

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

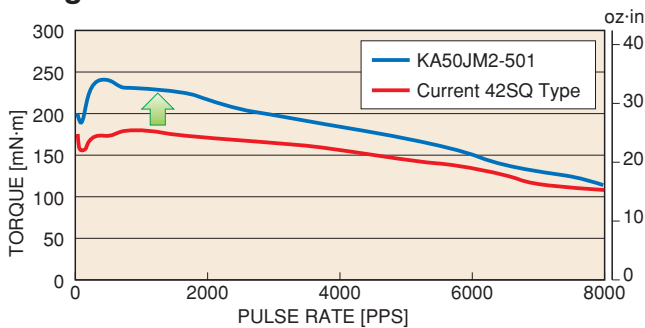
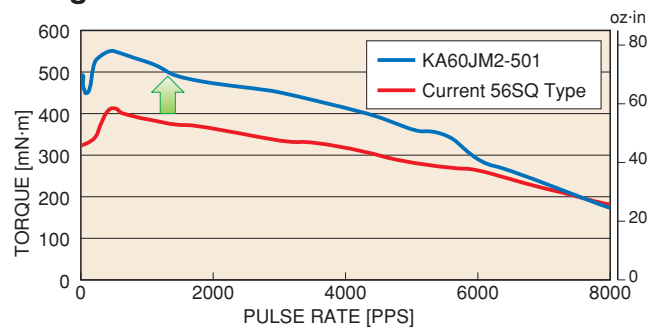
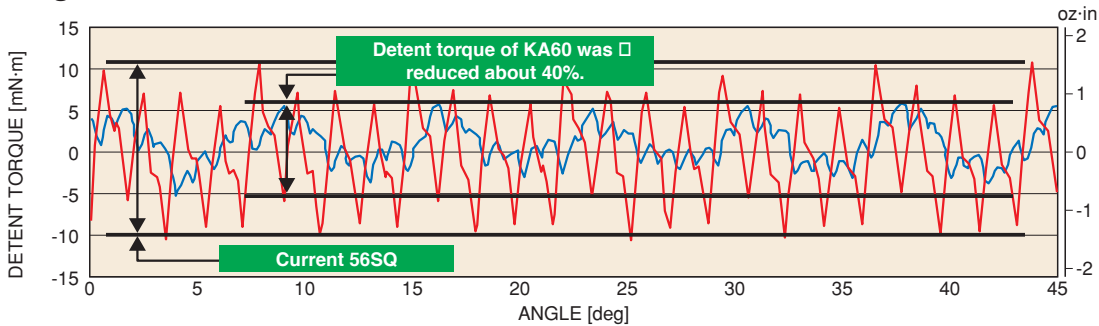


Fig. 2



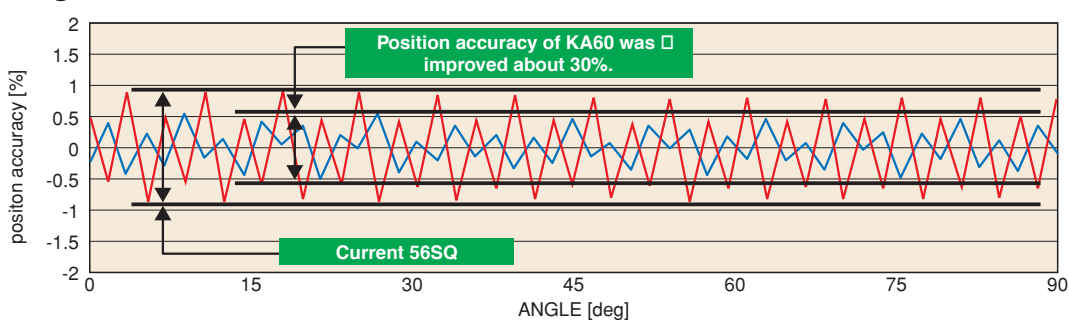
- Low vibration and low rotational fluctuation were realized by reducing the detent torque using three dimensional magnetic field analysis. Rotational fluctuation was reduced about 30%.

Fig. 3



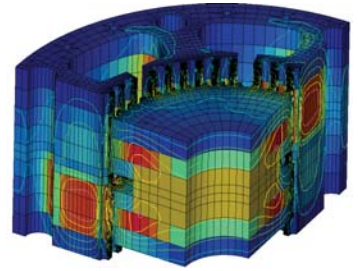
- Position accuracy was improved by minimizing the deviation of induced voltage. Position accuracy was improved about 30%. (Refer to Fig.4)

Fig. 4



- Shaft size and mounting dimension compatibility between the 42sq. & KA50 and the 56sq. & KA60.
- Space Saving: High torque performance with shorter motor.
- All models are RoHS compliant.

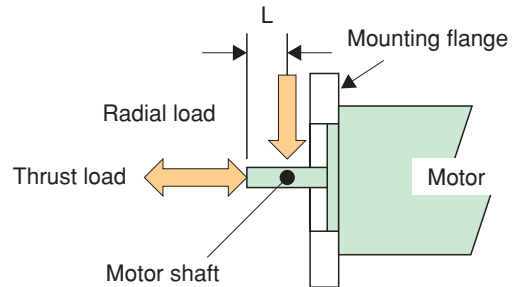
- * Three dimensional magnetic field analysis: The magnetic strength is shown three dimensionally and the highest efficiency core shape is determined.
- * Robust design: A design method that is not influenced by the variation in parts to eliminate product performance variation.



Max. Allowable Load / Runout for Motor Shaft

Load for Motor Shaft

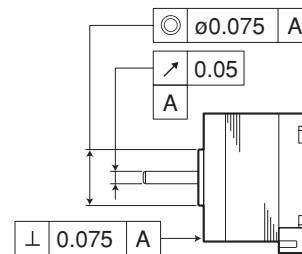
| Type | Thrust load | Radial load | |
|------|---------------------------|---------------------------|-------|
| | | Load | L |
| KA50 | 14.7 N [1.5 kgf] [3.3 lb] | 19.6 N [2.0 kgf] [4.4 lb] | 10 mm |
| KA60 | 40 N [4.1 kgf] [9.0 lb] | 70 N [7.1 kgf] [15.8 lb] | |



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)

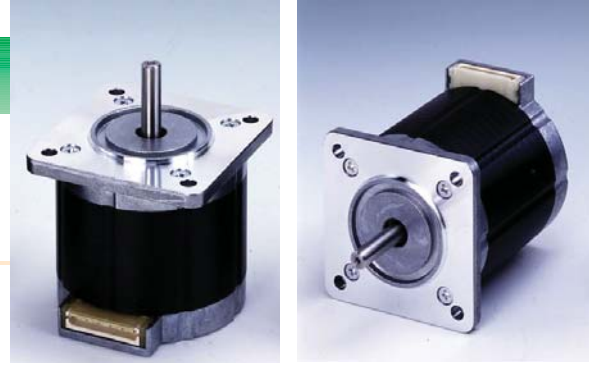


Specification

| | |
|---|---|
| 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) |

KA60 Series (1.8 degree/step)

Standard Specifications



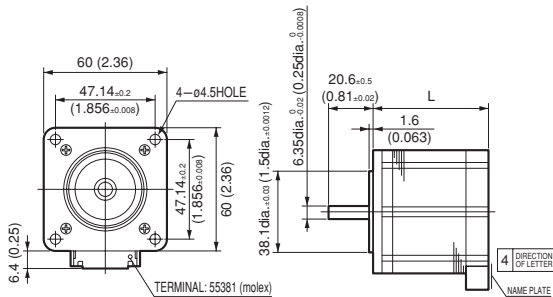
UNIPOLAR

| 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 ² | oz·in ² |
| 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 ² | oz·in ² |
| 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 |

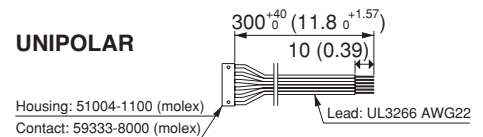
Outline unit = mm (inch)



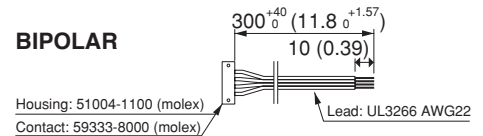
| model | L[mm] | L[inch] | mass[g] | weight[lb] |
|---------|-------|---------|---------|------------|
| KA60JM2 | 44 | 1.73 | 500 | 1.1 |
| KA60KM2 | 54 | 2.13 | 700 | 1.5 |
| KA60LM2 | 65 | 2.56 | 850 | 1.9 |

Accessories: Lead assy

UNIPOLAR



BIPOLAR

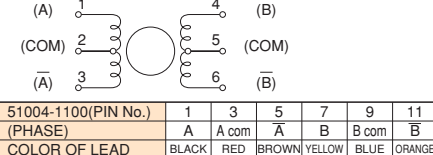


Connection Diagrams

Rotational direction

UNIPOLAR

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

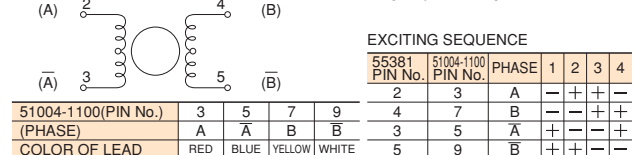


EXCITING SEQUENCE

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

BIPOLAR

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



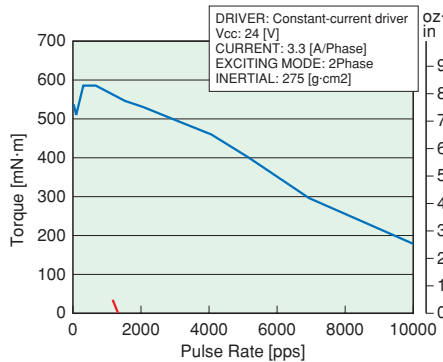
EXCITING SEQUENCE

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

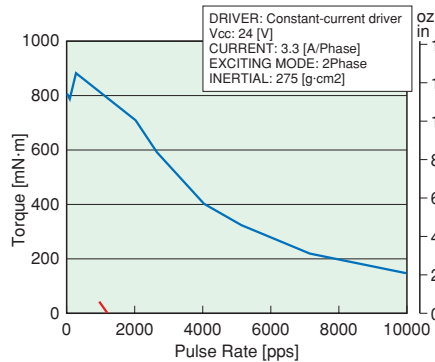
Speed-Torque Characteristics

UNIPOLAR

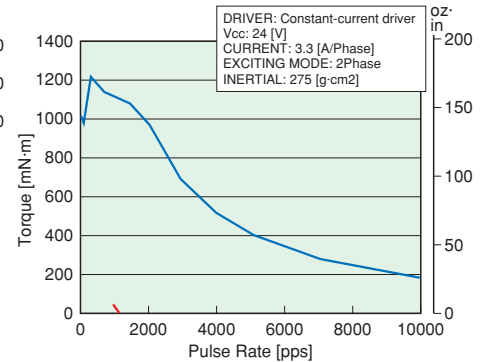
KA60JM2-501



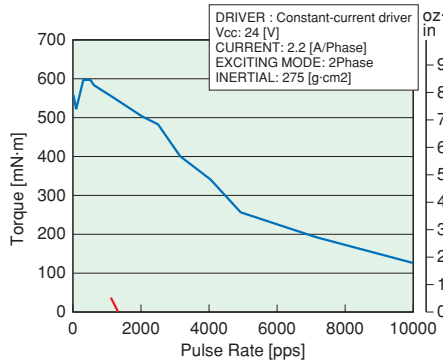
KA60KM2-501



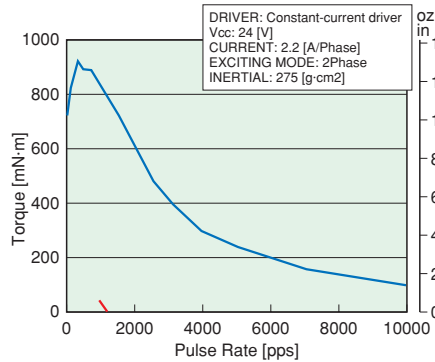
KA60LM2-501



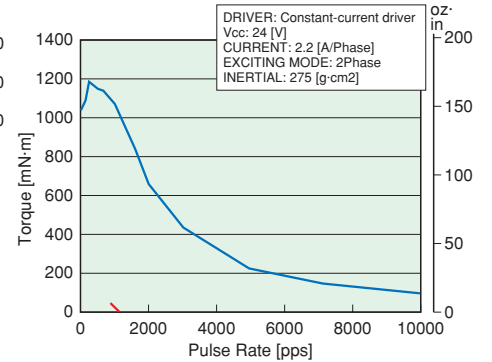
KA60JM2-502



KA60KM2-502

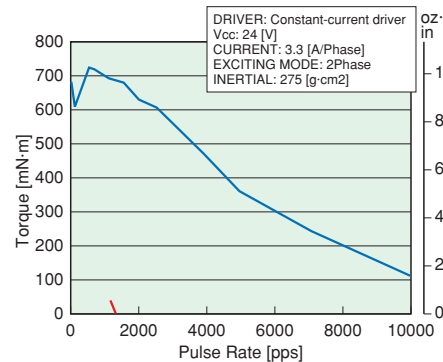


KA60LM2-502

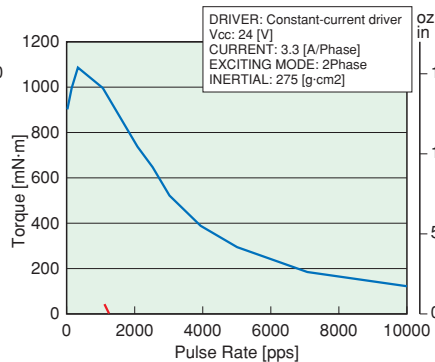


BIPOLAR

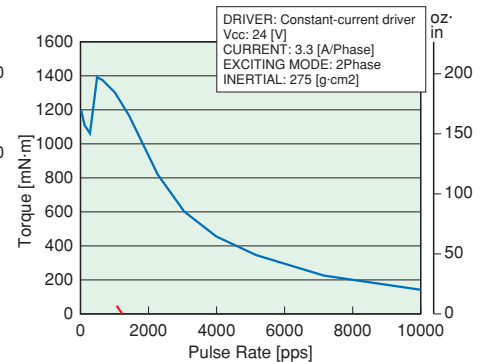
KA60JM2-551



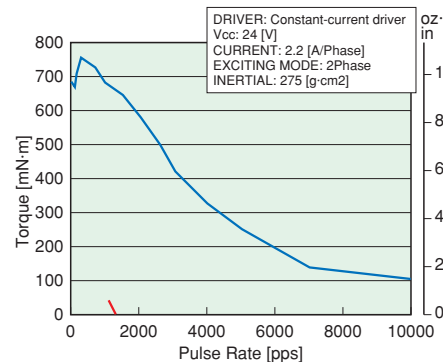
KA60KM2-551



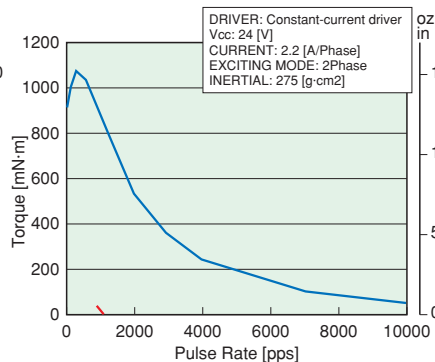
KA60LM2-551



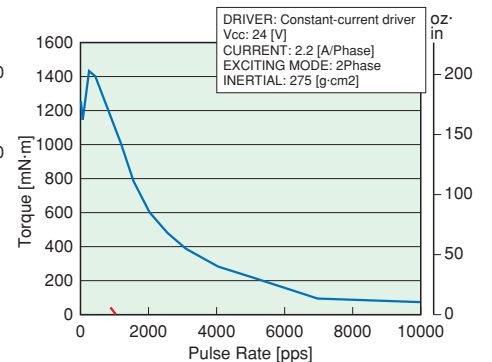
KA60JM2-552



KA60KM2-552



KA60LM2-552



KA Series Semi-Standard

Motor with D-cut Single Shaft

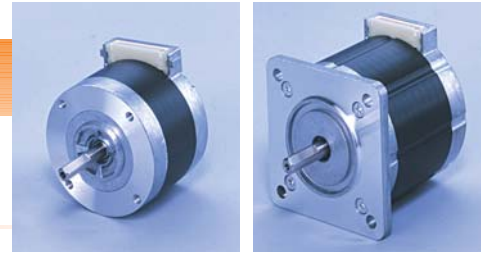
(Model example)

KA50JM2-501 ⇒ KA50JM2-50101

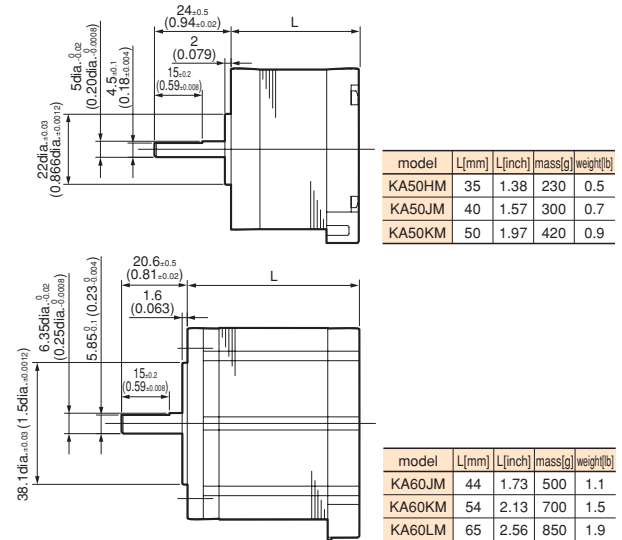
Model List

| | KA50 1.8 degree/step | KA60 1.8 degree/step | KA50 0.9 degree/step |
|----------|-------------------------|-------------------------|-------------------------|
| UNIPOLAR | KA50HM2-50101 | KA60JM2-50101 | KA50HM1-50101 |
| | KA50HM2-50201 | KA60JM2-50201 | KA50HM1-50201 |
| | KA50JM2-50101 | KA60KM2-50101 | KA50JM1-50101 |
| | KA50JM2-50201 | KA60KM2-50201 | KA50JM1-50201 |
| | KA50KM2-50101 | KA60LM2-50101 | KA50KM1-50101 |
| BIPOLAR | KA50HM2-55101 | KA60JM2-55101 | KA50HM1-55101 |
| | KA50HM2-55201 | KA60JM2-55201 | KA50HM1-55201 |
| | KA50JM2-55101 | KA60KM2-55101 | KA50JM1-55101 |
| | KA50JM2-55201 | KA60KM2-55201 | KA50JM1-55201 |
| | KA50KM2-55101 | KA60LM2-55101 | KA50KM1-55101 |

The basic motor characteristics, connection diagrams, and accessories (lead connectors) conform to the standard specifications.



Outline unit = mm (inch) Single shaft specification



Motor with D-cut Double Shaft

(Model example)

UNIPOLAR KA50JM2-501 ⇒ KA50JM2-511

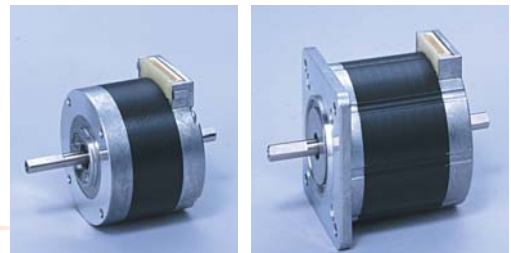
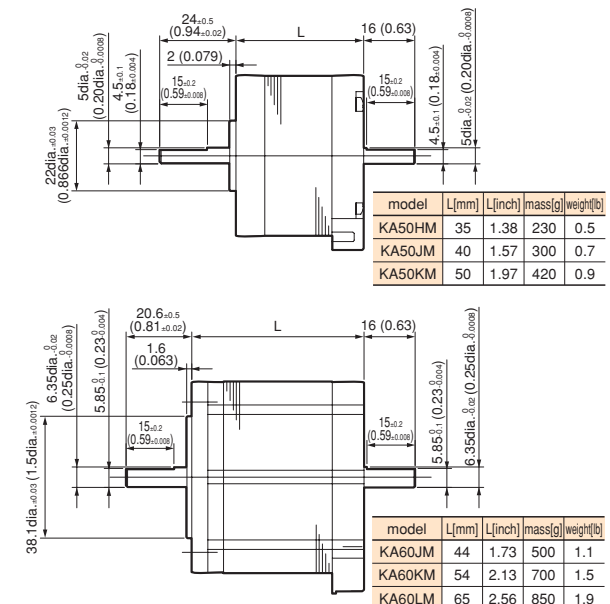
BIPOLAR KA50JM2-551 ⇒ KA50JM2-561

Model List

| | KA50 1.8 degree/step | KA60 1.8 degree/step | KA50 0.9 degree/step |
|----------|-------------------------|-------------------------|-------------------------|
| UNIPOLAR | KA50HM2-511 | KA60JM2-511 | KA50HM1-511 |
| | KA50HM2-512 | KA60JM2-512 | KA50HM1-512 |
| | KA50JM2-511 | KA60KM2-511 | KA50JM1-511 |
| | KA50JM2-512 | KA60KM2-512 | KA50JM1-512 |
| | KA50KM2-511 | KA60LM2-511 | KA50KM1-511 |
| BIPOLAR | KA50HM2-561 | KA60JM2-561 | KA50HM1-561 |
| | KA50HM2-562 | KA60JM2-562 | KA50HM1-562 |
| | KA50JM2-561 | KA60KM2-561 | KA50JM1-561 |
| | KA50JM2-562 | KA60KM2-562 | KA50JM1-562 |
| | KA50KM2-561 | KA60LM2-561 | KA50KM1-561 |

The basic motor characteristics, connection diagrams, and accessories (lead connectors) conform to the standard specifications.

Outline unit = mm (inch) Double shaft specification

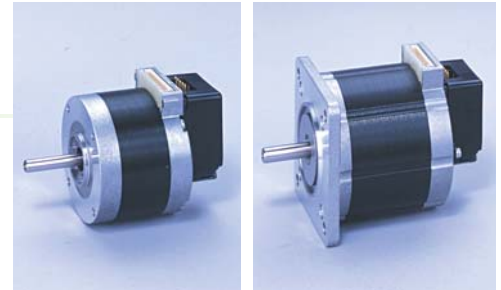


Motor with Encoder

(Model example)

KA50JM2-501 ⇒ 2 Channel KA50JM2E2-501

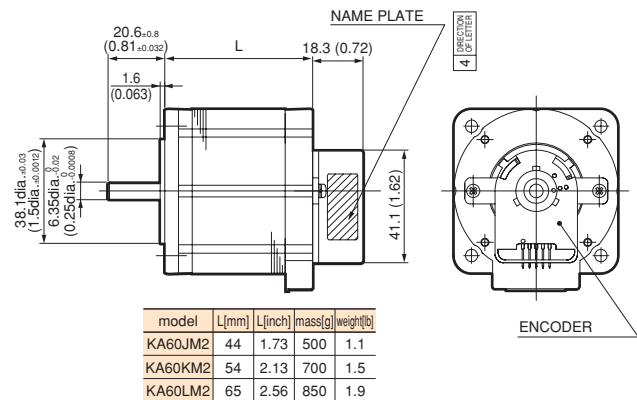
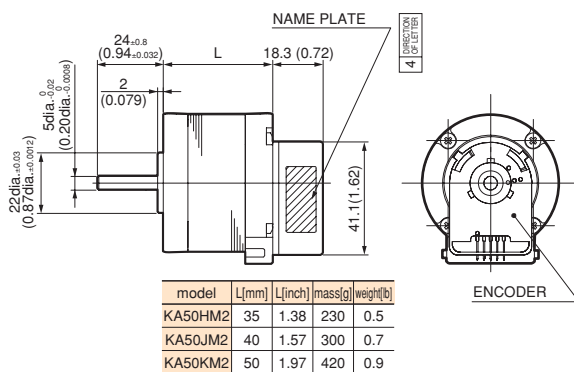
3 Channel KA50JM2E3-501



Model List

| | KA50 1.8 degree/step | | | KA60 1.8 degree/step | | |
|----------|----------------------|---------------|---------------|----------------------|---------------|---------------|
| | Base motor | 2 Channel | 3 Channel | Base motor | 2 Channel | 3 Channel |
| UNIPOLAR | KA50HM2-501 | KA50HM2E2-501 | KA50HM2E3-501 | KA60JM2-501 | KA60JM2E2-501 | KA60JM2E3-501 |
| | KA50HM2-502 | KA50HM2E2-502 | KA50HM2E3-502 | KA60JM2-502 | KA60JM2E2-502 | KA60JM2E3-502 |
| | KA50JM2-501 | KA50JM2E2-501 | KA50JM2E3-501 | KA60KM2-501 | KA60KM2E2-501 | KA60KM2E3-501 |
| | KA50JM2-502 | KA50JM2E2-502 | KA50JM2E3-502 | KA60KM2-502 | KA60KM2E2-502 | KA60KM2E3-502 |
| | KA50KM2-501 | KA50KM2E2-501 | KA50KM2E3-501 | KA60LM2-501 | KA60LM2E2-501 | KA60LM2E3-501 |
| | KA50KM2-502 | KA50KM2E2-502 | KA50KM2E3-502 | KA60LM2-502 | KA60LM2E2-502 | KA60LM2E3-502 |
| BIPOLAR | KA50HM2-551 | KA50HM2E2-551 | KA50HM2E3-551 | KA60JM2-551 | KA60JM2E2-551 | KA60JM2E3-551 |
| | KA50HM2-552 | KA50HM2E2-552 | KA50HM2E3-552 | KA60JM2-552 | KA60JM2E2-552 | KA60JM2E3-552 |
| | KA50JM2-551 | KA50JM2E2-551 | KA50JM2E3-551 | KA60KM2-551 | KA60KM2E2-551 | KA60KM2E3-551 |
| | KA50JM2-552 | KA50JM2E2-552 | KA50JM2E3-552 | KA60KM2-552 | KA60KM2E2-552 | KA60KM2E3-552 |
| | KA50KM2-551 | KA50KM2E2-551 | KA50KM2E3-551 | KA60LM2-551 | KA60LM2E2-551 | KA60LM2E3-551 |
| | KA50KM2-552 | KA50KM2E2-552 | KA50KM2E3-552 | KA60LM2-552 | KA60LM2E2-552 | KA60LM2E3-552 |

Outline unit = mm (inch)



Encoder specification

| | |
|----------------------|---|
| | KA50, KA60 |
| Resolution [P/R] | 400 |
| Power-supply voltage | DC 5V ±0.5 V |
| Output aspect | 2 Channel (A, B aspect) or 3 Channel (A, B, I aspect) |
| Output wave form | TTL |

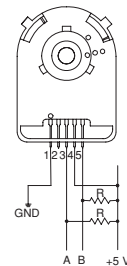
Recommended pull-up resistor value

| | 2 Channel | 3 Channel |
|-------|-----------|-----------|
| R [Ω] | 11 k | 2.7 k |

The basic motor characteristics, connection diagrams, and accessories (lead connectors) conform to the standard specifications.

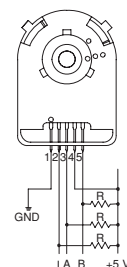
Connection diagrams

2 Channel



| PIN No. | 1 | 2 | 3 | 4 | 5 |
|------------|-----|---|----------|------|----------|
| Connection | GND | — | A aspect | +5 V | B aspect |

3 Channel



| PIN No. | 1 | 2 | 3 | 4 | 5 |
|------------|-----|----------|----------|------|----------|
| Connection | GND | I aspect | A aspect | +5 V | B aspect |