	CTP12xxF26	•		80 (0.56)	2.6	1.09	1.9	3.0 (0.021)	4.71	0.00106 (0.075)	0.76 (0.34)	15 (67)	Push 6.0 (27)
	CTP12xxF16	•			1.6	2.65	4.9						
	CTP12xxF10	•			1.0	6.51	12						
	CTP12xxF07	•			0.65	15.7	30						Pull 15 (67)
	CTP12xxS20		•	62 (0.44)	2.0	1.70	1.6						
	CTP12xxS13		•		1.3	4.13	3.9						
	CTP12xxS08		•		0.82	10.1	9.2						
	CTP12xxS05		•		0.53	23.8	21						

*Notes: *Maximum shaft loading based on 20,000 hours of operation at 1500 rpm.
See page 90 for CT series connector diagrams and switching sequences.

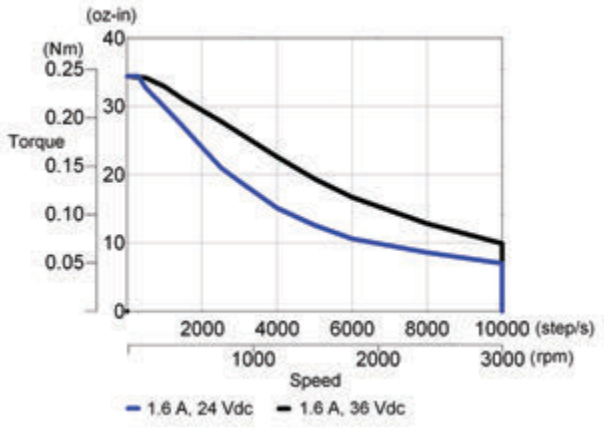
CTP/CTM Series Stepper Motors

CTP1 Performance Curves

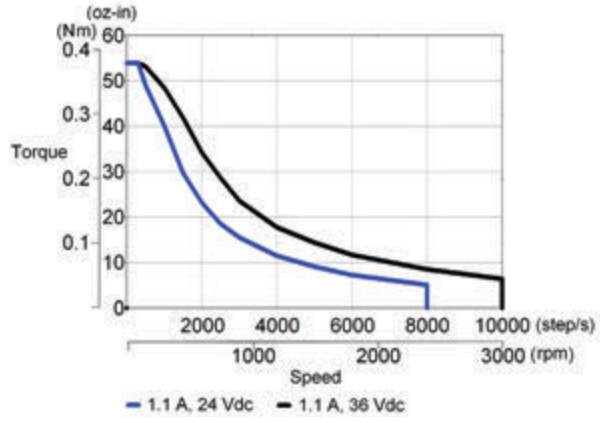
CTP10xxF10 w/ P70530



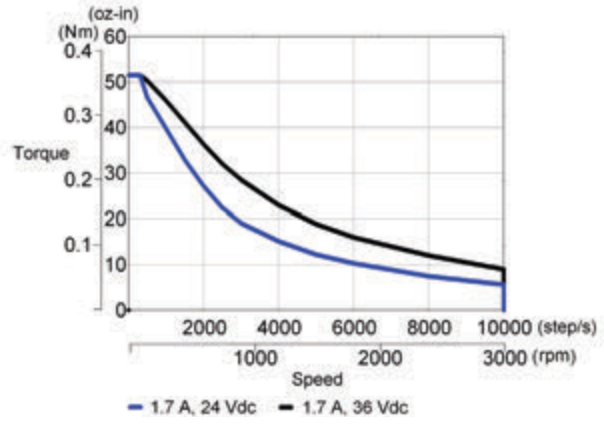
CTP10xxF16 w/ P70530



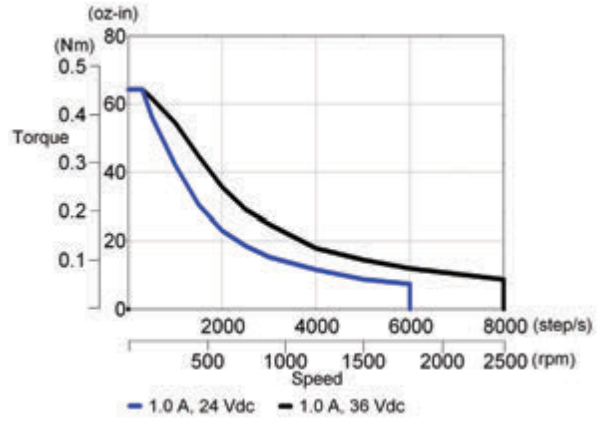
CTP11xxF11 w/ P70530



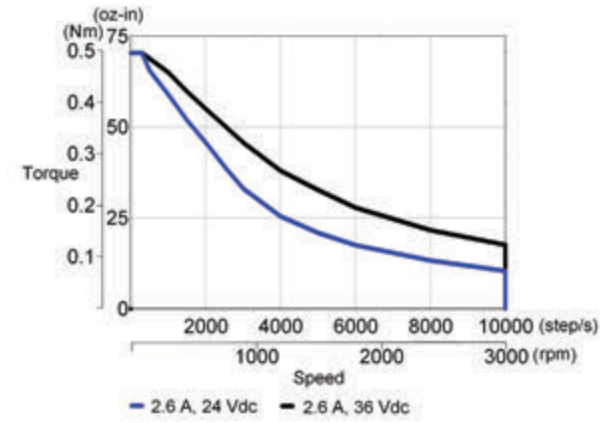
CTP11xxF17 w/ P70530



CTP12xxF10 w/ P70530



CTP12xxF26 w/ P70530



CTP2 / CTM2 Performance Data

	Motor Model Number	Config.		Holding Torque (2 phases on)	Rated Current/ Phase	Phase Resistance	Phase Inductance	Detent Torque	Thermal Resistance	Rotor Inertia	Weight	Shaft Loading*	
												Radial Force	Axial Force
		Series	Unipolar	oz-in (Nm) +/-10%	Amps DC	Ohms +/-10%	mH Typical	oz-in (Nm)	Mounted °C/Watt	oz-in-s^2 (kg-m^2 x10^{-3})	lb (kg)	lb (N)	lb (N)
Short Stack	CTP20xxF38	•		100 (0.71)	3.8	0.58	1.3	5.0 (0.035)	3.99	0.0026 (0.018)	1.0 (0.45)	20 (89)	50 (222)
	CTP20xxF27	•			2.7	1.11	2.5						
	CTP20xxF17	•			1.7	2.87	7.1						
	CTP20xxF11	•			1.1	6.98	17						
	CTP20xxF07	•			0.68	17.1	41						
	CTP20xxF04	•			0.45	40.6	89						
	CTP20xxS34		•	75 (0.53)	3.4	0.73	0.83						
	CTP20xxS21		•		2.1	1.83	2.2						
	CTP20xxS13		•		1.3	4.39	5.2						
	CTP20xxS09		•		0.87	10.5	12						
1 Stack	CTP21xxF56	•		200 (1.41)	5.6	0.31	1.1	8.0 (0.056)	3.57	0.0035 (0.025)	1.4 (0.64)	20 (89)	50 (222)
	CTP21xxF39	•			3.9	0.60	2.2						
	CTP21xxF25	•			2.5	1.48	5.8						
	CTP21xxF15	•			1.5	3.86	16						
	CTP21xxF10	•			1.0	9.40	38						
	CTP21xxF04	•			0.45	44.0	170						
	CTP21xxS48		•	160 (1.13)	4.8	0.41	0.74						
	CTP21xxS31		•		3.1	0.97	1.9						
	CTP21xxS19		•		1.9	2.44	5.0						
	CTP21xxS12		•		1.2	5.89	12						
Enhanced 1 Stack	CTM21xxF56	•		260 (1.84)	5.6	0.31	0.78	13 (0.092)	3.57	0.0035 (0.025)	1.5 (0.68)	20 (89)	50 (222)
	CTM21xxF39	•			3.9	0.60	1.6						
	CTM21xxF25	•			2.5	1.48	4.2						
	CTM21xxF15	•			1.5	3.86	12						
	CTM21xxF10	•			1.0	9.40	28						
	CTM21xxF04	•			0.45	44.0	123						
	CTM21xxS48		•	200 (1.41)	4.8	0.41	0.54						
	CTM21xxS31		•		3.1	0.97	1.4						
	CTM21xxS19		•		1.9	2.44	3.7						
	CTM21xxS12		•		1.2	5.89	8.6						

Notes: *Maximum shaft loading based on 20,000 hours of operation at 1500 rpm.
See page 90 for CT series connector diagrams and switching sequences.

Continued on page 28.

CTP/CTM Series Stepper Motors

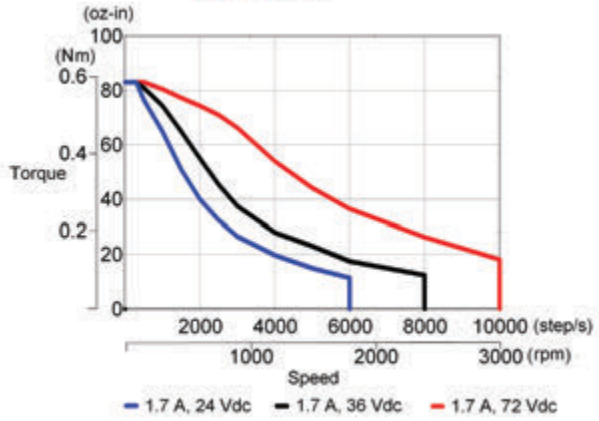
CTP2 / CTM2 Performance Data (continued)

	Motor Model Number	Config.		Holding Torque (2 phases on)	Rated Current/ Phase	Phase Resistance	Phase Inductance	Detent Torque	Thermal Resistance	Rotor Inertia	Weight	Shaft Loading*	
												Radial Force	Axial Force
		Series	Unipolar	oz-in (Nm) +/-10%	Amps DC	Ohms +/-10%	mH Typical	oz-in (Nm)	Mounted °C/Watt	oz-in-s² (kg-m² x10⁻³)	lb (kg)	lb (N)	lb (N)
2 Stack	CTP22xxF69	•		360 (2.54)	6.9	0.28	1.2	12 (0.085)	2.62	0.0068 (0.048)	2.4 (1.09)	20 (89)	50 (222)
	CTP22xxF50	•			5.0	0.52	2.2						
	CTP22xxF31	•			3.1	1.31	6.1						
	CTP22xxF19	•			1.9	3.25	16						
	CTP22xxF12	•			1.2	8.40	41						
	CTP22xxF06	•			0.60	32.2	150						
	CTP22xxS49		•	285 (2.01)	4.9	0.53	1.2						
	CTP22xxS31		•		3.1	1.30	3.0						
	CTP22xxS19		•		1.9	3.39	8.3						
	CTP22xxS12		•		1.2	8.26	20						
Enhanced 2 Stack	CTM22xxF69	•		470 (3.32)	6.9	0.28	0.81	22 (0.16)	2.62	0.0068 (0.048)	2.5 (1.13)	20 (89)	50 (222)
	CTM22xxF50	•			5.0	0.52	1.6						
	CTM22xxF31	•			3.1	1.31	4.3						
	CTM22xxF19	•			1.9	3.25	11						
	CTM22xxF12	•			1.2	8.40	29						
	CTM22xxF06	•			0.60	32.2	108						
	CTM22xxS49		•	360 (2.54)	4.9	0.53	0.81						
	CTM22xxS31		•		3.1	1.30	2.1						
	CTM22xxS19		•		1.9	3.39	5.9						
	CTM22xxS12		•		1.2	8.26	14						

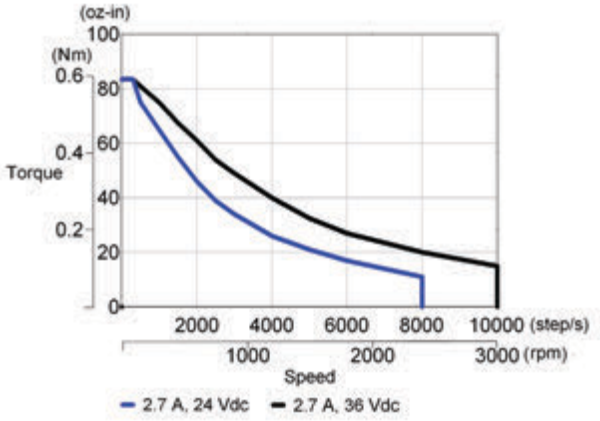
Notes: *Maximum shaft loading based on 20,000 hours of operation at 1500 rpm.
See page 90 for CT series connector diagrams and switching sequences.

CTP2 / CTM2 Performance Curves

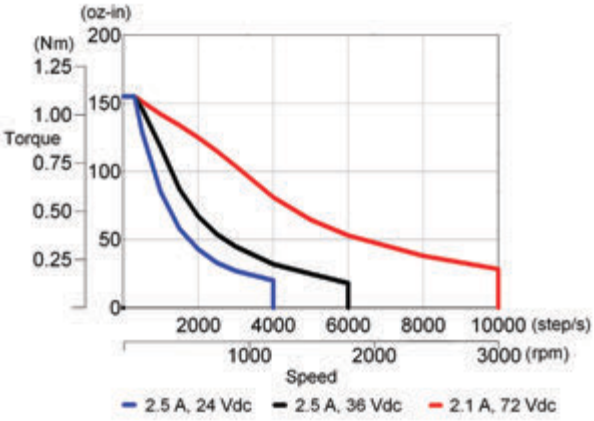
CTP20xxF17 w/ P70530



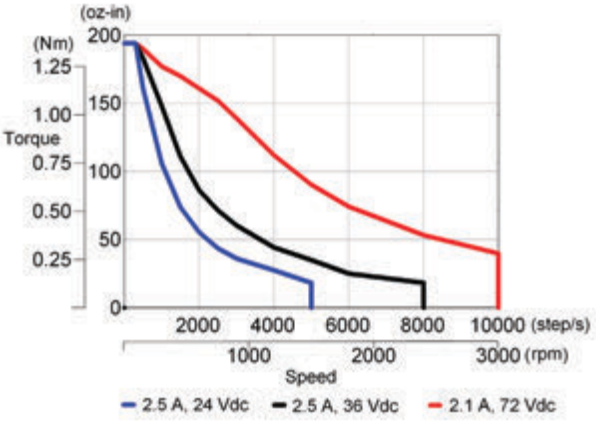
CTP20xxF27 w/ P70530



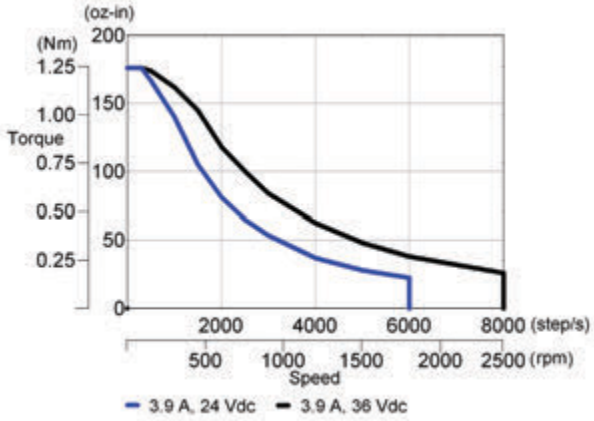
CTP21xxF25 w/ P70530



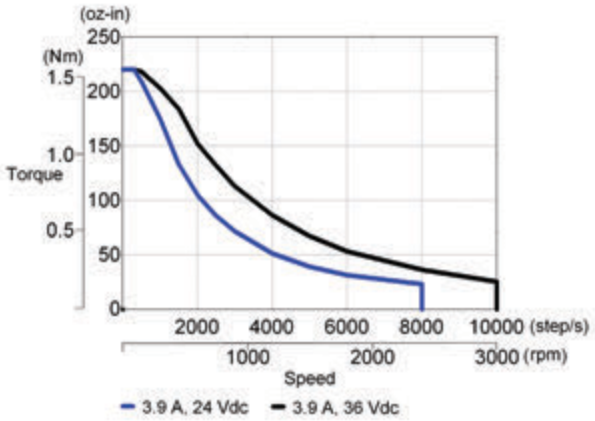
CTM21xxF25 w/ P70530



CTP21xxF39 w/ P70530



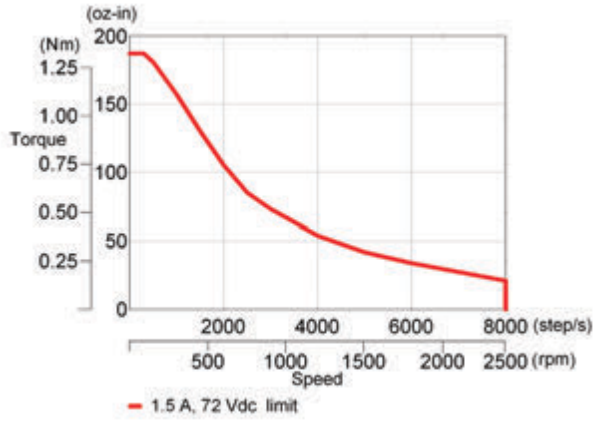
CTM21xxF39 w/ P70530



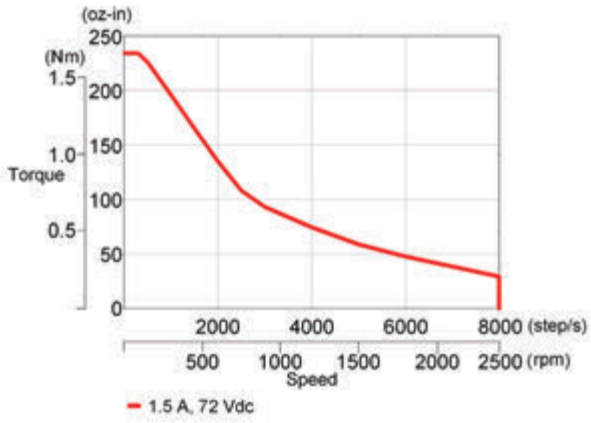
CTP/CTM Series Stepper Motors

CTP2 / CTM2 Performance Curves

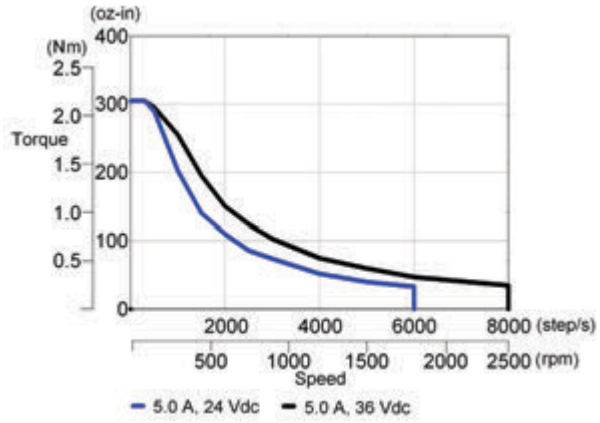
CTP21xxF15 w/ P70530



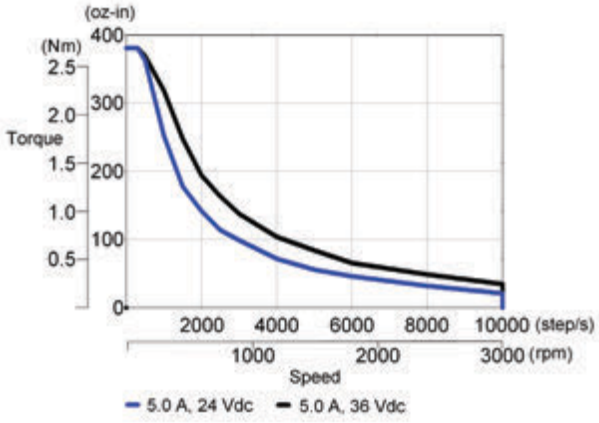
CTM21xxF15 w/ P70530



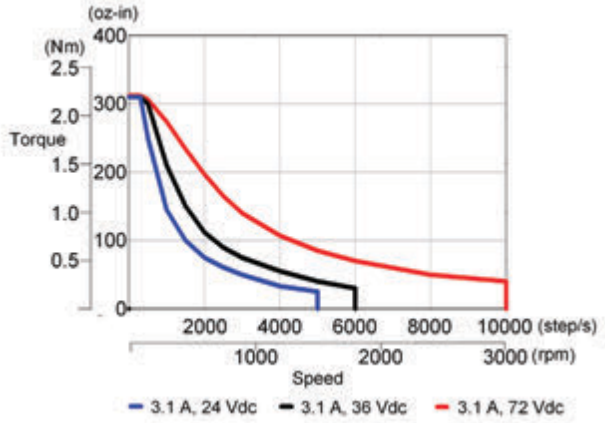
CTP22xxF50 w/ P70530



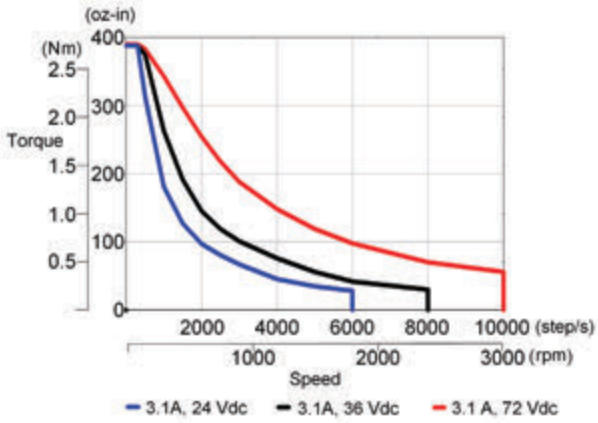
CTM22xxF50 w/ P70530



CTP22xxF31 w/ P70530

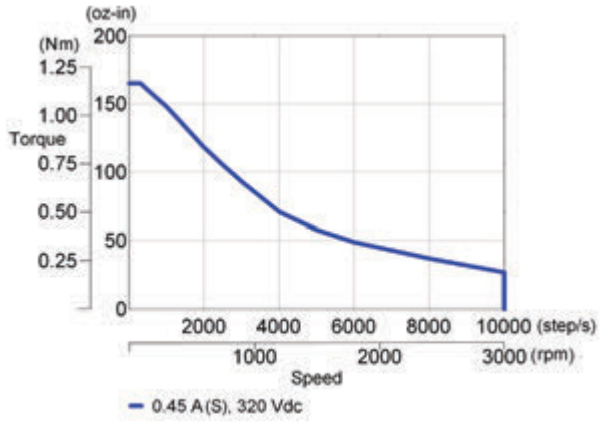


CTM22xxF31 w/ P70530

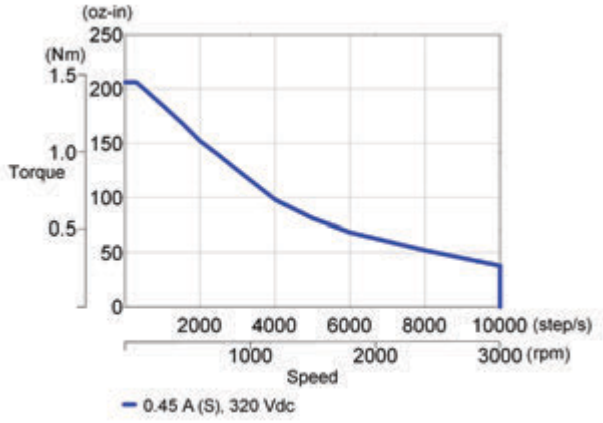


CTP2 / CTM2 Performance Curves

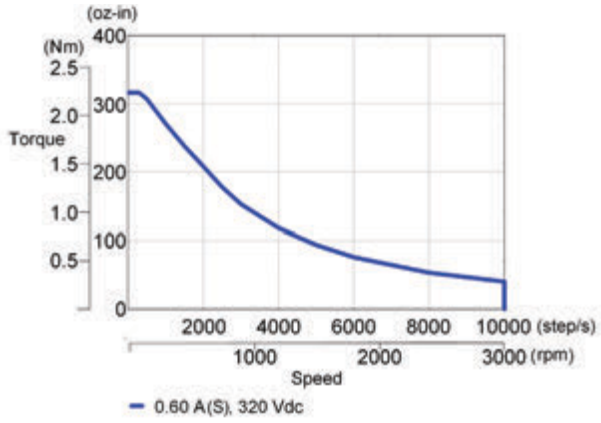
CTP21xxF04 w/ P70360



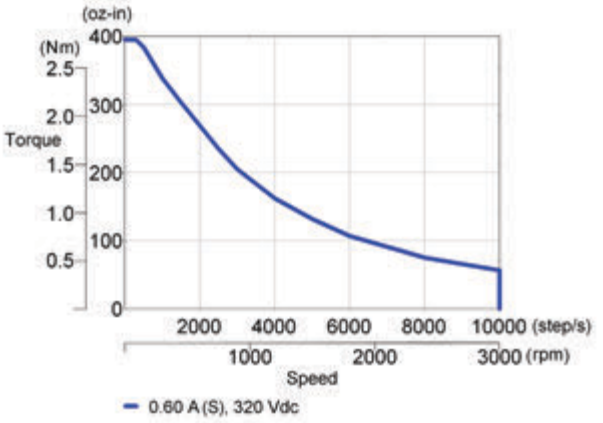
CTM21xxF04 w/ P70360



CTP22xxF06 w/ P70360



CTM22xxF06 w/ P70360



CTP/CTM Series Stepper Motors

CTP3 / CTM3 Performance Data

	Motor Model Number	Config.		Holding Torque (2 phases on)	Rated Current/ Phase	Phase Resistance	Phase Inductance	Detent Torque	Thermal Resistance	Rotor Inertia	Weight	Shaft Loading*	
		Series	Unipolar	oz-in (Nm) +/-10%	Amps DC	Ohms +/-10%	mH Typical	oz-in (Nm)	Mounted °C/Watt	oz-in-s^2 (kg-m^2 x 10^{-3})	lb (kg)	Radial Force lb (N)	Axial Force lb (N)
Short Stack	CTP31xxF99	•		565 (3.99)	9.9	0.19	1.2	22 (0.16)	2.02	0.0185 (0.131)	4.0 (1.8)	65 (289)	100 (445)
	CTP31xxF72	•			7.2	0.34	2.3						
	CTP31xxF45	•			4.5	0.79	5.8						
	CTP31xxF28	•			2.8	2.02	16						
	CTP31xxF09	•			0.90	19.5	150						
	CTP31xxS56		•	460 (3.25)	5.6	0.53	1.9						
	CTP31xxS35		•		3.5	1.29	4.9						
	CTP31xxS22		•		2.2	3.21	13						
Enhanced Short Stack	CTM31xxF99	•		690 (4.87)	9.9	0.19	0.87	30 (0.21)	2.02	0.0185 (0.131)	4.1 (1.9)	65 (289)	100 (445)
	CTM31xxF72	•			7.2	0.34	1.7						
	CTM31xxF45	•			4.5	0.79	4.3						
	CTM31xxF28	•			2.8	2.02	12						
	CTM31xxF09	•			0.90	19.5	112						
	CTM31xxS56		•	550 (3.88)	5.6	0.53	1.4						
	CTM31xxS35		•		3.5	1.29	3.7						
	CTM31xxS22		•		2.2	3.21	9.4						
1 Stack	CTP32xxF99	•		1100 (7.77)	9.9	0.23	1.8	30 (0.21)	1.55	0.0370 (0.261)	6.5 (3.0)	65 (289)	100 (445)
	CTP32xxF73	•			7.3	0.41	3.4						
	CTP32xxF46	•			4.6	1.01	9.1						
	CTP32xxF28	•			2.8	2.53	24						
	CTP32xxF11	•			1.1	16.1	150						
	CTP32xxS58		•	890 (628)	5.8	0.65	2.8						
	CTP32xxS36		•		3.6	1.63	7.6						
	CTP32xxS23		•		2.3	4.00	19						
Enhanced 1 Stack	CTM32xxF99	•		1350 (9.53)	9.9	0.23	1.4	41 (0.29)	1.55	0.0370 (0.261)	6.6 (3.0)	65 (289)	100 (445)
	CTM32xxF73	•			7.3	0.41	2.7						
	CTM32xxF46	•			4.6	1.01	7.1						
	CTM32xxF28	•			2.8	2.53	19						
	CTM32xxF11	•			1.1	16.1	120						
	CTM32xxS58		•	1070 (7.56)	5.8	0.65	2.2						
	CTM32xxS36		•		3.6	1.63	6.0						
	CTM32xxS23		•		2.3	4.00	15						

Notes: *Maximum shaft loading based on 20,000 hours of operation at 1500 rpm.
See page 90 for CT series connector diagrams and switching sequences.

Continued on page 33.

CTP3 / CTM3 Performance Data (continued)

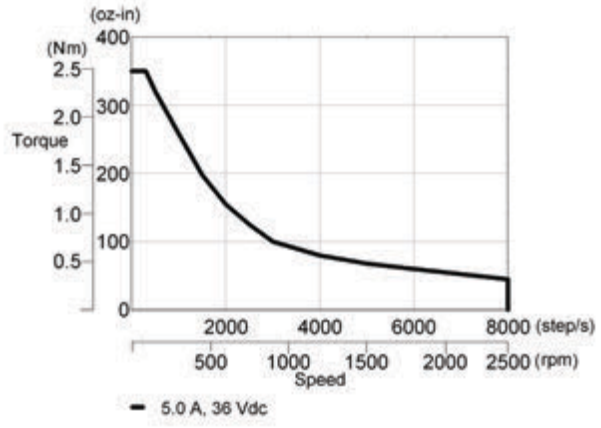
	Motor Model Number	Config.		Holding Torque (2 phases on)	Rated Current/ Phase	Phase Resistance	Phase Inductance	Detent Torque	Thermal Resistance	Rotor Inertia	Weight	Shaft Loading*	
		Series	Unipolar	oz-in (Nm) +/-10%	Amps DC	Ohms +/-10%	mH Typical	oz-in (Nm)	Mounted °C/Watt	oz-in-s^2 (kg-m^2 x10^{-3})	lb (kg)	Radial Force lb (N)	Axial Force lb (N)
2 Stack	CTP33xxF99	•		1570 (11.1)	9.9	0.24	2.0	38 (0.27)	1.36	0.0555 (0.392)	9.1 (4.1)	65 (289)	100 (445)
	CTP33xxF75	•			7.5	0.45	4.0						
	CTP33xxF47	•			4.7	1.08	10						
	CTP33xxF29	•			2.9	2.73	27						
	CTP33xxF13	•			1.3	13.8	140						
	CTP33xxS59		•	1250 (8.83)	5.9	0.70	3.2						
	CTP33xxS37		•		3.7	1.74	8.4						
	CTP33xxS23		•		2.3	4.31	21						
Enhanced 2 Stack	CTM33xxF99	•		1930 (13.6)	9.9	0.24	1.6	52 (0.37)	1.36	0.0555 (0.392)	9.3 (4.2)	65 (289)	100 (445)
	CTM33xxF75	•			7.5	0.45	3.2						
	CTM33xxF47	•			4.7	1.08	8.2						
	CTM33xxF29	•			2.9	2.73	22						
	CTM33xxF13	•			1.3	13.8	111						
	CTM33xxS59		•	1500 (10.6)	5.9	0.70	2.6						
	CTM33xxS37		•		3.7	1.74	6.7						
	CTM33xxS23		•		2.3	4.31	17						

Notes: *Maximum shaft loading based on 20,000 hours of operation at 1500 rpm.
See page 90 for CT series connector diagram of switching sequences.

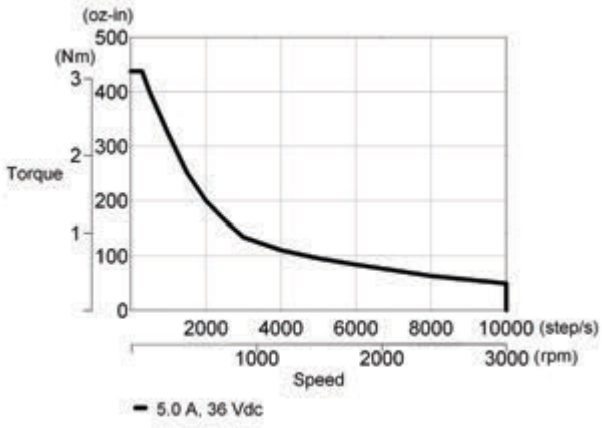
CTP/CTM Series Stepper Motors

CTP3 / CTM3 Performance Curves

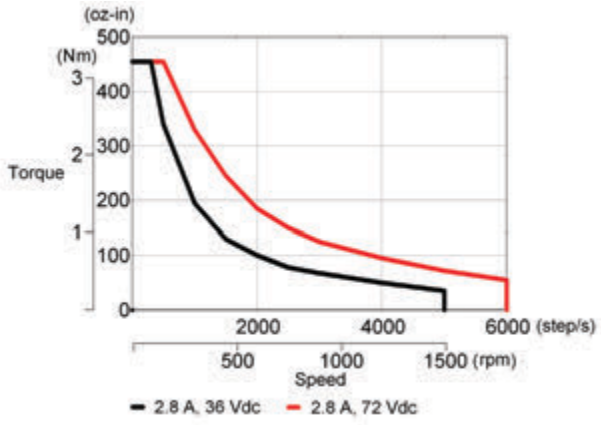
CTP3xxF72 w/ P70530



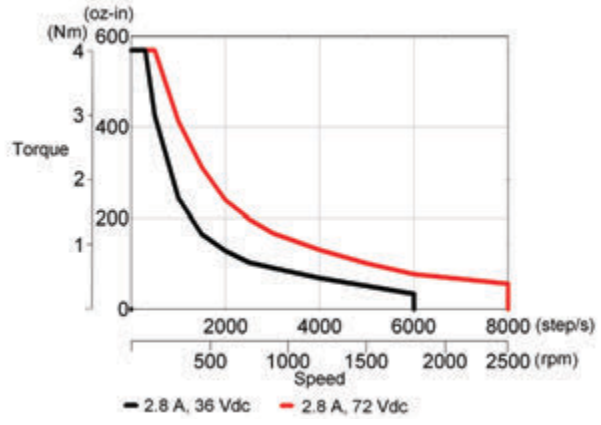
CTM31xxF72 w/ P70530



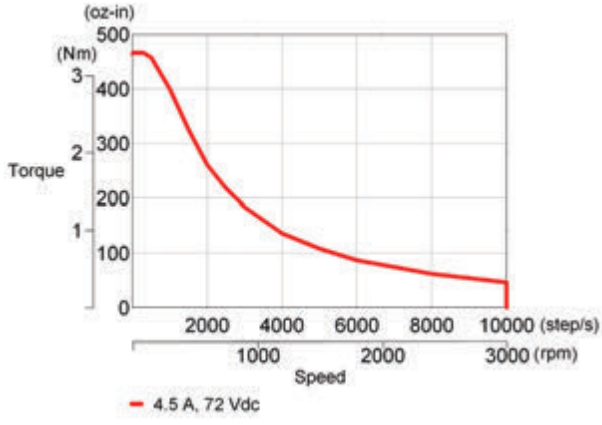
CTP31xxF28 w/ P70530



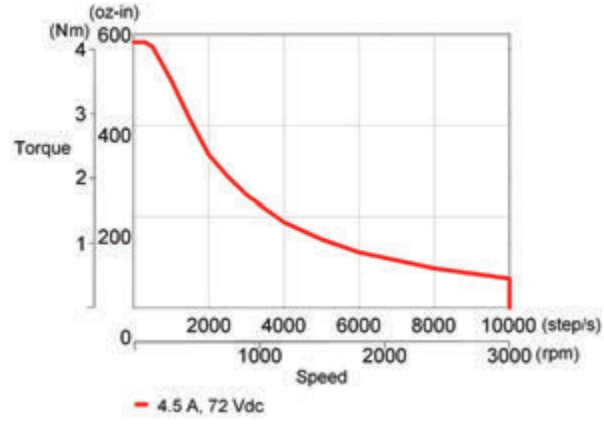
CTM31xxF28 w/ P70530



CTP31xxF45 w/ P70530

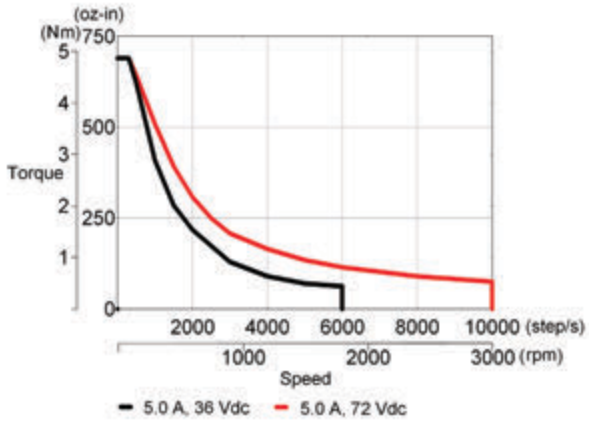


CTM31xxF45 w/ P70530

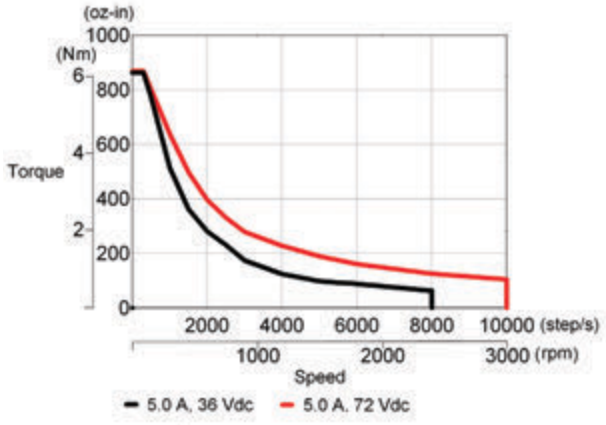


CTP3 / CTM3 Performance Curves

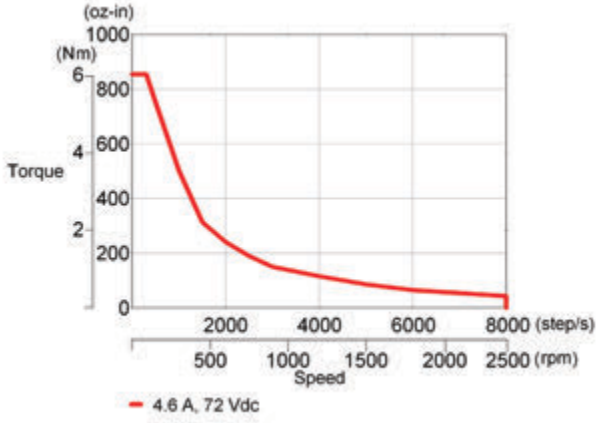
CTP32xxF73 w/ P70530



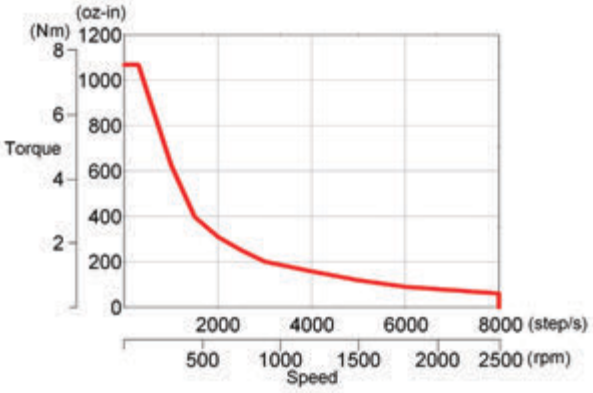
CTM32xxF73 w/ P70530



CTP32xxF46 w/ P70530



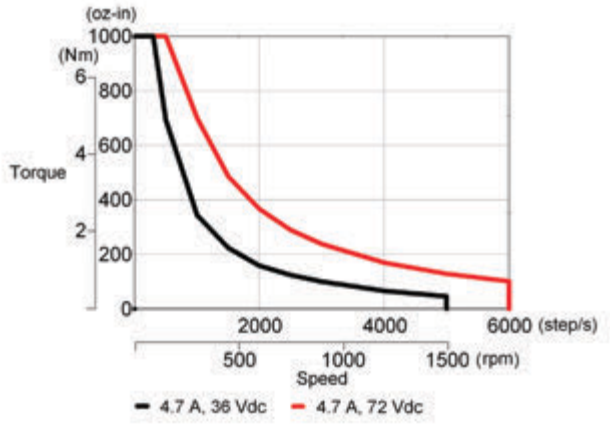
CTM32xxF46 w/ P70530



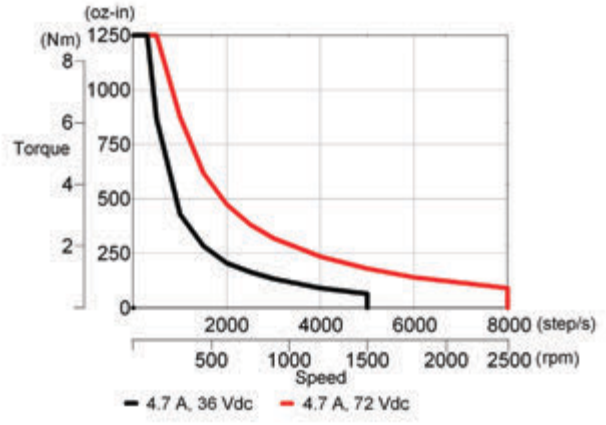
CTP/CTM Series Stepper Motors

CTP3 / CTM3 Performance Curves

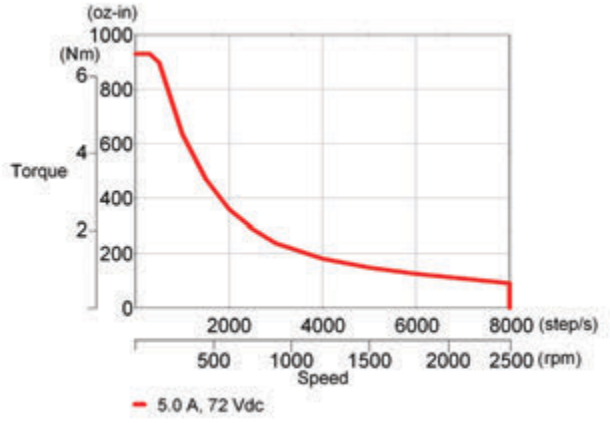
CTP33xxF47 w/ P70530



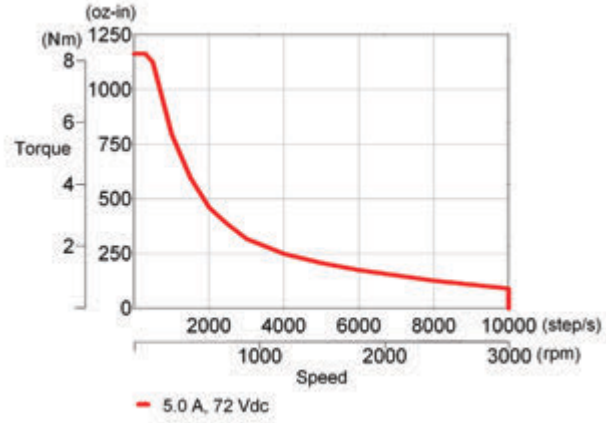
CTM33xxF47 w/ P70530



CTP33xxF75 w/ P70530

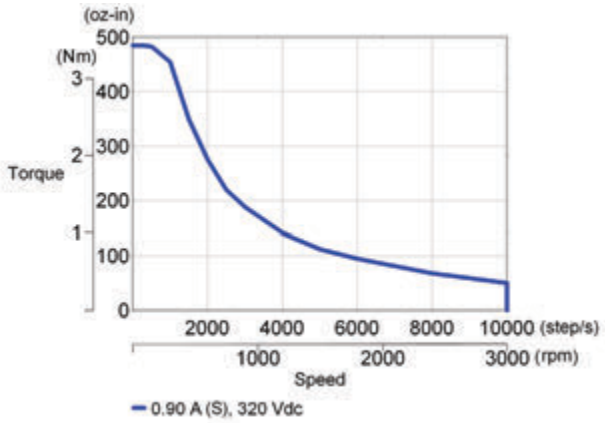


CTM33xxF75 w/ P70530

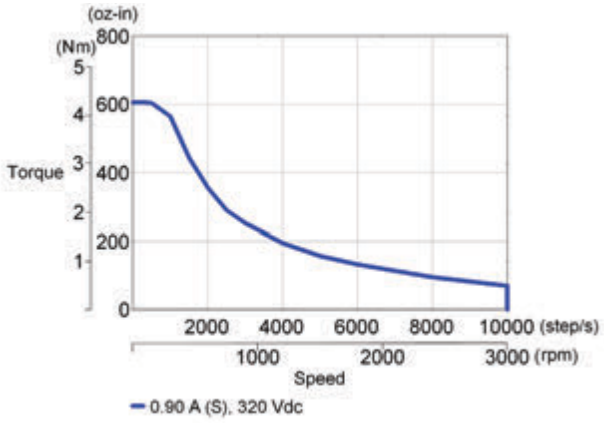


CTP3 / CTM3 Performance Curves

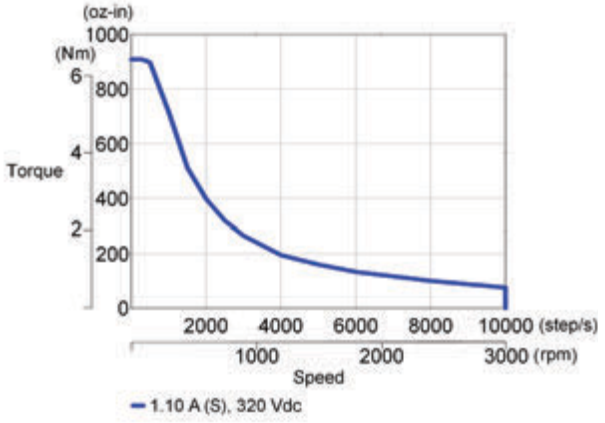
CTP31xxF09 w/ P70360



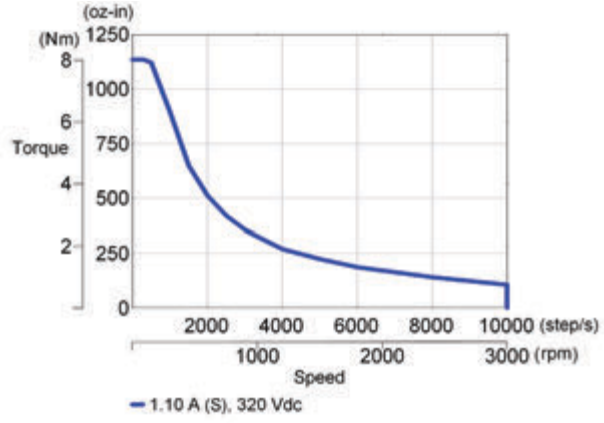
CTM31xxF09 w/ P70360



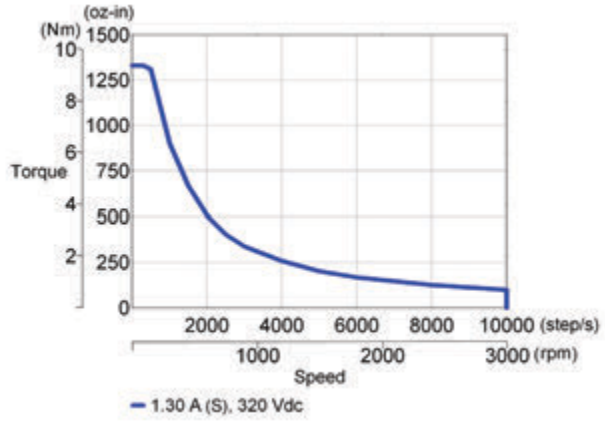
CTP32xxF11 w/ P70360



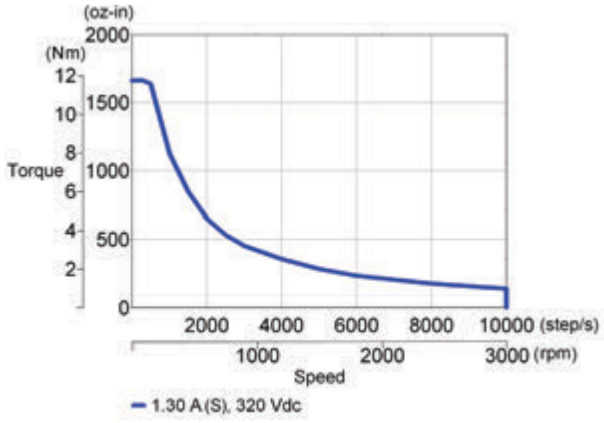
CTM32xxF11 w/ P70360



CTP33xxF13 w/ P70360



CTM33xxF13 w/ P70360



CT Series Stepper Motor

CTM 2 1 N L F 10 N AA 00

CT Series
CTM = Cool torque maximum series
CTP = Cool torque performance series

Frame Size
1 = Size 17 / 4.2 cm (CTP only)
2 = Size 23 / 5.7 cm
3 = Size 34 / 8.5 cm

Length
0 = Short Stack (CTP only)
1 = 1 stack
2 = 2 stacks
3 = 3 stacks

Mounting
N = NEMA through holes (size 23 & 34 only)
E = English tapped holes (size 17 only)
M = Metric tapped holes (size 17 only)

Construction/Connection Style
L = Leads
S = Special

Number of Connections
F = Four
S = six

Winding Current
For 4 lead motors = Bipolar current x10
For 6 lead motors = Unipolar current x10
Examples:
05 = 0.5 Amps
10 = 1 Amp
50 = 5 Amps
00 = Special

Front Shaft Options
N = Round smooth shaft (size 23 only)
F = Flat (size 23 only)
K = Straight keyway (size 34 only)
M = Metric (size 17 only)
S = Special

Rear Options
AA = None
EE = English rear shaft & encoder mouting holes (size 23 & 34 only)
MA = Metric rear shaft (size 17 only)
SS = Special

Customization
00 = Standard motor
Other numbers serially assigned for special motors

Note: Options shown in bold blue text are considered standard.