

# 2 Phase Hybrid Stepper Motors

# KA Series

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**color**technik

**Antriebstechnik GmbH**

Starkenburgerstr. 6 \* 64546 Mörfelden

Tel.:06105 24044 \* Fax:06105 25593

info@color-technik.net

[www.color-technik.net](http://www.color-technik.net)

## Features

1. High torque
2. Low vibration
3. Silent operation
4. High position accuracy

The best magnetic balance is employed in our round type stepping motor. Motor performance is greatly improved using the latest technology of three dimensional magnetic field analysis and robust design.

## Features (Compare to our current 42 & 56 square size motors)

### Both high torque and low vibration performance were achieved.

- The round core provides the best magnetic balance. High torque performance is also achieved by optimizing the design with three dimensional magnetic field analysis. More than 30% higher holding torque was achieved and pull-out torque was also improved. (Refer to Fig. 1 and 2)

Fig. 1

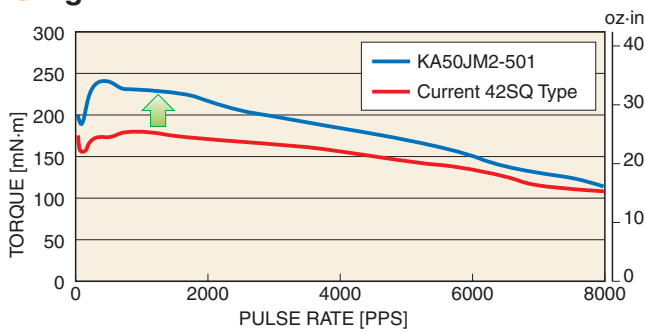
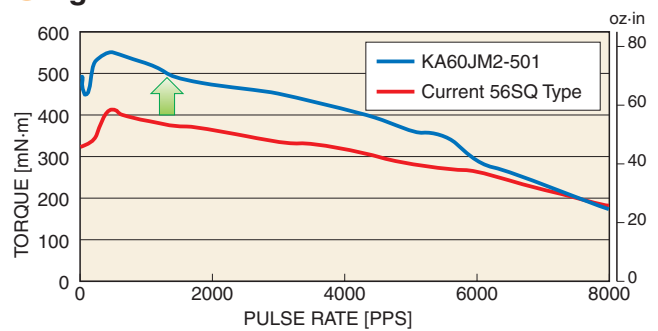
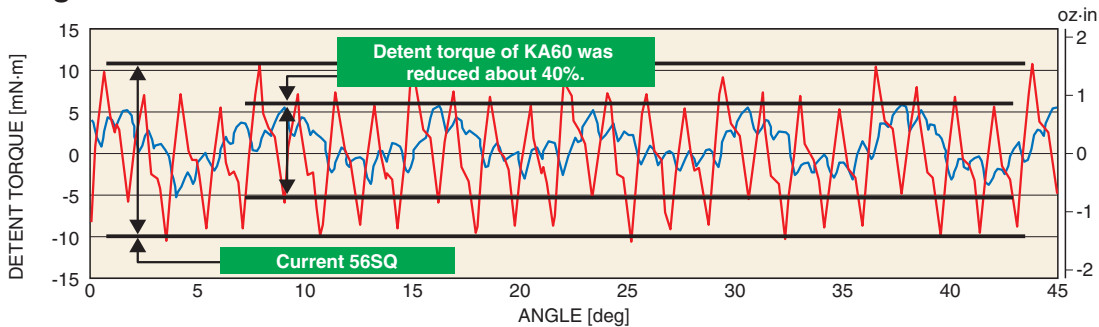


Fig. 2



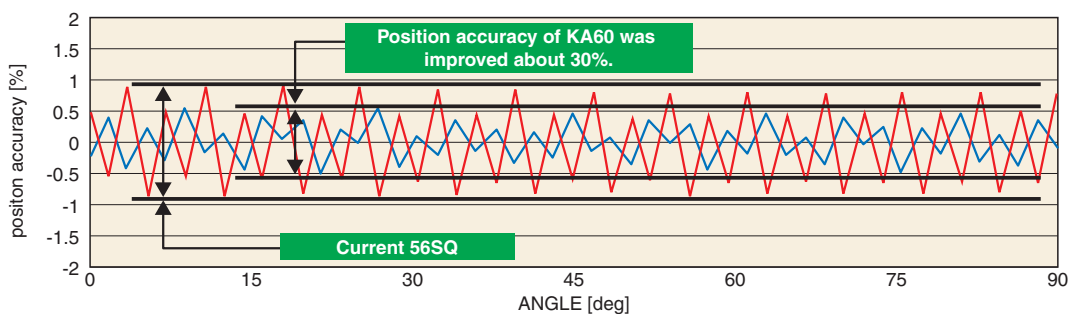
- Low vibration and low rotational fluctuation were realized by reducing the detent torque using three dimensional magnetic field analysis. Rotational fluctuation was reduced about 30%.

Fig. 3



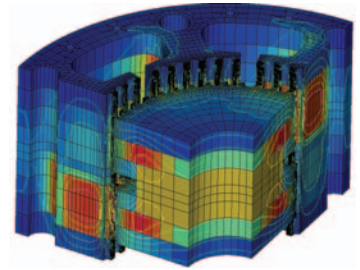
- Position accuracy was improved by minimizing the deviation of induced voltage. Position accuracy was improved about 30%. (Refer to Fig.4)

Fig. 4



- **Compatible shaft sizes and mounting positions between the 42SQ and KA50, as well as the 56SQ and KA60**
- **Space Saving: Shorter keeps motor high torque performance.**
- **All models are RoHS compliant.**

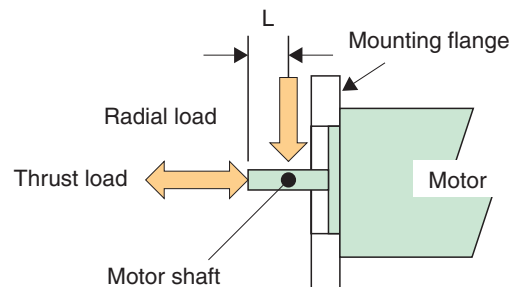
- \* Three dimensional magnetic field analysis: The magnetic strength is shown three dimensionally and the highest efficiency core shape is determined.
- \* Robust design: A design method that is not influenced by the variation in parts to eliminate product performance variation.



## Max. Allowable Load / Runout for Motor Shaft

### Load for Motor Shaft

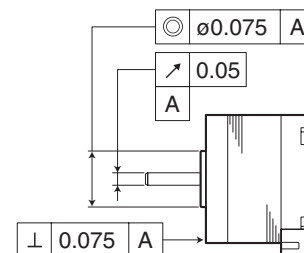
Type	Thrust load	Radial load	
		Load	L
KA50	14.7 N [1.5 kgf] [3.3 lb]	19.6 N [2.0 kgf] [4.4 lb]	10 mm
KA60	40 N [4.1 kgf] [9.0 lb]	70 N [7.1 kgf] [15.8 lb]	



### Shaft Run Out

Shaft run out	0.05 T.I.R. [mm]*
Concentricity between shaft and mounting circle	0.075 T.I.R. [mm]*
Perpendicularity between shaft and mounting face	0.075 T.I.R. [mm]*

\* T.I.R. (Total Indicator Reading)



## Specification

Temperature rise	70 K max (By resistance method)
Insulation class	Class E equivalent
Insulation resistance	100 MΩ min. At 500 V DC (at normal temp. & humidity, between lead and case)
Dielectric strength	500 V AC 50 Hz for 1 minute (at normal temp. & humidity, between lead and case)
Ambient temp. range	-10 °C ~ +50 °C
Storage temperature range	-20 °C ~ +70 °C
Humidity range in operation and storage	5 % ~ 95 % RH (noncondensing)

# KA50 Series (1.8 degree/step)

## Standard Specifications

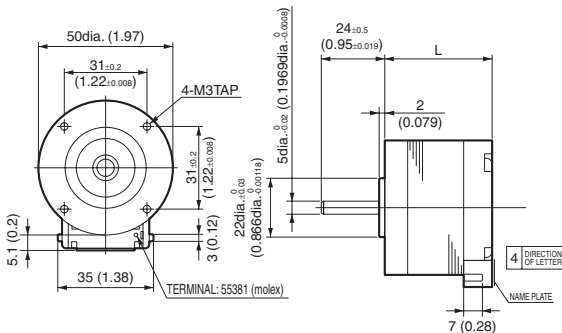
### UNIPOLAR

Model	Step angle	Voltage	Current	Resistance	Inductance	Holding torque		Detent torque		Rotor inertia	
Dimension	degree/step	V/∅	A/∅	Ω/∅	mH/∅	mN·m	oz·in	mN·m	oz·in	g·cm <sup>2</sup>	oz·in <sup>2</sup>
KA50HM2-501	1.8	2.08	2.0	1.04	0.9	216	31	12	1.7	50	0.3
KA50HM2-502		4.20	1.0	4.2	3.8	216	31	12	1.7	50	0.3
KA50JM2-501		2.46	2.0	1.23	1.3	324	46	15	2.1	70	0.4
KA50JM2-502		5.00	1.0	5.0	5.4	324	46	15	2.1	70	0.4
KA50KM2-501		3.20	2.0	1.6	1.8	471	67	20	2.8	100	0.5
KA50KM2-502		6.20	1.0	6.2	6.7	471	67	20	2.8	100	0.5

### BIPOLAR

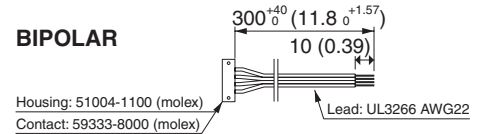
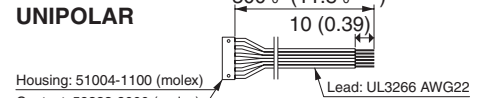
Model	Step angle	Voltage	Current	Resistance	Inductance	Holding torque		Detent torque		Rotor inertia	
Dimension	degree/step	V/∅	A/∅	Ω/∅	mH/∅	mN·m	oz·in	mN·m	oz·in	g·cm <sup>2</sup>	oz·in <sup>2</sup>
KA50HM2-551	1.8	1.66	2.0	0.83	1.3	231	33	12	1.7	50	0.3
KA50HM2-552		3.20	1.0	3.20	5.1	231	33	12	1.7	50	0.3
KA50JM2-551		1.96	2.0	0.98	1.9	373	53	15	2.1	70	0.4
KA50JM2-552		3.80	1.0	3.8	7.1	373	53	15	2.1	70	0.4
KA50KM2-551		2.60	2.0	1.30	2.5	520	74	20	2.8	100	0.5
KA50KM2-552		5.10	1.0	5.10	10	520	74	20	2.8	100	0.5

## Outline unit = mm (inch)



model	L[mm]	L[inch]	mass[g]	weight[lb]
KA50HM2	35	1.38	230	0.5
KA50JM2	40	1.57	300	0.7
KA50KM2	50	1.97	420	0.9

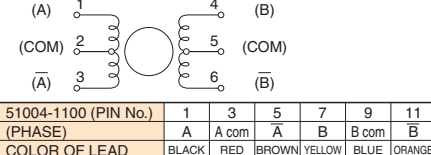
### Accessories: Lead assy



## Connection Diagrams

### Rotational direction UNIPOLAR

(PHASE) 55381 PIN No. 55381 (PHASE) CW viewed from rotor shaft when using the following sequence diagram.

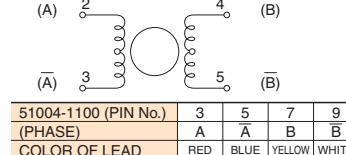


EXCITING SEQUENCE

55381 PIN No.	51004-1100 PIN No.	PHASE	1	2	3	4
1	1	A	-	-	-	-
4	7	B	-	-	-	-
3	5	A	-	-	-	-
6	11	B	-	-	-	-
2	3	A com	+	+	+	+
5	9	B com	+	+	+	+

### BIPOLAR

(PHASE) 55381 PIN No. 55381 (PHASE) CW viewed from rotor shaft when using the following sequence diagram.



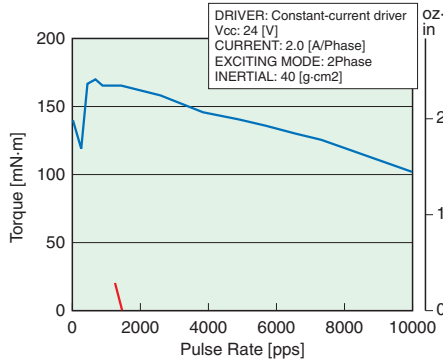
EXCITING SEQUENCE

55381 PIN No.	51004-1100 PIN No.	PHASE	1	2	3	4
2	3	A	-	+	+	-
4	7	B	-	-	+	+
3	5	A	+	-	-	+
5	9	B	+	+	-	-

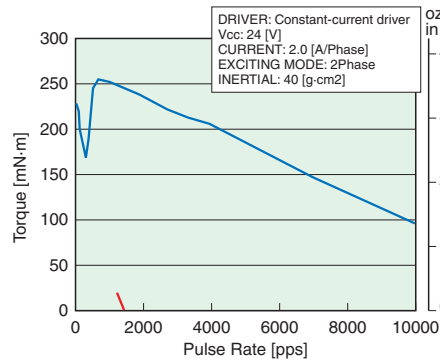
# Pulse-Torque Curve

## UNIPOLAR

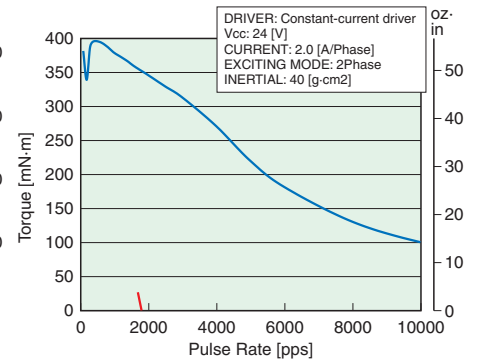
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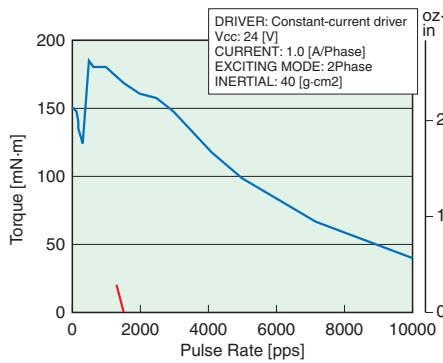
**KA50JM2-501**



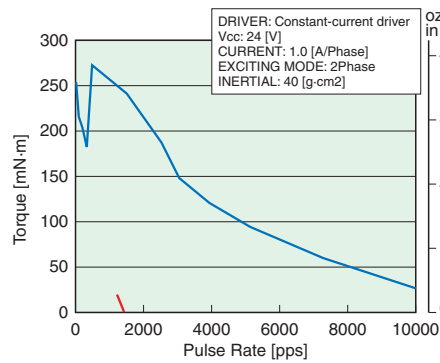
**KA50KM2-501**



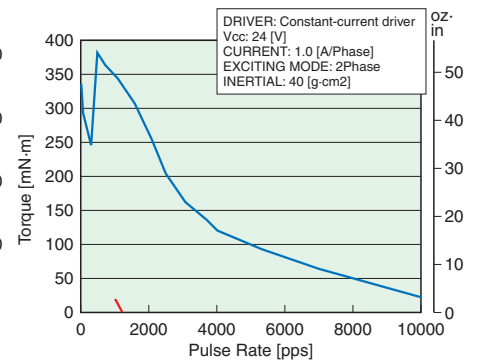
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**KA50JM2-502**

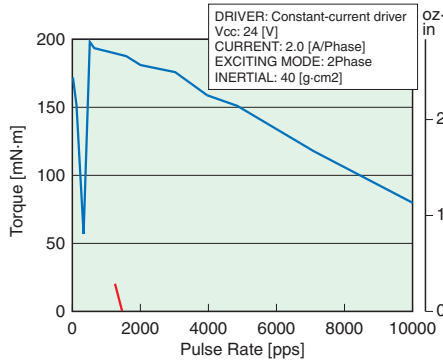


**KA50KM2-502**

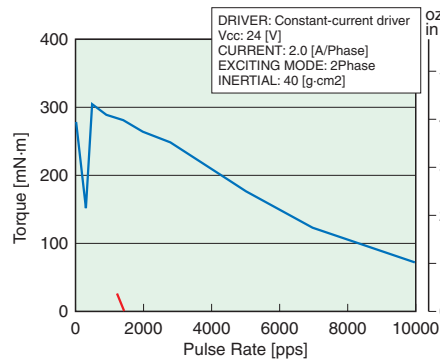


## BIPOLAR

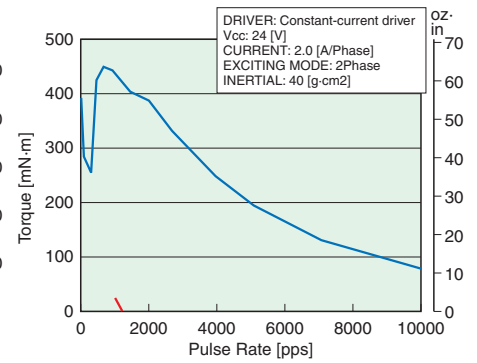
**KA50HM2-551**



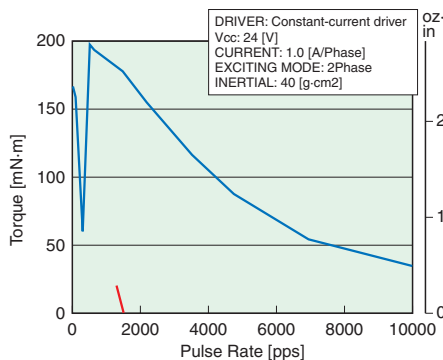
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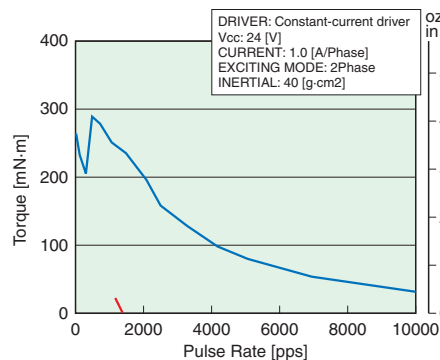
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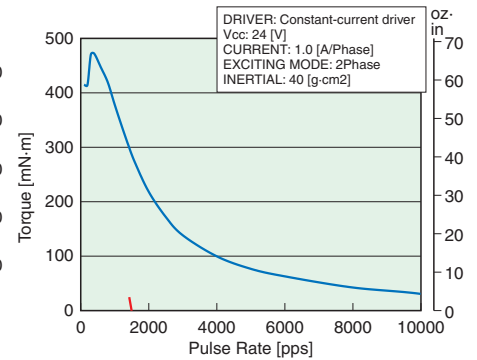
**KA50HM2-552**



**KA50JM2-552**

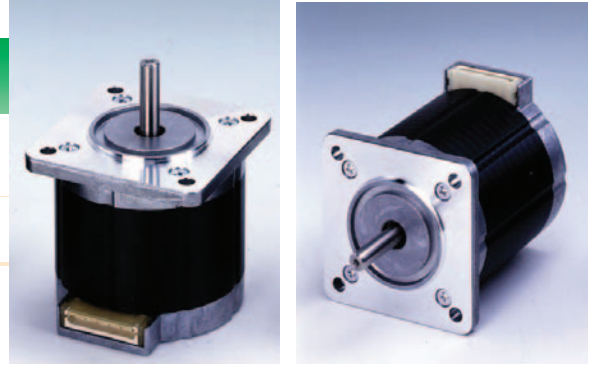


**KA50KM2-552**



# KA60 Series (1.8 degree/step)

## Standard Specifications



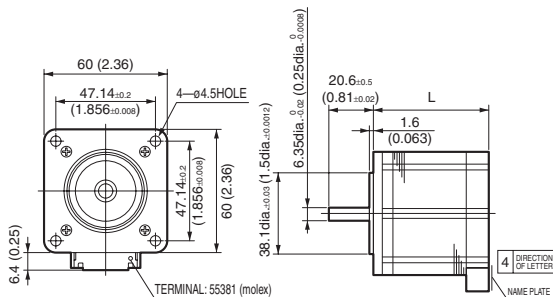
### UNIPOLAR

Model	Step angle	Voltage	Current	Resistance	Inductance	Holding torque		Detent torque		Rotor inertia	
Dimension	degree/step	V/∅	A/∅	Ω/∅	mH/∅	mN·m	oz·in	mN·m	oz·in	g·cm <sup>2</sup>	oz·in <sup>2</sup>
KA60JM2-501	1.8	2.44	3.3	0.74	0.83	707	100	35	5.0	180	1.0
KA60JM2-502		3.41	2.2	1.55	1.8	707	100	35	5.0	180	1.0
KA60KM2-501		2.97	3.3	0.9	1.4	1011	143	50	7.1	270	1.5
KA60KM2-502		4.40	2.2	2.0	3.0	1011	143	50	7.1	270	1.5
KA60LM2-501		3.63	3.3	1.10	1.6	1315	186	60	8.5	360	2.0
KA60LM2-502		5.28	2.2	2.4	3.4	1315	186	60	8.5	360	2.0

### BIPOLAR

Model	Step angle	Voltage	Current	Resistance	Inductance	Holding torque		Detent torque		Rotor inertia	
Dimension	degree/step	V/∅	A/∅	Ω/∅	mH/∅	mN·m	oz·in	mN·m	oz·in	g·cm <sup>2</sup>	oz·in <sup>2</sup>
KA60JM2-551	1.8	2.05	3.3	0.62	1.2	805	114	35	5.0	180	1.0
KA60JM2-552		2.42	2.2	1.10	2.6	805	114	35	5.0	180	1.0
KA60KM2-551		2.41	3.3	0.73	2.1	1207	171	50	7.1	270	1.5
KA60KM2-552		3.01	2.2	1.37	4.5	1207	171	50	7.1	270	1.5
KA60LM2-551		2.97	3.3	0.90	2.2	1600	227	60	8.5	360	2.0
KA60LM2-552		3.74	2.2	1.7	4.9	1600	227	60	8.5	360	2.0

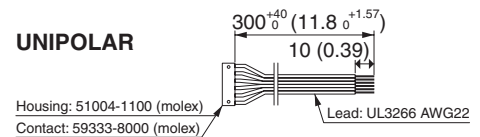
## Outline unit = mm (inch)



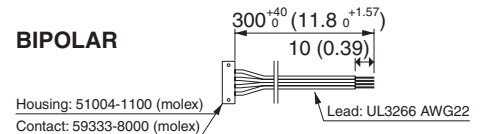
model	L[mm]	L[inch]	mass[g]	weight[lb]
KA60JM2	44	1.73	500	1.1
KA60KM2	54	2.13	700	1.5
KA60LM2	65	2.56	850	1.9

### Accessories: Lead assy

#### UNIPOLAR



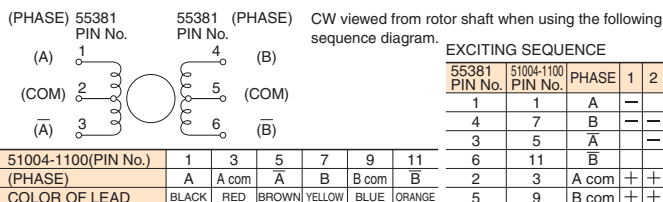
#### BIPOLAR



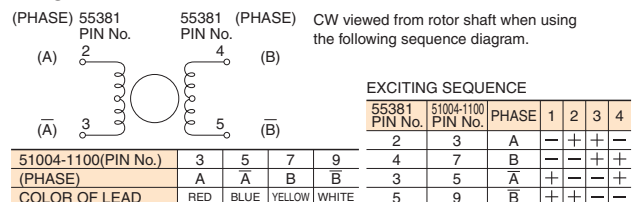
## Connection Diagrams

### Rotational direction

#### UNIPOLAR



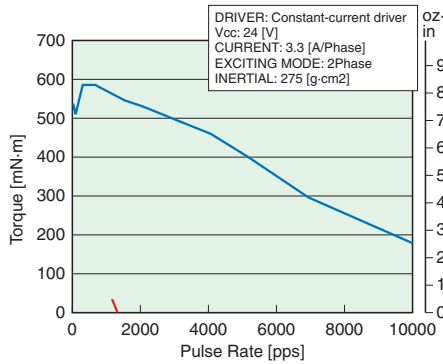
#### BIPOLAR



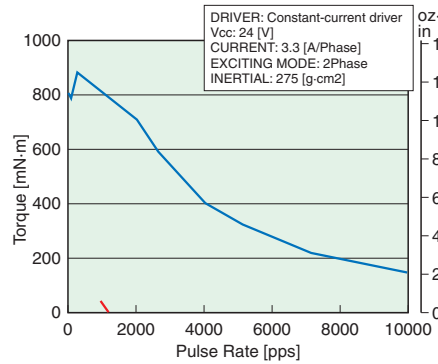
# Pulse-Torque Curve

## UNIPOLAR

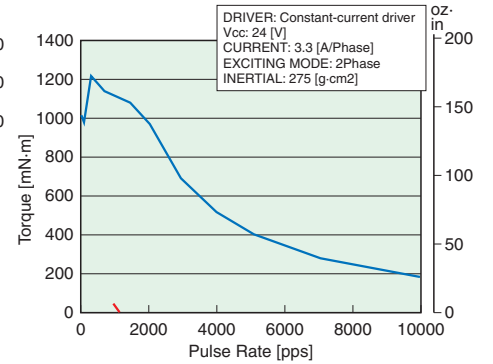
### KA60JM2-501



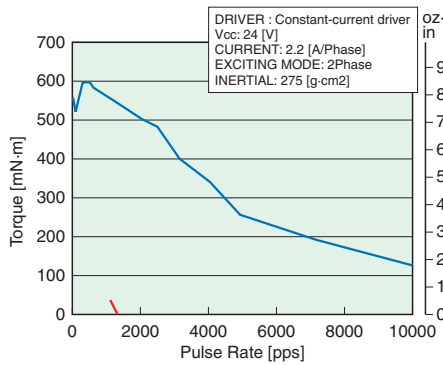
### KA60KM2-501



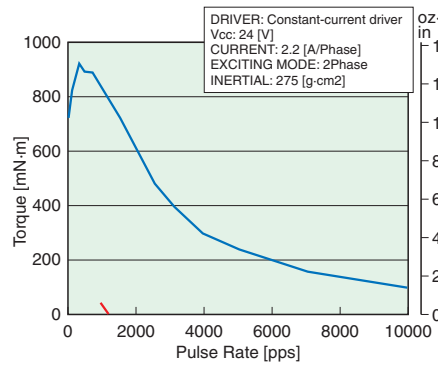
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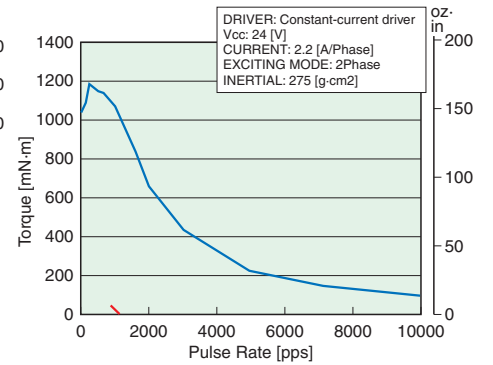
### KA60JM2-502



### KA60KM2-502

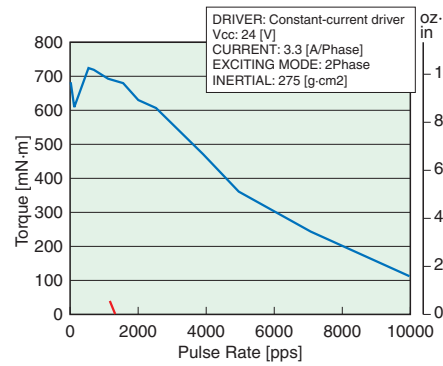


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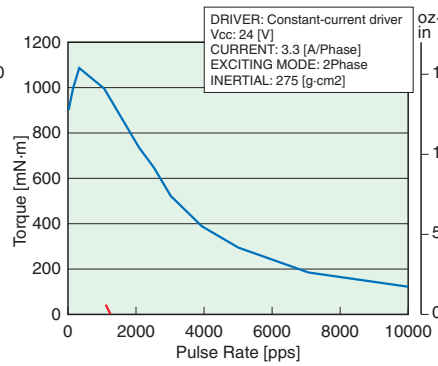


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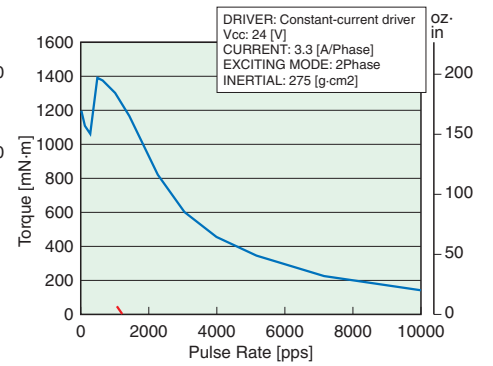
### KA60JM2-551



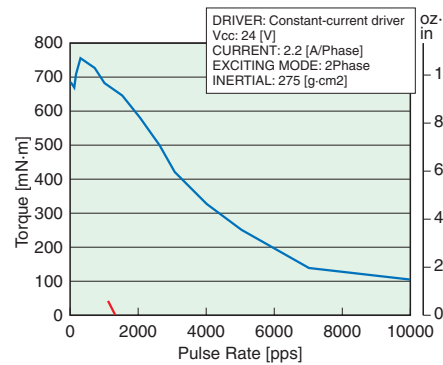
### KA60KM2-551



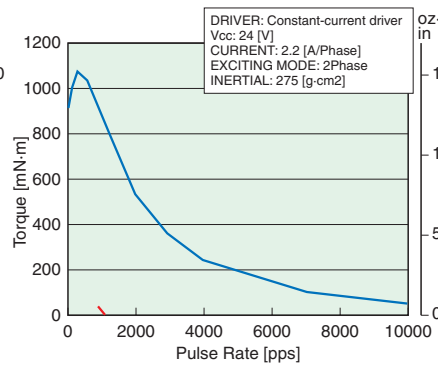
### KA60LM2-551



### KA60JM2-552



### KA60KM2-552



### KA60LM2-552

