

Product

Precision Step Motors

勝特力材料 886-3-5753170
胜特力电子(上海) 86-21-34970699
胜特力电子(深圳) 86-755-83298787

[Http://www.100y.com.tw](http://www.100y.com.tw)

NMB
CORPORATION

PEOPLE
PRODUCTS
VISION

A Minebea Group Company



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胜特力电子(上海) 86-21-34970699
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Keeping The World In Motion

An established industry leader in the design and manufacture of precision stepping motors, NMB Corporation offers a broad range of standard and custom designs for OEM users. New precision stepping motors are introduced and specified in this catalog: the new 17PM-K and 17PU-H

SMH series are sheet metal construction type hybrid motors, our high-torque hybrid 17PM-K series, our new microstep, low-noise, high-torque 23LM/KM hybrid motor series, and added availability of the 15, 17 and 23 size permanent magnet motors. These new offerings reflect our commitment to advanced engineering design, leading-edge production technology and ongoing quality control programs that assure total customer satisfaction.

With our complete in-house volume production capabilities and one of the largest tool and die centers in the industry, NMB continues its dedication to vertical integration, which results in high product quality at competitive pricing schedules. The company's facilities allow for the internal production of miniature precision bearings, die casting, lamination stamping and injection molding.

A leader in materials research, automated production technology and continuous quality improvement, NMB has earned ISO 9001, ISO 9002 and QS 9000 certification. In addition, the company has been recognized for its pioneering environmental safety efforts since March 1993 with the award of ISO 14001 environmental certification in 1997. All NMB companies and subsidiaries are CFC and trichloroethane free.

As one of the Minebea group of companies, NMB has extensive resources at its disposal to satisfy the most demanding requirements of its worldwide customer base. Plus, our global technical support staff is always available to discuss solutions for your particular engineering application.

NMB
CORPORATION

P E O P L E
P R O D U C T S
V I S I O N

A Minebea Group Company

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HYBRID MOTORS

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| Motor Diameter | Model Number | Step Angle | Rated Voltage | Rated Current | Winding Resistance | Inductance | Holding Torque | | Rotor Inertia | Page |
|----------------|---------------|------------|---------------|---------------|--------------------|------------|----------------|-------|-------------------|-------|
| | | Degrees | Volts | Amps | Ohms | mH | g-cm | oz-in | g-cm ² | |
| 1.4" | 14PM-M204 | 1.8 | 12.00 | 0.18 | 65.0 | 24.0 | 330 | 5 | 11.0 | 0.060 |
| | 14PM-M206 | 1.8 | 5.20 | 0.40 | 13.0 | 4.8 | 330 | 5 | 11.0 | 0.060 |
| 1.6" | 16PY-Q207 | 0.9 | 10.00 | 0.25 | 40.0 | 8.5 | 380 | 5 | 13.0 | 0.071 |
| | 16PY-Q204 | 0.9 | 3.96 | 0.90 | 4.4 | 1.6 | 500 | 7 | 13.0 | 0.071 |
| 1.7" | 16PU-M003 | 3.75 | 4.20 | 0.70 | 6.0 | 4.0 | 700 | 10 | 17.0 | 0.093 |
| | 16PU-M006 | 3.75 | 7.60 | 0.40 | 19.5 | 10.5 | 700 | 10 | 17.0 | 0.093 |
| 1.7" | 17PM-K016V | 1.8 | 8.80 | 0.40 | 22.0 | 19.5 | 1,500 | 21 | 34.0 | 0.186 |
| | 17PM-K017V | 1.8 | 4.40 | 0.80 | 5.5 | 5.7 | 1,500 | 21 | 34.0 | 0.186 |
| | 17PM-K018V | 1.8 | 3.00 | 1.20 | 2.5 | 2.8 | 1,500 | 21 | 34.0 | 0.186 |
| | 17PM-K316V | 1.8 | 9.60 | 0.40 | 24.0 | 25.8 | 1,700 | 24 | 45.0 | 0.246 |
| | 17PM-K301V | 1.8 | 4.80 | 0.80 | 6.0 | 7.1 | 1,700 | 24 | 45.0 | 0.246 |
| | 17PM-K303V | 1.8 | 3.20 | 1.20 | 2.7 | 3.3 | 1,700 | 24 | 45.0 | 0.246 |
| | 17PM-K111V | 1.8 | 10.00 | 0.40 | 25.0 | 33.4 | 2,200 | 31 | 56.0 | 0.306 |
| | 17PM-K101V | 1.8 | 5.00 | 0.80 | 6.2 | 8.6 | 2,200 | 31 | 56.0 | 0.306 |
| | 17PM-K103V | 1.8 | 3.60 | 1.20 | 3.0 | 4.4 | 2,200 | 31 | 56.0 | 0.306 |
| | 17PM-K402V* | 1.8 | 6.00 | 0.80 | 7.5 | 7.0 | 3,400 | 47 | 75.0 | 0.410 |
| | 17PW-M003 | 1.875 | 4.90 | 0.65 | 7.5 | 6.2 | 1,200 | 17 | 17.0 | 0.093 |
| | 17PS-M001V | 3.6 | 3.20 | 0.40 | 7.9 | 5.4 | 450 | 6 | 17.0 | 0.093 |
| | 17PU-H008V | 3.75 | 3.70 | 0.90 | 4.1 | 2.9 | 600 | 8 | 34.0 | 0.186 |
| | 17PU-H010V | 3.75 | 4.80 | 0.80 | 6.0 | 3.4 | 750 | 10 | 34.0 | 0.186 |
| | 17PU-H309V | 3.75 | 6.10 | 0.80 | 7.6 | 5.2 | 1,000 | 14 | 45.0 | 0.246 |
| | 17PU-H312V | 3.75 | 9.50 | 0.50 | 19.0 | 17.0 | 1,000 | 14 | 45.0 | 0.246 |
| | 17PM-K204VT** | 1.8 | 2.40 | 0.80 | 3.0 | 2.6 | 1,250 | 17 | 28.0 | 0.153 |
| | 17PM-K018VT** | 1.8 | 3.50 | 1.00 | 3.5 | 2.7 | 1,700 | 24 | 34.0 | 0.186 |
| | 17PU-H204VT** | 3.75 | 2.40 | 0.80 | 3.0 | 2.1 | 750 | 10 | 28.0 | 0.153 |
| | 17PU-H018VT** | 3.75 | 3.50 | 1.00 | 3.5 | 2.0 | 1,150 | 16 | 34.0 | 0.186 |
| 2.3" | 23LY-C205 | 0.9 | 4.00 | 1.10 | 3.6 | 5.3 | 3,000 | 42 | 55.0 | 0.301 |
| | 23LY-C201 | 0.9 | 5.50 | 0.78 | 7.1 | 8.3 | 3,000 | 42 | 55.0 | 0.301 |
| | 23LY-C202 | 0.9 | 3.75 | 1.25 | 3.0 | 4.5 | 3,000 | 42 | 55.0 | 0.301 |
| | 23LY-C301 | 0.9 | 3.00 | 1.70 | 1.8 | 4.5 | 4,000 | 56 | 110.0 | 0.601 |
| | 23LY-C303 | 0.9 | 5.10 | 1.00 | 5.1 | 13.0 | 4,000 | 56 | 110.0 | 0.601 |
| | 23LY-C305 | 0.9 | 6.00 | 0.85 | 7.1 | 18.0 | 4,000 | 56 | 110.0 | 0.601 |
| | 23LY-C002 | 0.9 | 4.30 | 1.60 | 2.7 | 7.2 | 4,800 | 67 | 160.0 | 0.875 |
| | 23LY-C001 | 0.9 | 8.50 | 0.85 | 10.0 | 30.0 | 4,800 | 67 | 160.0 | 0.875 |
| | 23LM-C250V | 1.8 | 3.00 | 1.50 | 2.0 | 2.5 | 3,200 | 44 | 55.0 | 0.301 |
| | 23LM-C213V | 1.8 | 2.20 | 2.00 | 1.1 | 1.3 | 3,200 | 44 | 55.0 | 0.301 |
| | 23LM-C343V | 1.8 | 3.30 | 1.50 | 2.2 | 3.5 | 4,300 | 60 | 110.0 | 0.601 |
| | 23LM-C355V | 1.8 | 2.50 | 2.00 | 1.25 | 2.3 | 4,300 | 60 | 110.0 | 0.601 |
| | 23LM-C047V | 1.8 | 4.70 | 1.50 | 3.1 | 6.1 | 5,200 | 72 | 160.0 | 0.875 |
| | 23LM-C055V | 1.8 | 3.40 | 2.00 | 1.7 | 3.5 | 5,200 | 72 | 160.0 | 0.875 |
| | 23LM-K250V | 1.8 | 3.00 | 1.50 | 2.0 | 3.0 | 2,400 | 33 | 55.0 | 0.301 |
| | 23LM-K213V | 1.8 | 2.20 | 2.00 | 1.1 | 1.6 | 2,400 | 33 | 55.0 | 0.301 |
| | 23LM-K343V | 1.8 | 3.30 | 1.50 | 2.2 | 3.9 | 3,400 | 47 | 110.0 | 0.601 |
| | 23LM-K355V | 1.8 | 2.50 | 2.00 | 1.25 | 2.6 | 3,400 | 47 | 110.0 | 0.601 |
| | 23LM-K047V | 1.8 | 4.70 | 1.50 | 3.1 | 6.5 | 4,000 | 56 | 160.0 | 0.875 |
| | 23LM-K055V | 1.8 | 3.40 | 2.00 | 1.7 | 3.7 | 4,000 | 56 | 160.0 | 0.875 |
| 23KM | 23KM-C250V | 1.8 | 3.30 | 1.50 | 2.2 | 2.6 | 4,400 | 61 | 150.0 | 0.820 |
| | 23KM-C379V | 1.8 | 4.10 | 1.50 | 2.7 | 3.6 | 8,000 | 111 | 230.0 | 1.257 |
| | 23KM-C032V | 1.8 | 5.10 | 1.50 | 3.4 | 5.4 | 9,500 | 132 | 280.0 | 1.530 |
| | 23KM-C716V | 1.8 | 6.30 | 1.50 | 4.2 | 6.8 | 14,000 | 194 | 440.0 | 2.405 |
| | 23KM-K250V | 1.8 | 3.30 | 1.50 | 2.2 | 3.1 | 3,700 | 51 | 150.0 | 0.820 |
| | 23KM-K379V | 1.8 | 4.10 | 1.50 | 2.7 | 4.2 | 5,600 | 78 | 230.0 | 1.257 |
| | 23KM-K032V | 1.8 | 5.10 | 1.50 | 3.4 | 6.4 | 7,400 | 103 | 280.0 | 1.531 |
| | 23KM-K716V | 1.8 | 6.30 | 1.50 | 4.2 | 8.0 | 12,000 | 167 | 440.0 | 2.405 |

HYBRID MOTORS (cont'd.)

| Motor Diameter | Model Number | Step Angle | Rated Voltage | Rated Current | Winding Resistance | Inductance | Holding Torque | | Rotor Inertia | Page |
|-------------------|--------------|------------|---------------|---------------|--------------------|------------|----------------|-------|-------------------|--------------------|
| Inches | | Degrees | Volts | Amps | Ohms | mH | g-cm | oz-in | g-cm ² | oz-in ² |
| 2.3" (cont'd.) | 23LQ-C202V | 5.0 | 3.90 | 1.10 | 3.5 | 4.0 | 2,300 | 32 | 55.0 | 0.301 |
| | 23LQ-C309V | 5.0 | 6.75 | 1.00 | 6.75 | 8.6 | 3,100 | 43 | 110.0 | 0.601 |
| 3.4" | 23LQ-C055V | 5.0 | 3.40 | 2.00 | 1.7 | 2.7 | 3,600 | 50 | 160.0 | 0.875 |
| | 34PM-C101 | 1.8 | 3.00 | 4.00 | 0.75 | 3.5 | 20,000 | 278 | 1,100.0 | 6.014 |
| | 34PM-C108 | 1.8 | 12.00 | 1.00 | 12.0 | 56.0 | 20,000 | 278 | 1,100.0 | 6.014 |
| | 34PM-C007 | 1.8 | 5.50 | 1.25 | 4.4 | 14.5 | 12,000 | 167 | 560.0 | 3.062 |
| | 34PM-C049 | 1.8 | 1.70 | 4.70 | 0.36 | 1.7 | 12,000 | 167 | 560.0 | 3.062 |

*NMB's new 17 size high-torque motor

**NMB's new sheet metal hybrid (SMH) motor series

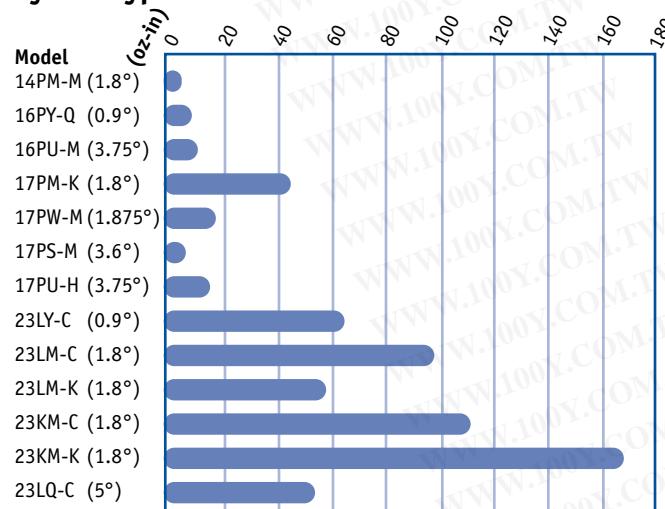
PERMANENT MAGNET MOTORS

| Motor Diameter | Model Number | Step Angle | Rated Voltage | Rated Current | Winding Resistance | Inductance | Holding Torque | | Rotor Inertia | Page |
|----------------|--------------|------------|---------------|---------------|--------------------|------------|----------------|-------|-------------------|--------------------|
| Inches | | Degrees | Volts | Amps | Ohms | mH | g-cm | oz-in | g-cm ² | oz-in ² |
| 0.6" | 06BJ-H005 | 18.0 | 5.0 | 0.25 | 20.0 | 7.0 | 27 | 0 | 0.06 | 0.0003 |
| | 06BJ-H012 | 18.0 | 12.0 | 0.12 | 100.0 | 37.0 | 30 | 0 | 0.06 | 0.0003 |
| 0.8" | 08BJ-H007 | 18.0 | 3.8 | 0.19 | 20.0 | 7.0 | 40 | 1 | 0.2 | 0.001 |
| | 08BJ-H040 | 18.0 | 2.1 | 0.35 | 6.0 | 5.0 | 40 | 1 | 0.2 | 0.001 |
| 1.5" | 15BA-H051P | 15.0 | 8.0 | 0.23 | 35.0 | 18.0 | 165 | 2 | 4.0 | 0.022 |
| | 15BA-H073P | 15.0 | 4.0 | 0.40 | 10.0 | 5.0 | 155 | 2 | 4.0 | 0.022 |
| | 15BA-H043P | 15.0 | 2.0 | 0.80 | 2.5 | 3.4 | 220 | 3 | 4.0 | 0.022 |
| | 15BB-H051P | 7.5 | 8.0 | 0.23 | 35.0 | 27.0 | 165 | 2 | 4.0 | 0.022 |
| 1.7" | 15BB-H073P | 7.5 | 4.0 | 0.40 | 10.0 | 6.7 | 155 | 2 | 4.0 | 0.022 |
| | 15BB-H170P | 7.5 | 6.6 | 0.22 | 30.0 | 17.0 | 190 | 3 | 1.5 | 0.008 |
| | 15BB-H043P | 7.5 | 2.0 | 0.80 | 2.5 | 4.5 | 205 | 3 | 4.0 | 0.022 |
| | 17BB-H262P | 7.5 | 5.4 | 0.45 | 12.0 | 11.0 | 500 | 7 | 12.0 | 0.066 |
| 2.3" | 17BB-H267P | 7.5 | 7.5 | 0.30 | 25.0 | 19.0 | 480 | 7 | 12.0 | 0.066 |
| | 17BB-H240P | 7.5 | 5.4 | 0.45 | 12.0 | 27.0 | 670 | 9 | 12.0 | 0.066 |
| | 23BB-H251P | 7.5 | 5.0 | 0.75 | 6.6 | 9.0 | 1,200 | 17 | 30.0 | 0.164 |
| | 23BB-H252P | 7.5 | 12.0 | 0.34 | 36.0 | 32.0 | 1,200 | 17 | 30.0 | 0.164 |
| | 23BB-H246P | 7.5 | 4.9 | 0.75 | 6.5 | 17.0 | 1,400 | 19 | 30.0 | 0.164 |

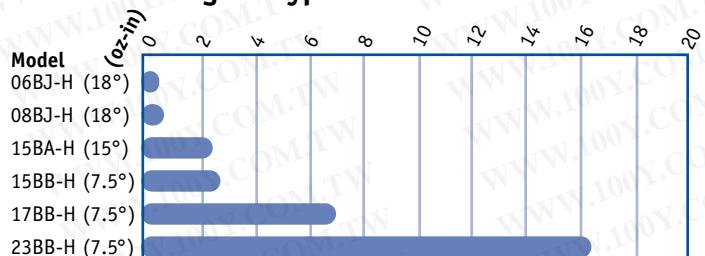
STEP MOTOR PERFORMANCE

Holding Torque Range

Hybrid Type



Permanent Magnet Type



PART NUMBERING SYSTEM

23 L M - K 0 01 - 01

Size

Motor O.D. in tenths of an inch.
(Example: Size 23 = 2.3" Dia.)

Type

B = Permanent Magnet
L = Precision, Hybrid
K = Precision, Hybrid
P = Precision, Hybrid

Step Angle

| | | |
|---|---|--------|
| A | = | 15° |
| B | = | 7.5° |
| J | = | 18° |
| M | = | 1.8° |
| Q | = | 5.0° |
| S | = | 3.6° |
| U | = | 3.75° |
| W | = | 1.875° |
| Y | = | 0.9° |

Versions

01 to 99 = standard
L1 to L9 = with leadscrew
G1 to G9 = with gear
P1 to P9 = with pulley

Different Windings

01 to 99

Motor Lengths

0 to 9

Motor Construction

C = 2 & 4 phase Hybrid
H = 2 & 4 phase PM
K = 2 & 4 phase Hybrid
M = 2 & 4 phase Hybrid
Q = 2 & 4 phase Hybrid

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CUSTOM FEATURES

NMB will modify the step motors in this catalog to meet your application-specific requirements by customizing these features:

- Pulley/Gears
- Windings
- Re-Wire Ends
- Shaft
- Connector or Wire On Lead
- Termination
- Mount
- Tapped Encoder Holes

SIZE/STEP ANGLE MATRIX

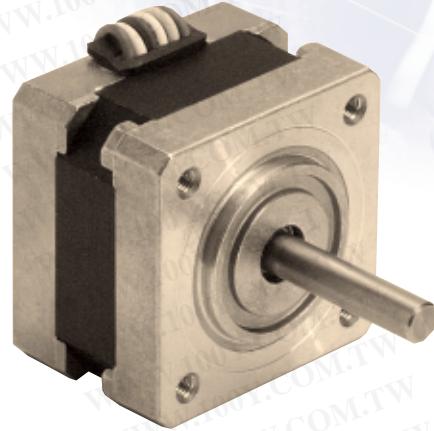
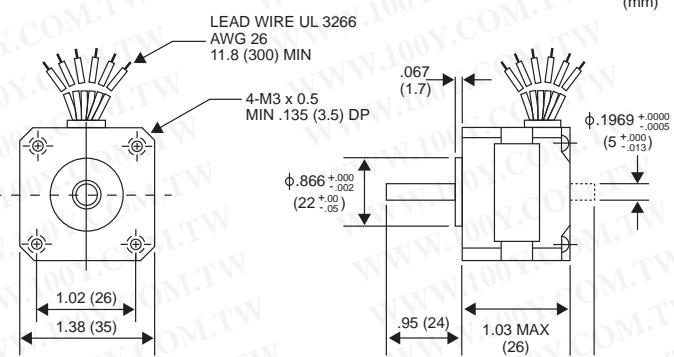
| Size (x 0.1 inch) | | 06 | 08 | 14 | 15 | 16 | 17 | 23 | 34 |
|---------------------|-------|----|----|----|----|----|----|----|----|
| Size (mm) | | 15 | 20 | 34 | 35 | 39 | 42 | 56 | 86 |
| Step Angle (Degree) | 0.9 | | | | | | | | |
| | 1.8 | | | | | | | | |
| | 1.875 | | | | | | | | |
| | 3.6 | | | | | | | | |
| | 3.75 | | | | | | | | |
| | 5 | | | | | | | | |
| | 7.5 | | | | | | | | |
| | 15 | | | | | | | | |
| | 18 | | | | | | | | |

Hybrid Type

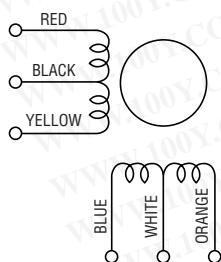
Permanent Magnet Type

14PM-M 1.8° HYBRID

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WINDING DIAGRAM



GENERAL SPECIFICATIONS

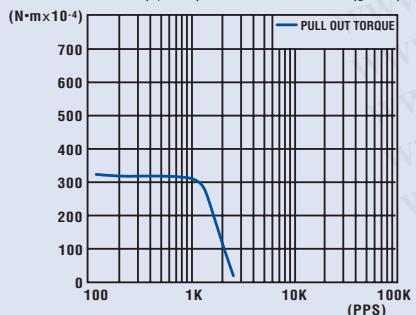
| | |
|---------------------------------|---------------------------|
| Step Angle | 1.8° |
| Step Angle Accuracy | +/-5% |
| Temperature Rise | 80° C Max. |
| Ambient Temperature Range | -20° to +50° C |
| Insulation Resistance | 100MΩ Min., 500 VDC |
| Dielectric Strength | 500 VAC for 1 min. |
| Radial Play | 0.02 mm Max. (450 g-load) |
| End Play | 0.08 mm Max. (450 g-load) |
| Switching Sequence | See page 31 |

MODEL SPECIFICATIONS

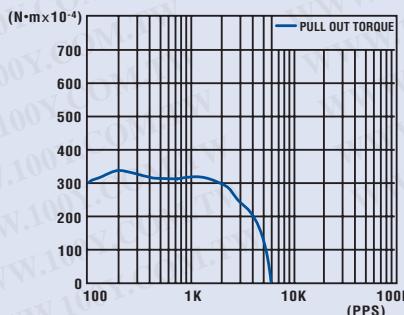
| Model Number | Rated Voltage V | Rated Current/Phase A | Winding Resistance/Phase Ω | Holding Torque g-cm | Inductance mH | Rotor Inertia g-cm² | Detent Torque g-cm | Weight g |
|--------------|-----------------|-----------------------|----------------------------|---------------------|---------------|---------------------|--------------------|----------|
| 14PM-M204 | 12.0 | 0.18 | 65.0 | 330 | 24.0 | 11.0 | 50 | 110 |
| 14PM-M206 | 5.2 | 0.4 | 13.0 | 330 | 4.8 | 11.0 | 50 | 110 |

TORQUE/SPEED CHARACTERISTICS

Model: 14PM-M204
 Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
 Drive Current: 0.18 (A/WDG) • Load Inertia: 34.0 (g-cm²)



Model: 14PM-M206
 Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
 Drive Current: 0.40 (A/WDG) • Load Inertia: 34.0 (g-cm²)

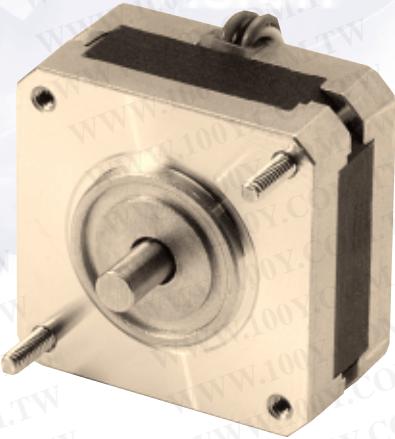


16PY-Q0.9 HYBRID

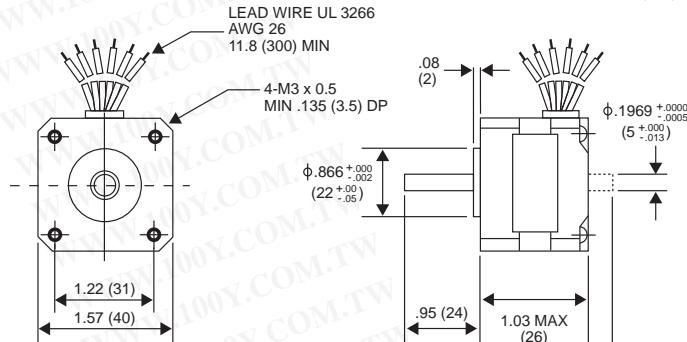
16PY-Q 0.9° HYBRID

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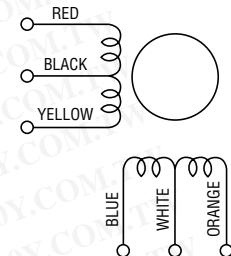
Unit: inches
(mm)



GENERAL SPECIFICATIONS

| | |
|---------------------------------|---------------------------|
| Step Angle | 0.9° |
| Step Angle Accuracy | +/-5% |
| Temperature Rise | 80° C Max. |
| Ambient Temperature Range | -20° to +50° C |
| Insulation Resistance..... | 100MΩ Min., 500 VDC |
| Dielectric Strength..... | 500 VAC for 1 min. |
| Radial Play | 0.02 mm Max. (450 g-load) |
| End Play | 0.08 mm Max. (450 g-load) |
| Switching Sequence..... | See page 31 |

WINDING DIAGRAM

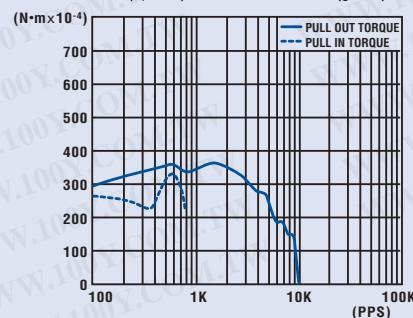


MODEL SPECIFICATIONS

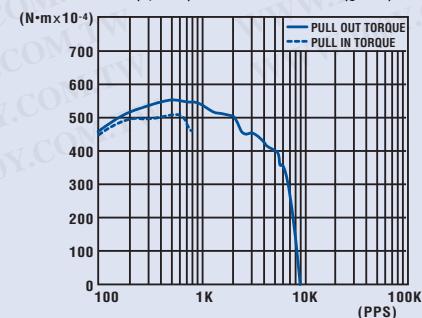
| Model Number | Rated Voltage | Rated Current/Phase | Winding Resistance/Phase | Holding Torque | Inductance | Rotor Inertia | Detent Torque | Weight |
|--------------|---------------|---------------------|--------------------------|----------------|------------|---------------|---------------|--------|
| | V | A | Ω | g-cm | mH | g-cm² | g-cm | g |
| 16PY-Q207 | 10.00 | 0.25 | 40.00 | 380 | 8.5 | 13.0 | 30 | 120 |
| 16PY-Q204 | 3.96 | 0.90 | 4.40 | 500 | 1.6 | 13.0 | 30 | 120 |

TORQUE/SPEED CHARACTERISTICS

Model: 16PY-Q207
Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
Drive Current: 0.25 (A/WDG) • Load Inertia: 34.0 (g·cm²)

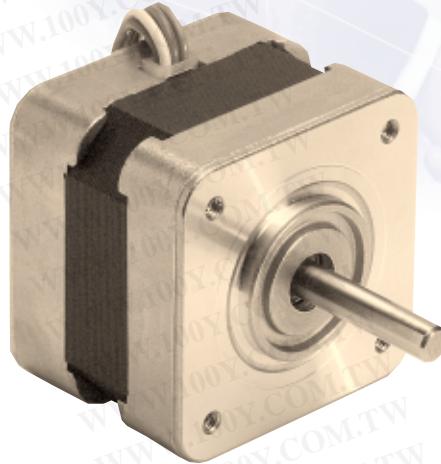
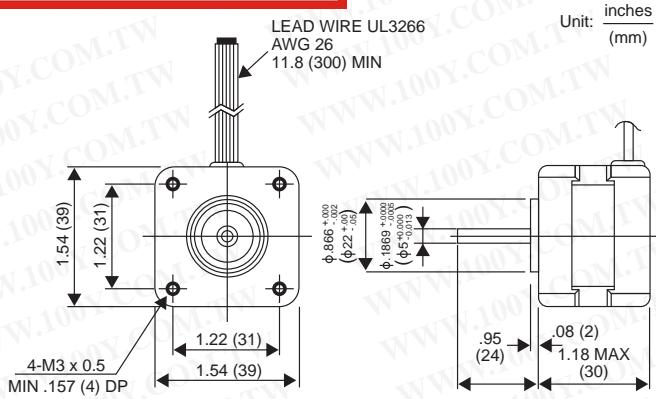


Model: 16PY-Q204
Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
Drive Current: 0.90 (A/WDG) • Load Inertia: 34.0 (g·cm²)

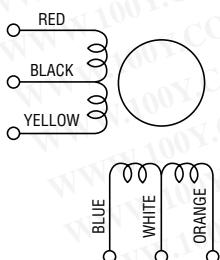


16PU-M 3.75° HYBRID

勝特力材料 886-3-5753170
 胜特力电子(上海) 86-21-34970699
 胜特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)



WINDING DIAGRAM



GENERAL SPECIFICATIONS

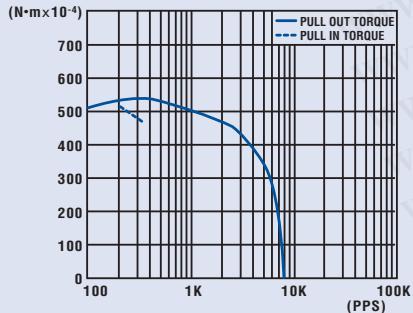
| | |
|---------------------------------|---------------------------|
| Step Angle | 3.75° |
| Step Angle Accuracy | +/-5% |
| Temperature Rise | 80° C Max. |
| Ambient Temperature Range | -20° to +50° C |
| Insulation Resistance | 100MΩ Min., 500 VDC |
| Dielectric Strength | 500 VAC for 1 min. |
| Radial Play | 0.02 mm Max. (450 g-load) |
| End Play | 0.08 mm Max. (450 g-load) |
| Switching Sequence | See page 31 |

MODEL SPECIFICATIONS

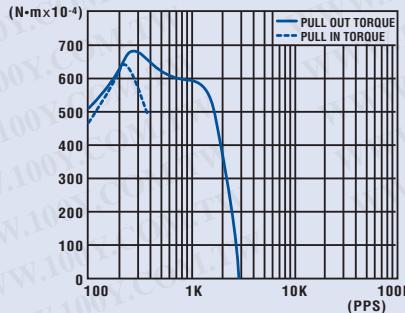
| Model Number | Rated Voltage V | Rated Current/Phase A | Winding Resistance/Phase Ω | Holding Torque g-cm | Inductance mH | Rotor Inertia g-cm² | Detent Torque g-cm | Weight g |
|--------------|-----------------|-----------------------|----------------------------|---------------------|---------------|---------------------|--------------------|----------|
| 16PU-M003 | 4.20 | 0.70 | 6.0 | 700 | 4.0 | 17.0 | 110 | 175 |
| 16PU-M006 | 7.60 | 0.40 | 19.5 | 700 | 10.5 | 17.0 | 110 | 175 |

TORQUE/SPEED CHARACTERISTICS

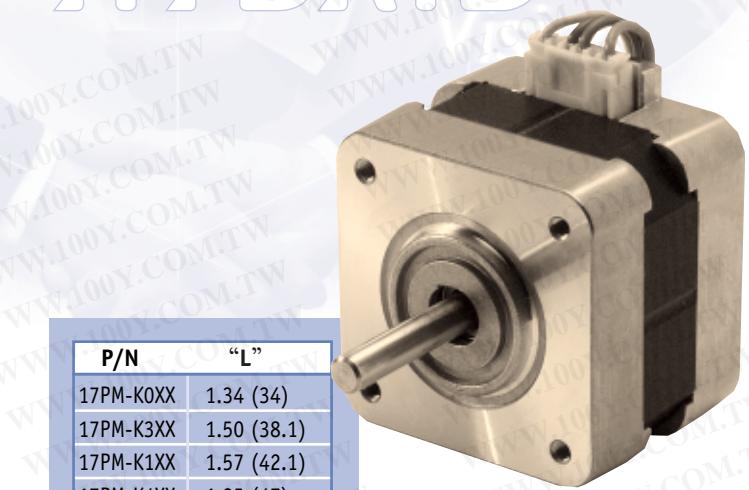
Model: 16PU-M003
 Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
 Drive Current: 0.70 (A/WDG) • Load Inertia: 34.0 (g-cm²)



Model: 16PU-M006
 Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
 Drive Current: 0.40 (A/WDG) • Load Inertia: 34.0 (g-cm²)



17PM-K 1.8° HYBRID

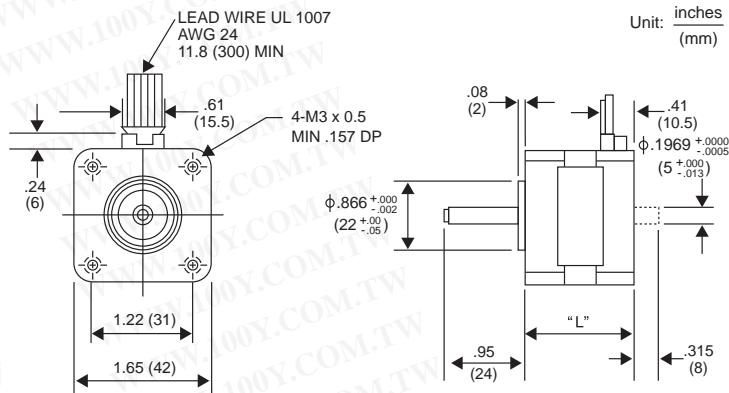


| P/N | "L" |
|-----------|-------------|
| 17PM-K0XX | 1.34 (34) |
| 17PM-K3XX | 1.50 (38.1) |
| 17PM-K1XX | 1.57 (42.1) |
| 17PM-K4XX | 1.85 (47) |

17PM-K 1.8° HYBRID

勝特力材料 886-3-5753170
胜特力电子(上海) 86-21-34970699
胜特力电子(深圳) 86-755-83298787

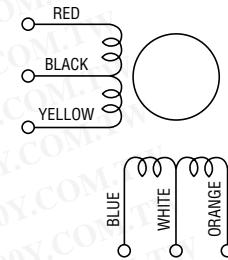
[Http://www.100y.com.tw](http://www.100y.com.tw)



GENERAL SPECIFICATIONS

| | |
|---------------------------------|---------------------------|
| Step Angle | 1.8° |
| Step Angle Accuracy | +/-5% |
| Temperature Rise | 80° C Max. |
| Ambient Temperature Range | -20° to +50° C |
| Insulation Resistance | 100MΩ Min., 500 VDC |
| Dielectric Strength | 500 VAC for 1 min. |
| Radial Play | 0.02 mm Max. (450 g-load) |
| End Play | 0.08 mm Max. (450 g-load) |
| Switching Sequence | See page 31 |

WINDING DIAGRAM



MODEL SPECIFICATIONS

| Model Number | Rated Voltage V | Rated Current/Phase A | Winding Resistance/Phase Ω | Holding Torque g-cm | Inductance mH | Rotor Inertia g-cm² | Dentent Torque g-cm | Weight g |
|--------------|-----------------|-----------------------|----------------------------|---------------------|---------------|---------------------|---------------------|----------|
| 17PM-K016V | 8.80 | 0.40 | 22.00 | 1,500 | 19.5 | 34.0 | 80 | 200 |
| 17PM-K017V | 4.40 | 0.80 | 5.50 | 1,500 | 5.7 | 34.0 | 80 | 200 |
| 17PM-K018V | 3.00 | 1.20 | 2.50 | 1,500 | 2.8 | 34.0 | 80 | 200 |
| 17PM-K316V | 9.60 | 0.40 | 24.00 | 1,700 | 25.8 | 45.0 | 100 | 250 |
| 17PM-K301V | 4.80 | 0.80 | 6.00 | 1,700 | 7.1 | 45.0 | 100 | 250 |
| 17PM-K303V | 3.20 | 1.20 | 2.70 | 1,700 | 3.3 | 45.0 | 100 | 250 |
| 17PM-K111V | 10.00 | 0.40 | 25.00 | 2,200 | 33.4 | 56.0 | 120 | 300 |
| 17PM-K101V | 5.00 | 0.80 | 6.20 | 2,200 | 8.6 | 56.0 | 120 | 300 |
| 17PM-K103V | 3.60 | 1.20 | 3.00 | 2,200 | 4.4 | 56.0 | 120 | 300 |
| 17PM-K402V | 6.00 | 0.80 | 7.50 | 3,400 | 7.0 | 75.0 | 200 | 350 |

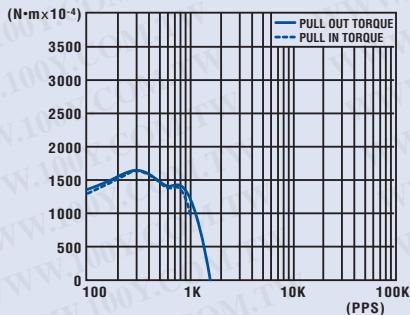
17PM-K 1.8° HYBRID

勝特力材料 886-3-5753170
 胜特力电子(上海) 86-21-34970699
 胜特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)

TORQUE/SPEED CHARACTERISTICS

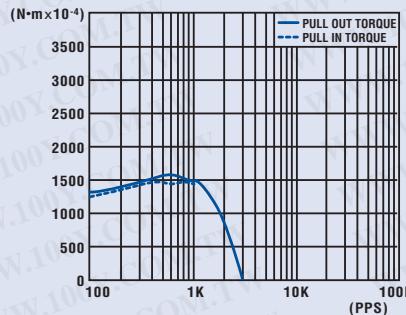
Model: 17PM-K016V

Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
 Drive Current: 0.40 (A/WDG) • Load Inertia: 34.0 (g·cm²)



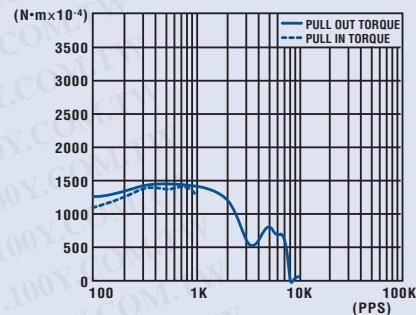
Model: 17PM-K017V

Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
 Drive Current: 0.80 (A/WDG) • Load Inertia: 34.0 (g·cm²)



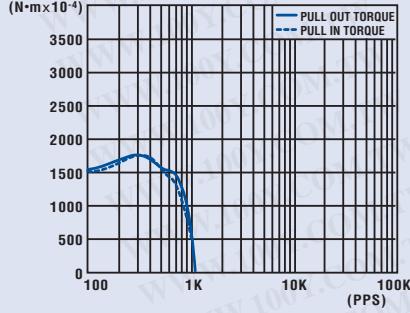
Model: 17PM-K018V

Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
 Drive Current: 1.20 (A/WDG) • Load Inertia: 34.0 (g·cm²)



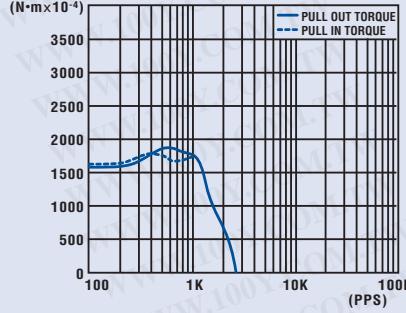
Model: 17PM-K316V

Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
 Drive Current: 0.40 (A/WDG) • Load Inertia: 34.0 (g·cm²)



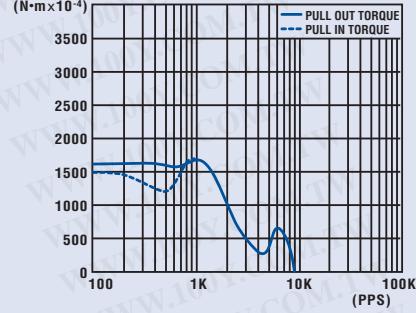
Model: 17PM-K301V

Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
 Drive Current: 0.80 (A/WDG) • Load Inertia: 34.0 (g·cm²)



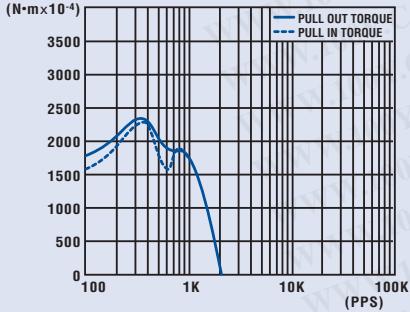
Model: 17PM-K303V

Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
 Drive Current: 1.20 (A/WDG) • Load Inertia: 34.0 (g·cm²)



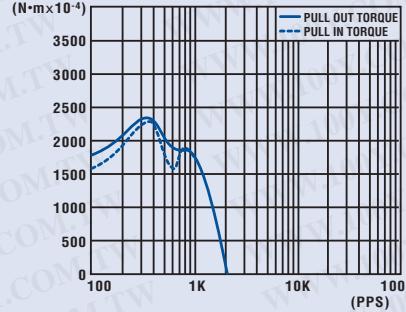
Model: 17PM-K111V

Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
 Drive Current: 0.40 (A/WDG) • Load Inertia: 34.0 (g·cm²)



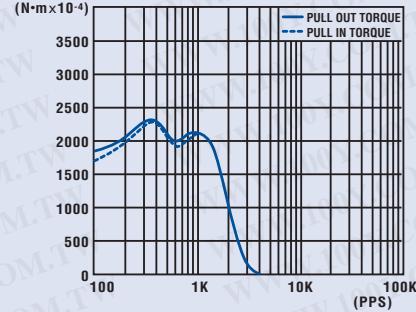
Model: 17PM-K101V

Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
 Drive Current: 0.80 (A/WDG) • Load Inertia: 34.0 (g·cm²)

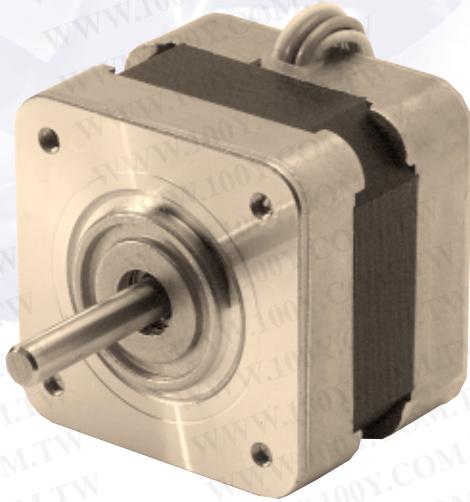


Model: 17PM-K103V

Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
 Drive Current: 1.20 (A/WDG) • Load Inertia: 34.0 (g·cm²)



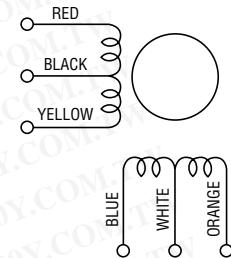
17PW-M 1.875° HYBRID



GENERAL SPECIFICATIONS

| | |
|---------------------------------|---------------------------|
| Step Angle | 1.875° |
| Step Angle Accuracy | +/-5% |
| Temperature Rise | 80° C Max. |
| Ambient Temperature Range | -20° to +50° C |
| Insulation Resistance | 100MΩ Min., 500 VDC |
| Dielectric Strength | 500 VAC for 1 min. |
| Radial Play | 0.02 mm Max. (450 g-load) |
| End Play | 0.08 mm Max. (450 g-load) |
| Switching Sequence | See page 31 |

WINDING DIAGRAM

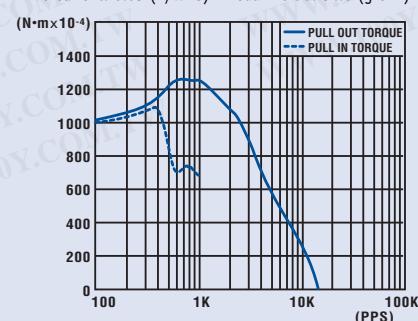


MODEL SPECIFICATIONS

| Model Number | Rated Voltage V | Rated Current/Phase A | Winding Resistance/Phase Ω | Holding Torque g-cm | Inductance mH | Rotor Inertia g-cm² | Detent Torque g-cm | Weight g |
|--------------|-----------------|-----------------------|----------------------------|---------------------|---------------|---------------------|--------------------|----------|
| 17PW-M003 | 4.9 | 0.65 | 7.5 | 1,200 | 6.2 | 17.0 | 250 | 200 |

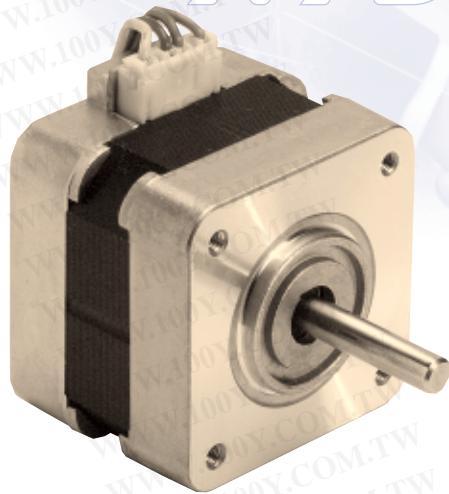
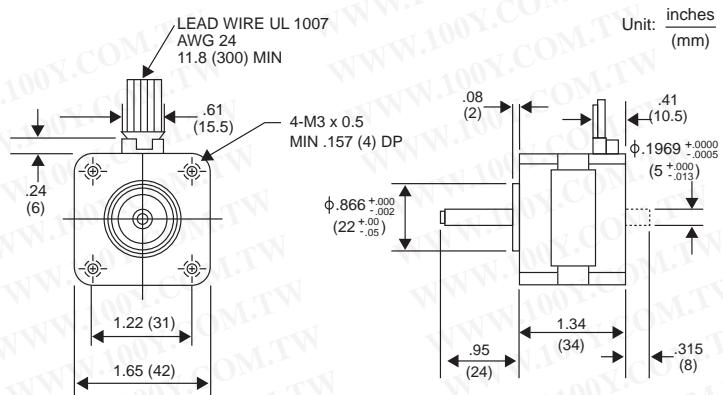
TORQUE/SPEED CHARACTERISTICS

Model: 17PW-M003
Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
Drive Current: 0.65 (A/WDG) • Load Inertia: 34.0 (g-cm²)

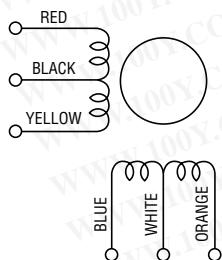


17PS-M 3.6° HYBRID

勝特力材料 886-3-5753170
 胜特力电子(上海) 86-21-34970699
 胜特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)



WINDING DIAGRAM



GENERAL SPECIFICATIONS

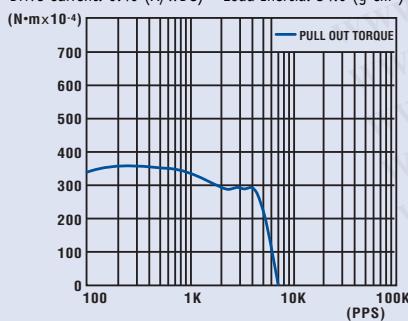
| | |
|---------------------------------|---------------------------|
| Step Angle | 3.6° |
| Step Angle Accuracy | +/-5% |
| Temperature Rise | 80° C Max. |
| Ambient Temperature Range | -20° to +50° C |
| Insulation Resistance | 100MΩ Min., 500 VDC |
| Dielectric Strength | 500 VAC for 1 min. |
| Radial Play | 0.02 mm Max. (450 g-load) |
| End Play | 0.08 mm Max. (450 g-load) |
| Switching Sequence | See page 31 |

MODEL SPECIFICATIONS

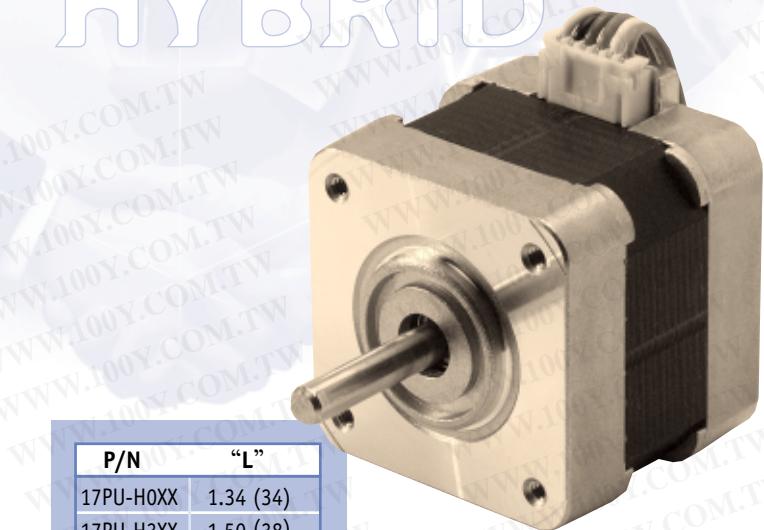
| Model Number | Rated Voltage V | Rated Current/Phase A | Winding Resistance/Phase Ω | Holding Torque g-cm | Inductance mH | Rotor Inertia g-cm² | Detent Torque g-cm | Weight g |
|--------------|-----------------|-----------------------|----------------------------|---------------------|---------------|---------------------|--------------------|----------|
| 17PS-M001V | 3.2 | 0.4 | 7.9 | 450 | 5.4 | 17.0 | 50 | 200 |

TORQUE/SPEED CHARACTERISTICS

Model: 17PS-M001V
 Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
 Drive Current: 0.40 (A/WDG) • Load Inertia: 34.0 (g-cm²)



17PU-H 3.75° HYBRID



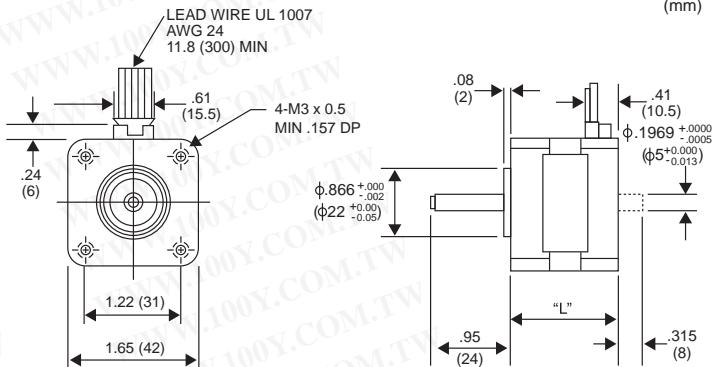
| P/N | "L" |
|-----------|-----------|
| 17PU-H0XX | 1.34 (34) |
| 17PU-H3XX | 1.50 (38) |

17PU-H 3.75° HYBRID

勝特力材料 886-3-5753170
胜特力电子(上海) 86-21-34970699
胜特力电子(深圳) 86-755-83298787

[Http://www.100y.com.tw](http://www.100y.com.tw)

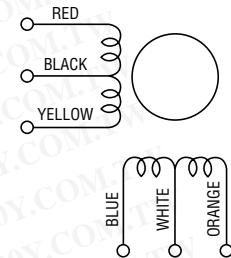
Unit: inches
(mm)



GENERAL SPECIFICATIONS

| | |
|---------------------------------|---------------------------|
| Step Angle | 3.75° |
| Step Angle Accuracy | +/-5% |
| Temperature Rise | 80° C Max. |
| Ambient Temperature Range | -20° to +50° C |
| Insulation Resistance | 100MΩ Min., 500 VDC |
| Dielectric Strength | 500 VAC for 1 min. |
| Radial Play | 0.02 mm Max. (450 g-load) |
| End Play | 0.08 mm Max. (450 g-load) |
| Switching Sequence | See page 31 |

WINDING DIAGRAM

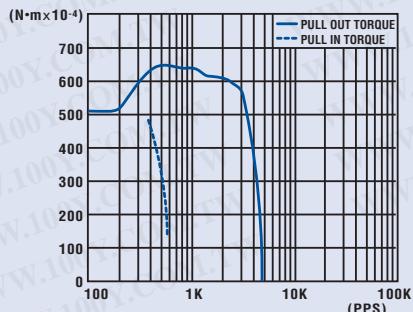


MODEL SPECIFICATIONS

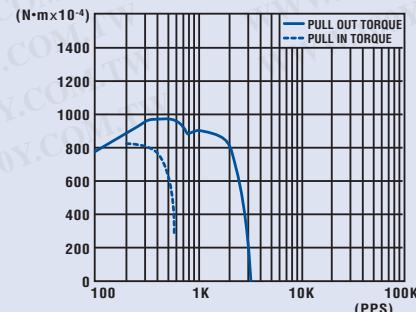
| Model Number | Rated Voltage V | Rated Current/Phase A | Winding Resistance/Phase Ω | Holding Torque g-cm | Inductance mH | Rotor Inertia g-cm² | Detent Torque g-cm | Weight g |
|--------------|-----------------|-----------------------|----------------------------|---------------------|---------------|---------------------|--------------------|----------|
| 17PU-H008V | 3.70 | 0.90 | 4.10 | 600 | 2.9 | 34.0 | 180 | 200 |
| 17PU-H010V | 4.80 | 0.80 | 6.00 | 750 | 3.4 | 34.0 | 180 | 200 |
| 17PU-H309V | 6.10 | 0.80 | 7.60 | 1,000 | 5.2 | 45.0 | 250 | 250 |
| 17PU-H312V | 9.50 | 0.50 | 19.00 | 1,000 | 17.0 | 45.0 | 250 | 250 |

TORQUE/SPEED CHARACTERISTICS

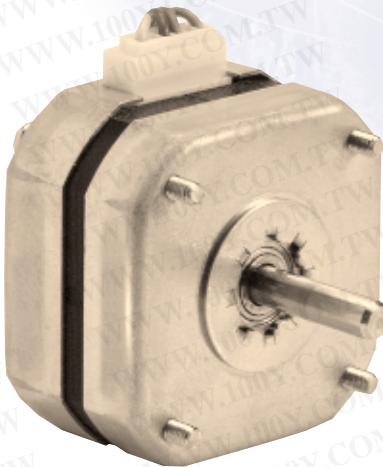
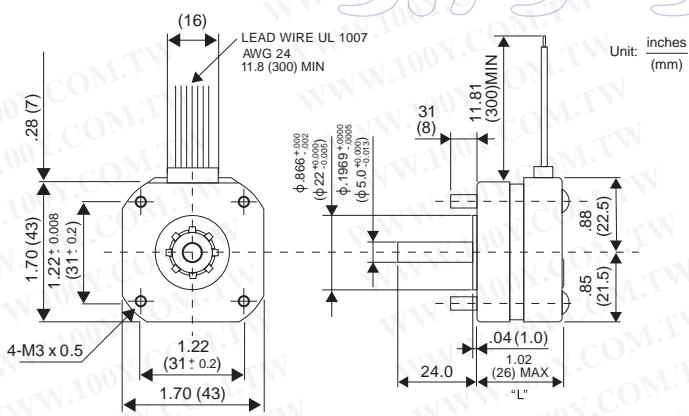
Model: 17PU-H010V
Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
Drive Current: 0.80 (A/WDG) • Load Inertia: 34.0 (g-cm²)



Model: 17PU-H309V
Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
Drive Current: 0.80 (A/WDG) • Load Inertia: 34.0 (g-cm²)



17PM-K 1.8° SMH HYBRID
17PU-H 3.75° SMH HYBRID



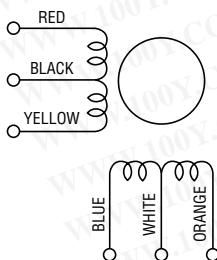
勝特力材料 886-3-5753170
胜特力电子(上海) 86-21-34970699
胜特力电子(深圳) 86-755-83298787

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| P/N | “L” |
|-----------|-----------|
| 17PM-K2XX | 1.02 (26) |
| 17PM-K0XX | 1.18 (30) |
| 17PU-H2XX | 1.02 (26) |
| 17PU-H0XX | 1.18 (30) |

NOTE: Also available with winged mounting brackets.

WINDING DIAGRAM



GENERAL SPECIFICATIONS

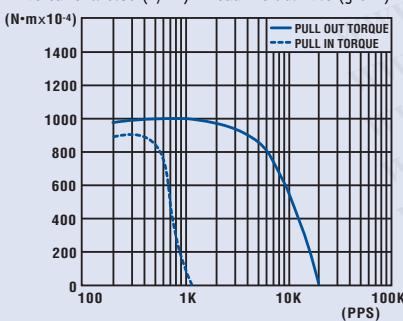
| | |
|---------------------------------|---------------------------|
| Step Angle Accuracy | +/-5% |
| Temperature Rise | 80° C Max. |
| Ambient Temperature Range | -20° to +50° C |
| Insulation Resistance | 100MΩ Min., 500 VDC |
| Dielectric Strength | 500 VAC for 1 min. |
| Radial Play | 0.02 mm Max. (450 g-load) |
| End Play | 0.10 mm Max. (450 g-load) |
| Switching Sequence | See page 31 |

MODEL SPECIFICATIONS

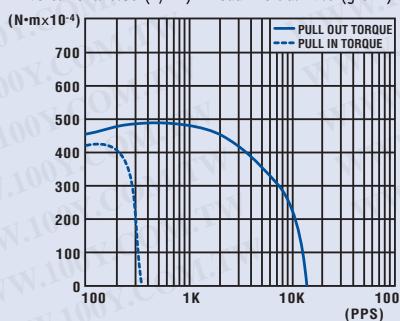
| Model Number | Step Angle | Rate Voltage | Rated Current/Phase | Winding Resistance/Phase | Holding Torque | Inductance | Rotor Inertia | Detent Torque | Weight |
|--------------|------------|--------------|---------------------|--------------------------|----------------|------------|---------------|---------------|--------|
| | D | V | A | Ω | g-cm | mH | g-cm² | g-cm | g |
| 17PM-K204VT | 1.8 | 2.40 | 0.8 | 3.0 | 1,250 | 2.6 | 28.0 | 60 | 180 |
| 17PM-K018VT | 1.8 | 3.50 | 1.0 | 3.5 | 1,700 | 2.7 | 34.0 | 70 | 220 |
| 17PU-H204VT | 3.75 | 2.40 | 0.8 | 3.0 | 750 | 2.1 | 28.0 | 120 | 180 |
| 17PU-H018VT | 3.75 | 3.50 | 1.0 | 3.5 | 1,150 | 2.0 | 34.0 | 150 | 220 |

TORQUE/SPEED CHARACTERISTICS

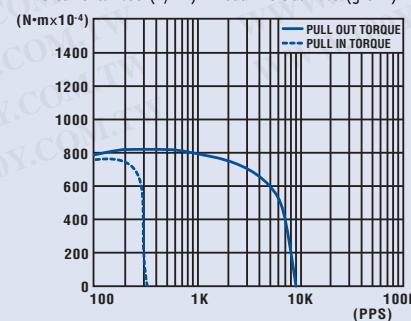
Model: 17PM-K204VT
Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
Drive Current: 0.80 (A/PH) • Load Inertia: 27.0 (g·cm²)



Model: 17PU-H204VT
Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
Drive Current: 0.80 (A/PH) • Load Inertia: 27.0 (g·cm²)



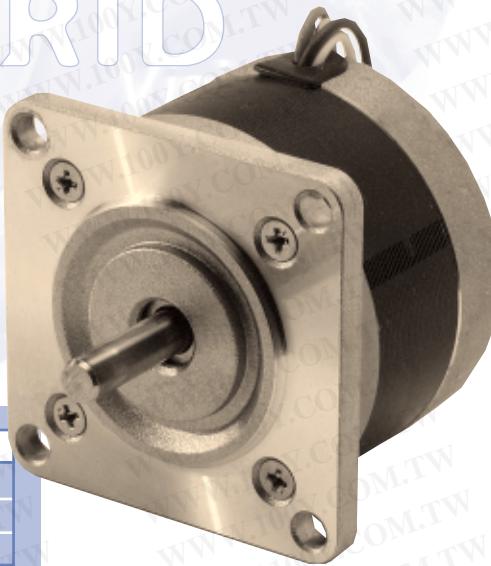
Model: 17PU-H018VT
Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
Drive Current: 1.00 (A/PH) • Load Inertia: 27.0 (g·cm²)



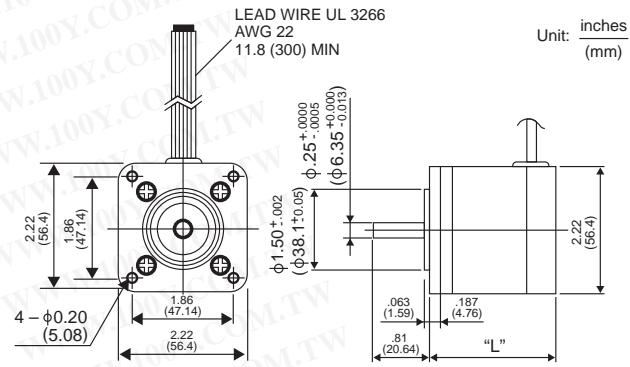
23LY-C 0.9° HYBRID

23LY-C 0.9° HYBRID

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 胜特力电子(深圳) 86-755-83298787
<http://www.100y.com.tw>



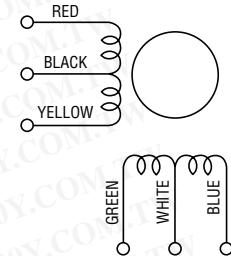
| P/N | "L" |
|-----------|-------------|
| 23LY-C2XX | 1.61 (41.0) |
| 23LY-C3XX | 1.45 (49.5) |
| 23LY-C0XX | 2.22 (56.5) |



GENERAL SPECIFICATIONS

| | |
|---------------------------------|---------------------------|
| Step Angle | 0.9° |
| Step Angle Accuracy | +/-5% |
| Temperature Rise | 80° C Max. |
| Ambient Temperature Range | -20° to +50° C |
| Insulation Resistance | 100MΩ Min., 500 VDC |
| Dielectric Strength | 500 VAC for 1 min. |
| Radial Play | 0.02 mm Max. (450 g-load) |
| End Play | 0.08 mm Max. (450 g-load) |
| Switching Sequence | See page 31 |

WINDING DIAGRAM

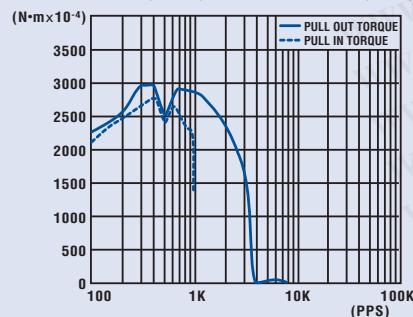


MODEL SPECIFICATIONS

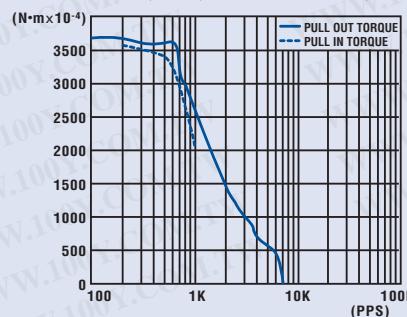
| Model Number | Rated Voltage V | Rated Current/Phase A | Winding Resistance/Phase Ω | Holding Torque g-cm | Inductance mH | Rotor Inertia g-cm² | Detent Torque g-cm | Weight g |
|--------------|-----------------|-----------------------|----------------------------|---------------------|---------------|---------------------|--------------------|----------|
| 23LY-C205 | 4.0 | 1.10 | 3.6 | 3,000 | 5.3 | 55.0 | 250 | 360 |
| 23LY-C201 | 5.5 | 0.78 | 7.1 | 3,000 | 8.3 | 55.0 | 250 | 360 |
| 23LY-C202 | 3.75 | 1.25 | 3.0 | 3,000 | 4.5 | 55.0 | 250 | 360 |
| 23LY-C301 | 3.0 | 1.70 | 1.8 | 4,000 | 4.5 | 110.0 | 300 | 450 |
| 23LY-C303 | 5.1 | 1.00 | 5.1 | 4,000 | 13.0 | 110.0 | 300 | 450 |
| 23LY-C305 | 6.0 | 0.85 | 7.1 | 4,000 | 18.0 | 110.0 | 300 | 450 |
| 23LY-C002 | 4.3 | 1.60 | 2.7 | 4,800 | 7.2 | 160.0 | 350 | 560 |
| 23LY-C001 | 8.5 | 0.85 | 10.0 | 4,800 | 30.0 | 160.0 | 350 | 560 |

TORQUE/SPEED CHARACTERISTICS

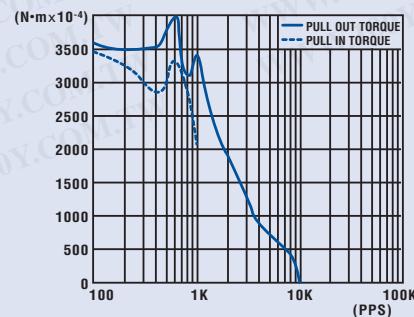
Model: 23LY-C202
 Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
 Drive Current: 1.25 (A/WDG) • Load Inertia: 172.0 (g-cm²)



Model: 23LY-C305
 Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
 Drive Current: 1.08 (A/WDG) • Load Inertia: 166.0 (g-cm²)



Model: 23LY-C002
 Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
 Drive Current: 1.60 (A/WDG) • Load Inertia: 147.0 (g-cm²)

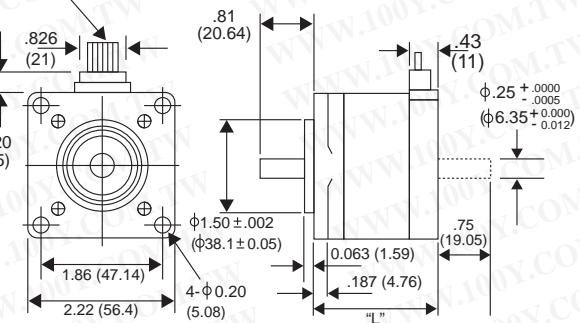


勝特力材料 886-3-5753170
 胜特力电子(上海) 86-21-34970699
 胜特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)

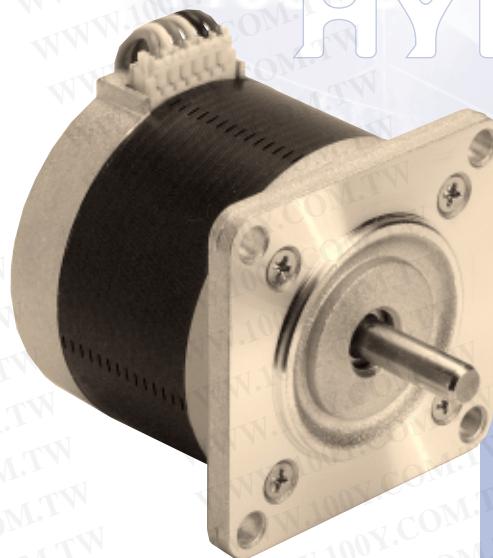
23LM-C 1.8° HYBRID

23LM-C 1.8°
 HYBRID

LEAD WIRE UL 1007
 AWG 22
 11.8 (300) MIN

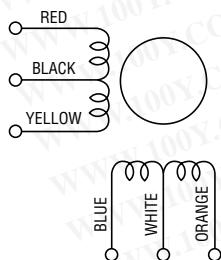


Unit: inches
 (mm)



| P/N | "L" |
|-----------|-------------|
| 23LM-C2XX | 1.61 (41.0) |
| 23LM-C3XX | 1.95 (49.5) |
| 23LM-C0XX | 2.22 (56.5) |

WINDING DIAGRAM



GENERAL SPECIFICATIONS

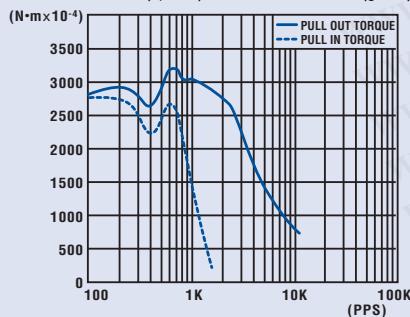
| | |
|---------------------------------|---------------------------|
| Step Angle | 1.8° |
| Step Angle Accuracy | +/-5% |
| Temperature Rise | 80° C Max. |
| Ambient Temperature Range | -20° to +50° C |
| Insulation Resistance | 100MΩ Min., 500 VDC |
| Dielectric Strength | 500 VAC for 1 min. |
| Radial Play | 0.02 mm Max. (450 g-load) |
| End Play | 0.08 mm Max. (450 g-load) |
| Switching Sequence | See page 31 |

MODEL SPECIFICATIONS

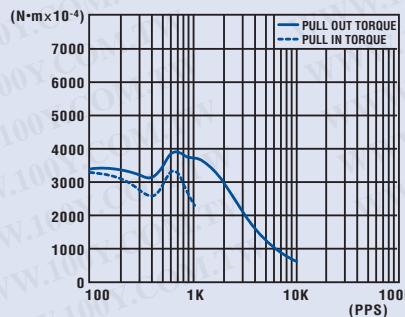
| Model Number | Rated Voltage V | Rated Current/Phase A | Winding Resistance/Phase Ω | Holding Torque g-cm | Inductance mH | Rotor Inertia g-cm² | Detent Torque g-cm | Weight g |
|--------------|-----------------|-----------------------|----------------------------|---------------------|---------------|---------------------|--------------------|----------|
| 23LM-C250V | 3.00 | 1.50 | 2.00 | 3,200 | 2.5 | 55.0 | 500 | 360 |
| 23LM-C213V | 2.20 | 2.00 | 1.10 | 3,200 | 1.3 | 55.0 | 500 | 360 |
| 23LM-C343V | 3.30 | 1.50 | 2.20 | 4,300 | 3.5 | 110.0 | 550 | 450 |
| 23LM-C355V | 2.50 | 2.00 | 1.25 | 4,300 | 2.3 | 110.0 | 550 | 450 |
| 23LM-C047V | 4.70 | 1.50 | 3.10 | 5,200 | 6.1 | 160.0 | 600 | 540 |
| 23LM-C055V | 3.40 | 2.00 | 1.70 | 5,200 | 3.5 | 160.0 | 600 | 540 |

TORQUE/SPEED CHARACTERISTICS

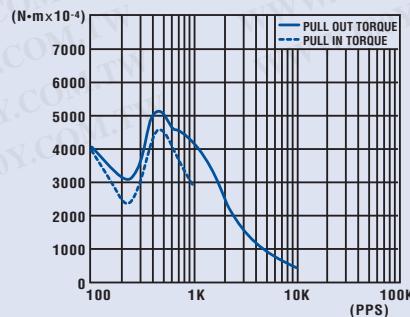
Model: 23LM-C250V
 Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
 Drive Current: 1.50 (A/WDG) • Load Inertia: 161.0 (g-cm²)



Model: 23LM-C343V
 Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
 Drive Current: 1.50 (A/WDG) • Load Inertia: 161.0 (g-cm²)



Model: 23LM-C047V
 Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
 Drive Current: 1.50 (A/WDG) • Load Inertia: 161.0 (g-cm²)



23LM-K202 規格表

電壓：5 V

電流：1.1 A

阻抗：5.6 Ω

精度：1.8 DEG 轉一圈 200 步

六線式步進馬達兩相激磁

綠 A 、 綠白 \overline{A} 、 紅 \overline{B} 、 紅白 B 、 白 V^+ 、 黑 V^-

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| | |
|-----------------------|------------|
| Motor Type | 23LM-K202 |
| Size (Outer Diameter) | 58mm |
| Size (Length) | 65mm |
| Drive Voltage | 5 Volt |
| Drive Method | 2-2 Phase |
| Step Angle | 1.8 degree |

23LM-R 1.8 HYBRID

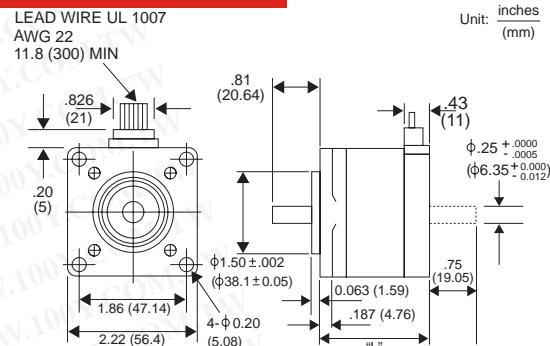
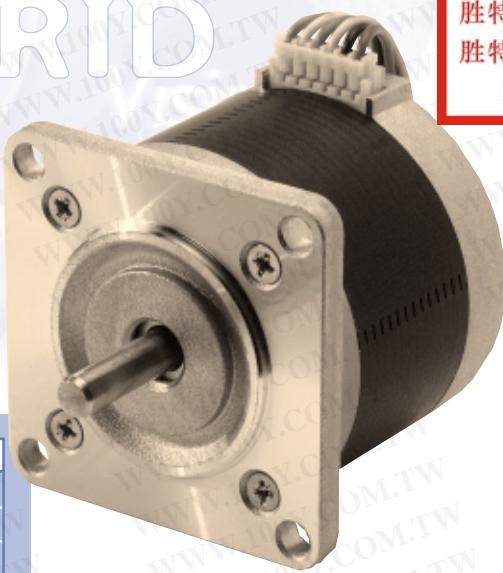
23LM-K 1.8° HYBRID

Microstep/ Low Noise Series

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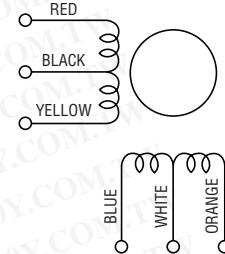
| P/N | “L” |
|-----------|-------------|
| 23LM-K2XX | 1.61 (41.0) |
| 23LM-K3XX | 1.95 (49.5) |
| 23LM-K0XX | 2.22 (56.5) |



GENERAL SPECIFICATIONS

| | |
|---------------------------------|---------------------------|
| Step Angle | 1.8° |
| Step Angle Accuracy | +/-5% |
| Temperature Rise | 80° C Max. |
| Ambient Temperature Range | -20° to +50° C |
| Insulation Resistance | 100MΩ Min., 500 VDC |
| Dielectric Strength | 500 VAC for 1 min. |
| Radial Play | 0.02 mm Max. (450 g-load) |
| End Play | 0.08 mm Max. (450 g-load) |
| Switching Sequence | See page 31 |

WINDING DIAGRAM



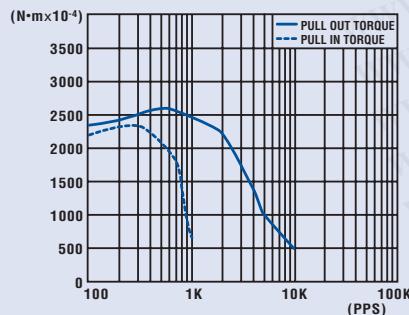
MODEL SPECIFICATIONS

| Model Number | Rated Voltage | Rated Current/Phase | Winding Resistance/Phase | Holding Torque | Inductance | Rotor Inertia | Detent Torque | Weight |
|--------------|---------------|---------------------|--------------------------|----------------|------------|-------------------|---------------|--------|
| | V | A | Ω | g-cm | mH | g-cm ² | g-cm | g |
| 23LM-K250V | 3.00 | 1.50 | 2.00 | 2,400 | 3.0 | 55.0 | 180 | 360 |
| 23LM-K213V | 2.20 | 2.00 | 1.10 | 2,400 | 1.6 | 55.0 | 180 | 360 |
| 23LM-K343V | 3.30 | 1.50 | 2.20 | 3,400 | 3.9 | 110.0 | 230 | 450 |
| 23LM-K355V | 2.50 | 2.00 | 1.25 | 3,400 | 2.6 | 110.0 | 230 | 450 |
| 23LM-K047V | 4.70 | 1.50 | 3.10 | 4,000 | 6.5 | 160.0 | 260 | 540 |
| 23LM-K055V | 3.40 | 2.00 | 1.70 | 4,000 | 3.7 | 160.0 | 260 | 540 |

TORQUE/SPEED CHARACTERISTICS

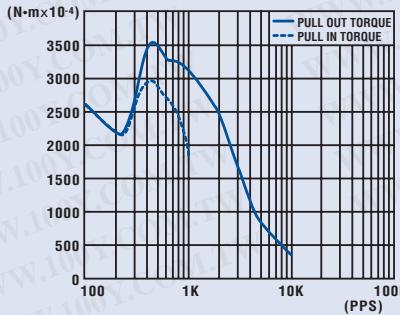
Model: 23LM-K250V

Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
Drive Current: 1.50 (A/WDG) • Load Inertia: 161.0 (g-cm²)



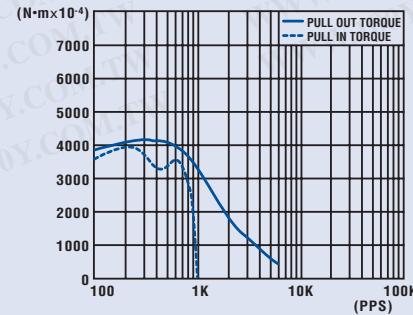
Model: 23LM-K343V

Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
Drive Current: 1.50 (A/WDG) • Load Inertia: 161.0 (g-cm²)



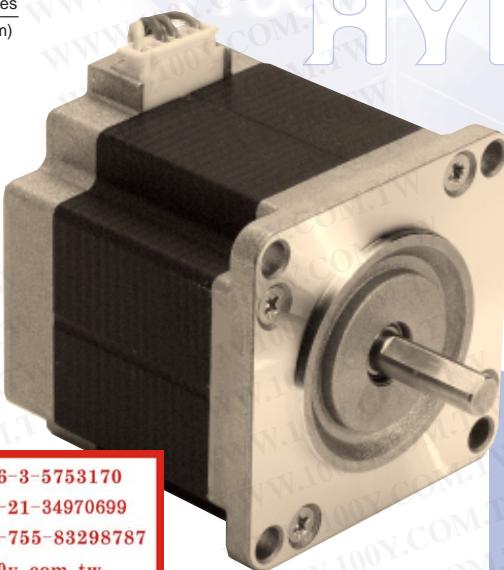
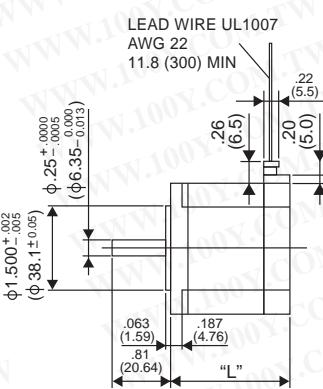
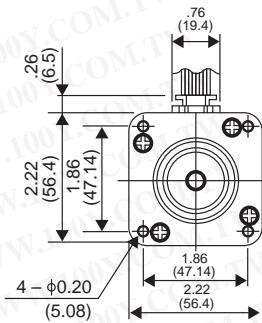
Model: 23LM-K047W

Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
Drive Current: 1.50 (A/WDG) • Load Inertia: 161.0 (g·cm²)



High Torque

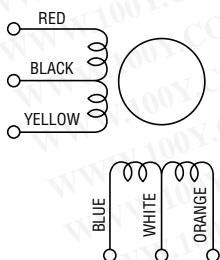
23KM-C 1.8° HYBRID



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| P/N | "L" |
|-----------|-----------|
| 23KM-C2XX | 1.65 (42) |
| 23KM-C3XX | 1.97 (50) |
| 23KM-C0XX | 2.13 (54) |
| 23KM-C7XX | 2.99 (76) |

WINDING DIAGRAM



GENERAL SPECIFICATIONS

Step Angle 1.8°
 Step Angle Accuracy +/-5%
 Temperature Rise 80° C Max.
 Ambient Temperature Range -20° to +50° C
 Insulation Resistance 100MΩ Min., 500 VDC
 Dielectric Strength 500 VAC for 1 min.
 Radial Play 0.02 mm Max. (450 g-load)
 End Play 0.08 mm Max. (450 g-load)
 Switching Sequence See page 31

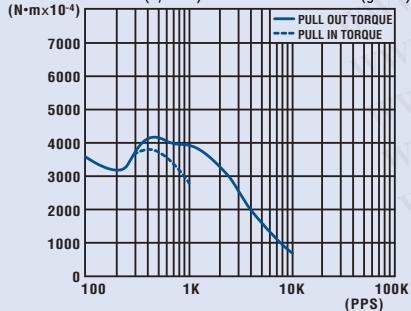
MODEL SPECIFICATIONS

| Model Number | Rated Voltage V | Rated Current/Phase A | Winding Resistance/Phase Ω | Holding Torque g-cm | Inductance mH | Rotor Inertia g-cm² | Detent Torque g-cm | Weight g |
|--------------|-----------------|-----------------------|----------------------------|---------------------|---------------|---------------------|--------------------|----------|
| 23KM-C250V | 3.30 | 1.50 | 2.20 | 4,400 | 2.6 | 150.0 | 200 | 470 |
| 23KM-C379V | 4.10 | 1.50 | 2.70 | 8,000 | 3.6 | 230.0 | 300 | 590 |
| 23KM-C032V | 5.10 | 1.50 | 3.40 | 9,500 | 5.4 | 280.0 | 350 | 680 |
| 23KM-C716V | 6.30 | 1.50 | 4.20 | 14,000 | 6.8 | 440.0 | 600 | 1,050 |

TORQUE/SPEED CHARACTERISTICS

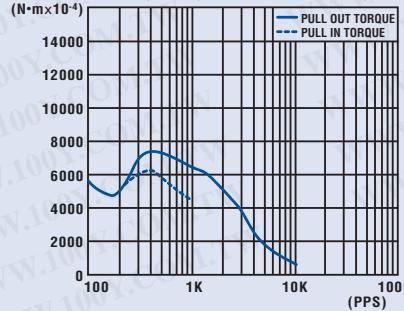
Model: 23KM-C250V

Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
Drive Current: 1.50 (A/WDG) • Load Inertia: 161.0 (g-cm²)



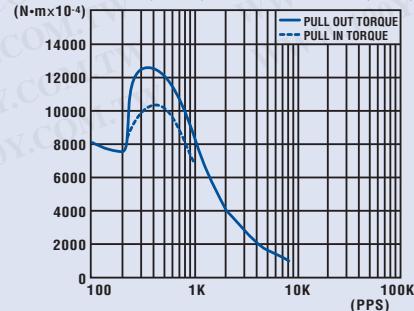
Model: 23KM-C379V

Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
Drive Current: 1.50 (A/WDG) • Load Inertia: 161.0 (g-cm²)

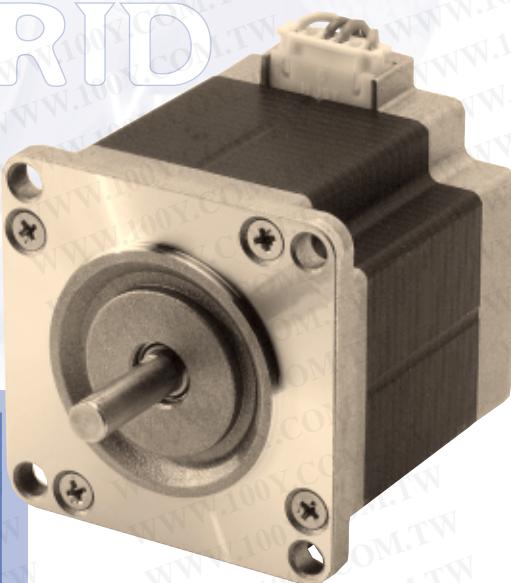


Model: 23KM-C716V

Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
Drive Current: 1.50 (A/WDG) • Load Inertia: 161.0 (g-cm²)



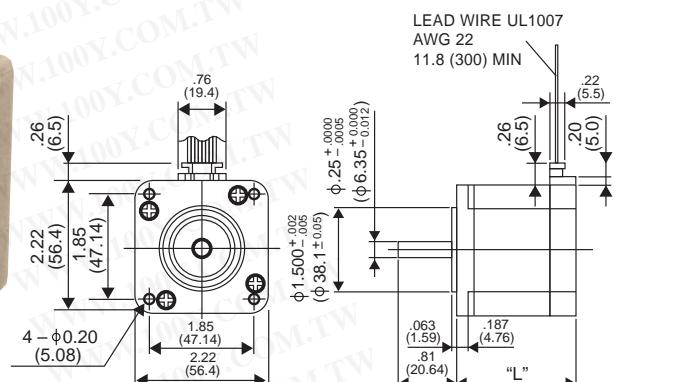
23KM-K 1.8° HYBRID



23KM-K 1.8° HYBRID

High Torque/
Microstep

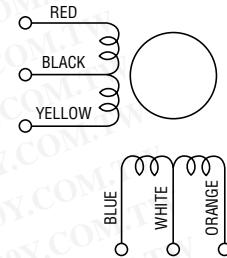
| P/N | "L" |
|-----------|-----------|
| 23KM-K2XX | 1.65 (42) |
| 23KM-K3XX | 1.97 (50) |
| 23KM-KOXX | 2.13 (54) |
| 23KM-K7XX | 2.99 (76) |



GENERAL SPECIFICATIONS

| | |
|---------------------------------|---------------------------|
| Step Angle | 1.8° |
| Step Angle Accuracy | +/-5% |
| Temperature Rise | 80° C Max. |
| Ambient Temperature Range | -20° to +50° C |
| Insulation Resistance | 100MΩ Min., 500 VDC |
| Dielectric Strength | 500 VAC for 1 min. |
| Radial Play | 0.02 mm Max. (450 g-load) |
| End Play | 0.08 mm Max. (450 g-load) |
| Switching Sequence | See page 31 |

WINDING DIAGRAM

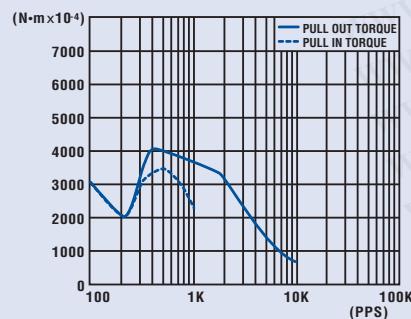


MODEL SPECIFICATIONS

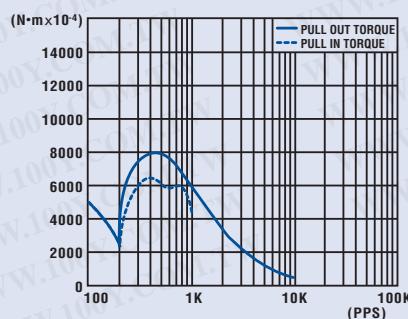
| Model Number | Rated Voltage V | Rated Current/Phase A | Winding Resistance/Phase Ω | Holding Torque g-cm | Inductance mH | Rotor Inertia g-cm² | Detent Torque g-cm | Weight g |
|--------------|-----------------|-----------------------|----------------------------|---------------------|---------------|---------------------|--------------------|----------|
| 23KM-K250V | 3.30 | 1.50 | 2.20 | 3,700 | 3.1 | 150.0 | 200 | 470 |
| 23KM-K379V | 4.10 | 1.50 | 2.70 | 5,600 | 4.2 | 230.0 | 300 | 590 |
| 23KM-K032V | 5.10 | 1.50 | 3.40 | 7,400 | 6.4 | 280.0 | 350 | 680 |
| 23KM-K716V | 6.30 | 1.50 | 4.20 | 12,000 | 8.0 | 440.0 | 600 | 1050 |

TORQUE/SPEED CHARACTERISTICS

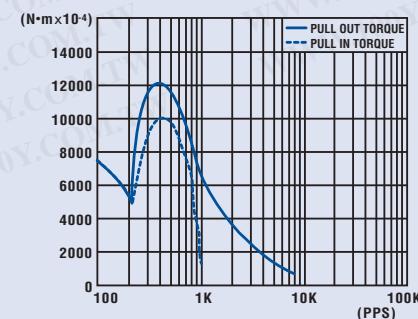
Model: 23KM-K250V
Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
Drive Current: 1.50 (A/WDG) • Load Inertia: 161.0 (g-cm²)



Model: 23KM-K032V
Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
Drive Current: 1.50 (A/WDG) • Load Inertia: 161.0 (g-cm²)



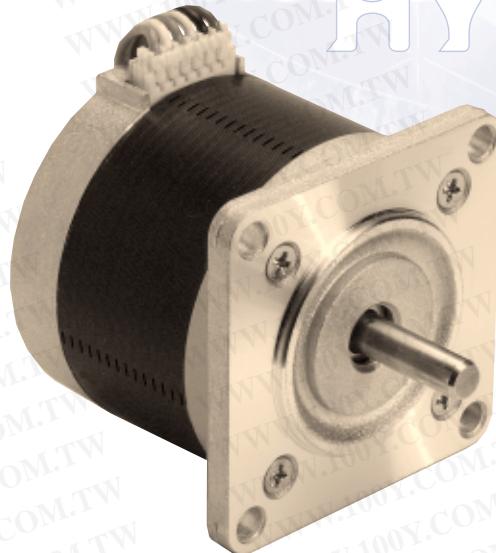
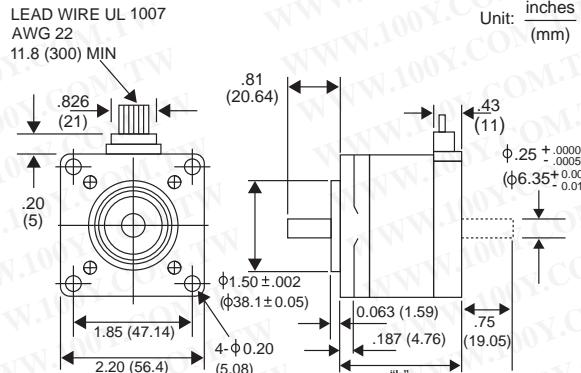
Model: 23KM-K716V
Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
Drive Current: 1.50 (A/WDG) • Load Inertia: 161.0 (g-cm²)



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胜特力电子(深圳) 86-755-83298787

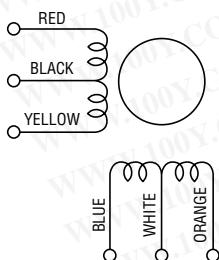
[Http://www.100y.com.tw](http://www.100y.com.tw)

23LQ-C 5° HYBRID



| P/N | "L" |
|-----------|-------------|
| 23LQ-C0XX | 2.22 (56.5) |
| 23LQ-C2XX | 1.61 (41.0) |
| 23LQ-C3XX | 1.95 (49.5) |

WINDING DIAGRAM



GENERAL SPECIFICATIONS

Step Angle 5°
 Step Angle Accuracy +/- 5%
 Temperature Rise 80° C Max.
 Ambient Temperature Range -20° to +50° C
 Insulation Resistance 100MΩ Min., 500 VDC
 Dielectric Strength 500 VAC for 1 min.
 Radial Play 0.02 mm Max. (450 g-load)
 End Play 0.08 mm Max. (450 g-load)
 Switching Sequence See page 31

MODEL SPECIFICATIONS

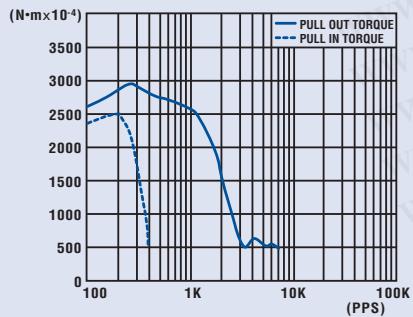
| Model Number | Rated Voltage V | Rated Current/Phase A | Winding Resistance/Phase Ω | Holding Torque g-cm | Inductance mH | Rotor Inertia g-cm² | Detent Torque g-cm | Weight g |
|--------------|-----------------|-----------------------|----------------------------|---------------------|---------------|---------------------|--------------------|----------|
| 23LQ-C202V | 3.9 | 1.1 | 3.50 | 2,300 | 4.0 | 55.0 | 370 | 360 |
| 23LQ-C309V | 6.75 | 1.0 | 6.75 | 3,100 | 8.6 | 110.0 | 380 | 450 |
| 23LQ-C055V | 3.4 | 2.0 | 1.70 | 3,600 | 2.7 | 160.0 | 450 | 540 |

Note: All models available with rear shafts.

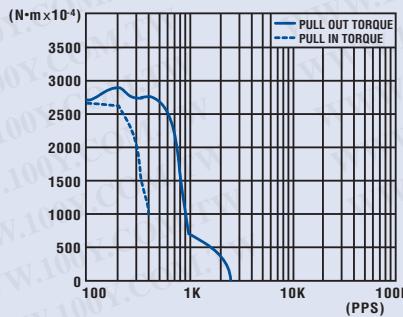
勝特力材料 886-3-5753170
 胜特力电子(上海) 86-21-34970699
 胜特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)

TORQUE/SPEED CHARACTERISTICS

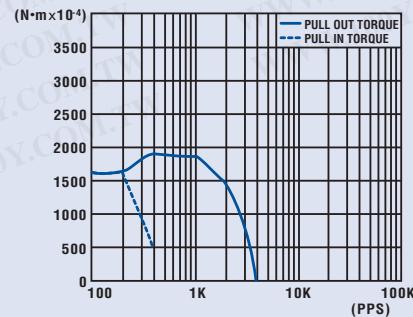
Model: 23LQ-C202V
 Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
 Drive Current: 1.10 (A/WDG) • Load Inertia: 161.0 (g-cm²)



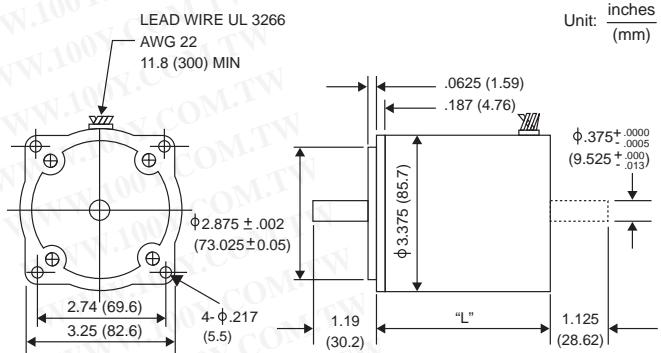
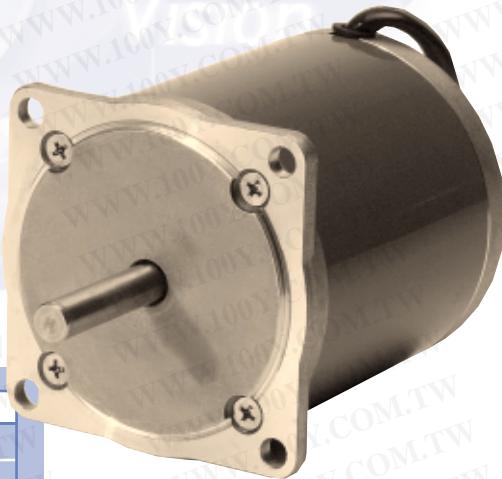
Model: 23LQ-C309V
 Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
 Drive Current: 1.00 (A/WDG) • Load Inertia: 161.0 (g-cm²)



Model: 23LQ-C055V
 Driver: Unipolar Chopper Dual • Supply Voltage: 24.0 (Volt)
 Drive Current: 2.00 (A/WDG) • Load Inertia: 161.0 (g-cm²)



34PM-C 1.8° HYBRID

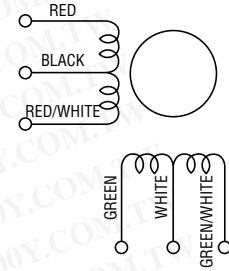


| P/N | "L" |
|-----------|-------------|
| 34PM-C1XX | 3.69 (93.7) |
| 34PM-C0XX | 2.44 (61.9) |

GENERAL SPECIFICATIONS

| | |
|---------------------------------|---------------------------|
| Step Angle | 1.8° |
| Step Angle Accuracy | +/-5% |
| Temperature Rise | 80° C Max. |
| Ambient Temperature Range | -20° to +50° C |
| Insulation Resistance | 100MΩ Min., 500 VDC |
| Dielectric Strength | 500 VAC for 1 min. |
| Radial Play | 0.02 mm Max. (450 g-load) |
| End Play | 0.08 mm Max. (450 g-load) |
| Switching Sequence | See page 31 |

WINDING DIAGRAM



MODEL SPECIFICATIONS

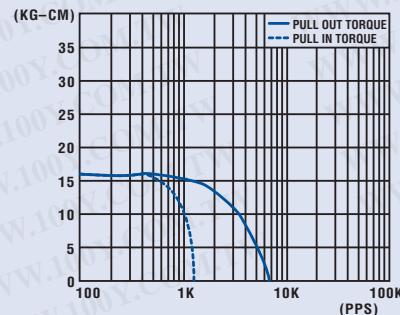
| Model Number | Rated Voltage V | Rated Current/Phase A | Winding Resistance/Phase Ω | Holding Torque g-cm | Inductance mH | Rotor Inertia g-cm² | Detent Torque g-cm | Weight g |
|--------------|-----------------|-----------------------|----------------------------|---------------------|---------------|---------------------|--------------------|----------|
| 34PM-C101 | 3.00 | 4.00 | 0.75 | 20,000 | 3.50 | 1,100.0 | 1,300 | 2,400 |
| 34PM-C108 | 12.00 | 1.00 | 12.00 | 20,000 | 56.00 | 1,100.0 | 1,300 | 2,400 |
| 34PM-C007 | 5.50 | 1.25 | 4.40 | 12,000 | 14.50 | 560.0 | 900 | 1,400 |
| 34PM-C049 | 1.70 | 4.70 | 0.36 | 12,000 | 1.65 | 560.0 | 900 | 1,400 |

Note: All models available with rear shafts.

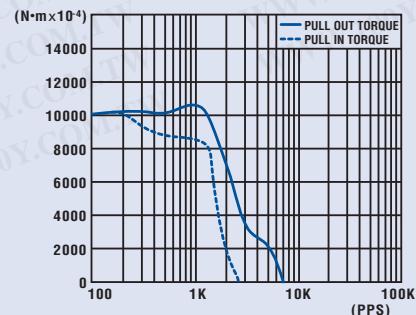
勝特力材料 886-3-5753170
胜特力电子(上海) 86-21-34970699
胜特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)

TORQUE/SPEED CHARACTERISTICS

Model: 34PM-C101
Driver: Dual Chopper • Supply Voltage: 35.0 (Volt)
Drive Current: 2.50 (A/PH) • Load Inertia: 26.9 (g-cm²)

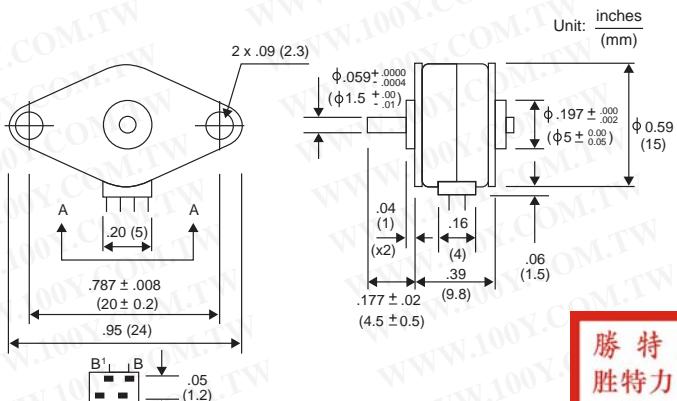


Model: 34PM-C007
Driver: Dual Chopper • Supply Voltage: 35.0 (Volt)
Drive Current: 1.25 (A/PH) • Load Inertia: 26.9 (g-cm²)



06BJ-H 18° PERMANENT MAGNET

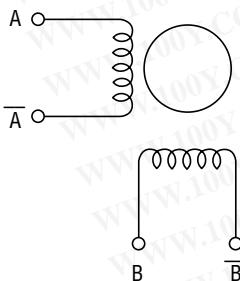
8J-H-18°



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WINDING DIAGRAM



GENERAL SPECIFICATIONS

| | |
|---------------------------------|---------------------------|
| Step Angle | 18° |
| Step Angle Accuracy | +/-1° |
| Temperature Rise | 80° C Max. |
| Ambient Temperature Range | -10° to +50° C |
| Insulation Resistance | 100MΩ Min., 500 VDC |
| Dielectric Strength | 500 VAC for 1 min. |
| Radial Play | 0.05 mm Max. (100 g-load) |
| End Play | 0.3 mm Max. (100 g-load) |
| Switching Sequence | See page 31 |

MODEL SPECIFICATIONS

| Model Number | Rated Voltage | Rated Current/Phase | Winding Resistance/Phase | Holding Torque | Inductance | Rotor Inertia | Detent Torque | Weight |
|--------------|---------------|---------------------|--------------------------|----------------|------------|---------------|---------------|--------|
| | V | A | Ω | g-cm | mH | g-cm² | g-cm | g |
| 06BJ-H005 | 5.0 | 0.25 | 20.0 | 27 | 7.0 | 0.06 | 2.5 | 8 |
| 06BJ-H012 | 12.0 | 0.12 | 100.0 | 30 | 37.0 | 0.06 | 2.5 | 8 |

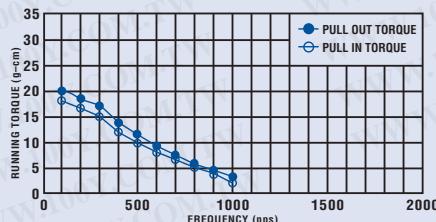
Note: This size is available in a bipolar winding only.

TORQUE/SPEED CHARACTERISTICS

Model: 06BJ-H005
Driver: Bipolar L/R Drive Dual Step
Supply Voltage: 5.0 (Volt)
Drive Current: 0.25 (A/PH)

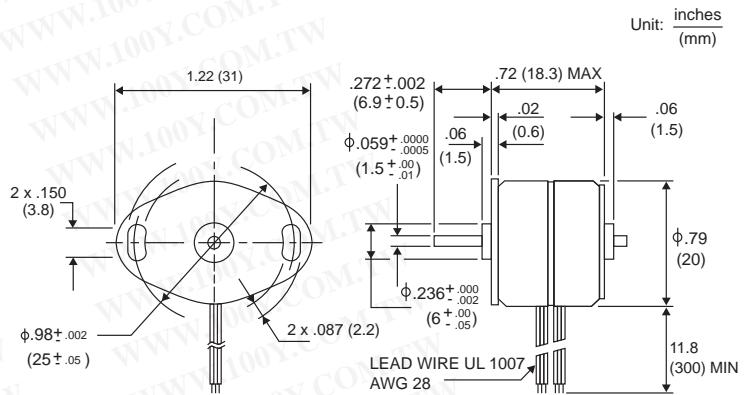


Model: 06BJ-H012
Driver: Bipolar L/R Drive Dual Step
Supply Voltage: 12.0 (Volt)
Drive Current: 12.0 (A/PH)



08BJ-H 18° PERMANENT MAGNET

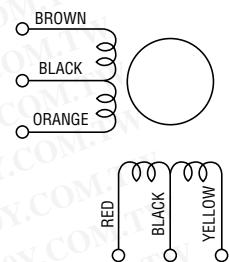
勝特力材料 886-3-5753170
 胜特力电子(上海) 86-21-34970699
 胜特力电子(深圳) 86-755-83298787
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GENERAL SPECIFICATIONS

| | |
|---------------------------------|---------------------------|
| Step Angle | 18° |
| Step Angle Accuracy..... | +/-1° |
| Temperature Rise..... | 80° C Max. |
| Ambient Temperature Range | -10° to +50° C |
| Insulation Resistance..... | 100MΩ Min., 500 VDC |
| Dielectric Strength..... | 500 VAC for 1 min. |
| Radial Play..... | 0.04 mm Max. (100 g-load) |
| End Play | 0.3 mm Max. (100 g-load) |
| Switching Sequence..... | See page 31 |

WINDING DIAGRAM

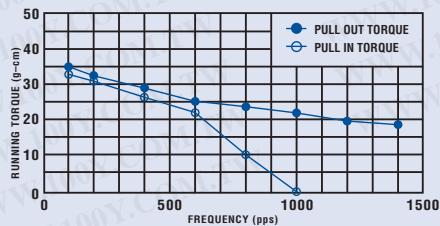


MODEL SPECIFICATIONS

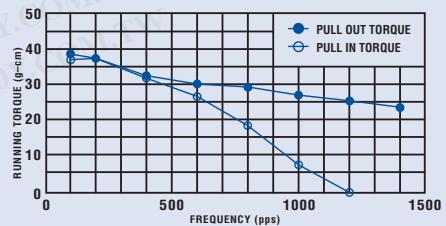
| Model Number | Rated Voltage V | Rated Current/Phase A | Winding Resistance/Phase Ω | Holding Torque g-cm | Inductance mH | Rotor Inertia g-cm² | Detent Torque g-cm | Weight g |
|-----------------|-----------------|-----------------------|----------------------------|---------------------|---------------|---------------------|--------------------|----------|
| Unipolar | | | | | | | | |
| 08BJ-H007 | 3.8 | 0.19 | 20.0 | 40 | 7.0 | 0.2 | 10 | 30 |
| Bipolar | | | | | | | | |
| 08BJ-H040 | 2.1 | 0.35 | 6.0 | 40 | 5.0 | 0.2 | 10 | 30 |

TORQUE/SPEED CHARACTERISTICS

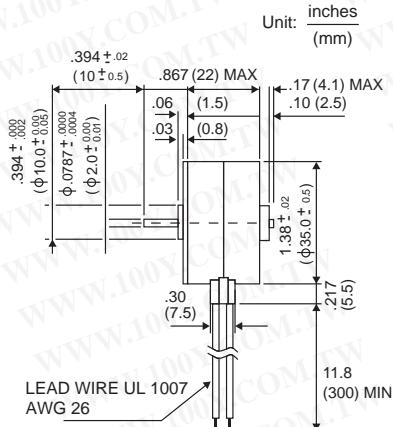
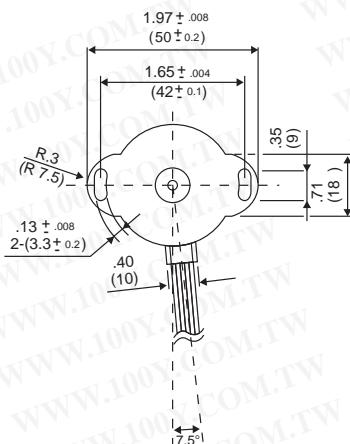
Model: 08BJ-H007
 Driver: Unipolar Chopper Dual
 Supply Voltage: 24.0 (Volt)
 Drive Current: 0.19 (A/PH)



Model: 08BJ-H040
 Driver: Bipolar Chopper Dual
 Supply Voltage: 24.0 (Volt)
 Drive Current: 0.35 (A/PH)



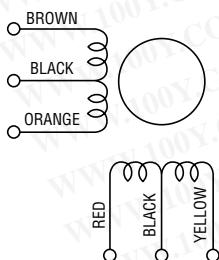
15BA-H 15° PERMANENT MAGNET



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WINDING DIAGRAM



GENERAL SPECIFICATIONS

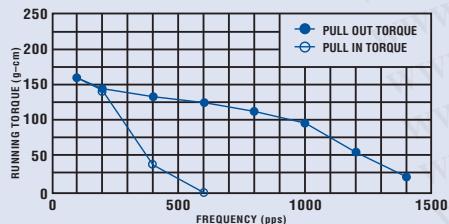
| | |
|---------------------------------|---------------------------|
| Step Angle | 15° |
| Step Angle Accuracy | +/-1° |
| Temperature Rise | 80° C Max. |
| Ambient Temperature Range | -10° to +50° C |
| Insulation Resistance | 100MΩ Min., 500 VDC |
| Dielectric Strength | 500 VAC for 1 min. |
| Radial Play | 0.03 mm Max. (100 g-load) |
| End Play | 0.3 mm Max. (100 g-load) |
| Switching Sequence | See page 31 |

MODEL SPECIFICATIONS

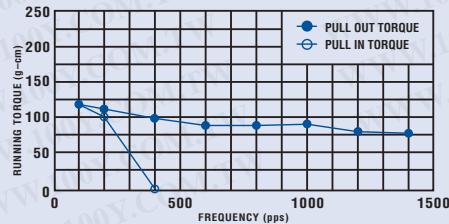
| Model Number | Rated Voltage | Rated Current/Phase | Winding Resistance/Phase | Holding Torque | Inductance | Rotor Inertia | Detent Torque | Weight |
|-----------------|---------------|---------------------|--------------------------|----------------|------------|---------------|---------------|--------|
| | V | A | Ω | g·cm | mH | g·cm² | g·cm | g |
| Unipolar | | | | | | | | |
| 15BA-H051P | 8.0 | 0.23 | 35.0 | 165 | 18.0 | 4.0 | 40 | 100 |
| 15BA-H073P | 4.0 | 0.40 | 10.0 | 155 | 5.0 | 4.0 | 40 | 100 |
| Bipolar | | | | | | | | |
| 15BA-H043P | 2.0 | 0.80 | 2.5 | 220 | 3.4 | 4.0 | 40 | 100 |

TORQUE/SPEED CHARACTERISTICS

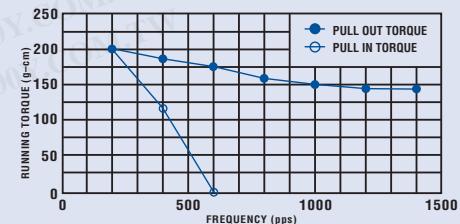
Model: 15BA-H051P
Driver: Unipolar Dual
Supply Voltage: 24.0 (Volt)
Drive Current: 0.23 (A/PH)



Model: 15BA-H073P
Driver: Unipolar Dual
Supply Voltage: 24.0 (Volt)
Drive Current: 0.40 (A/PH)



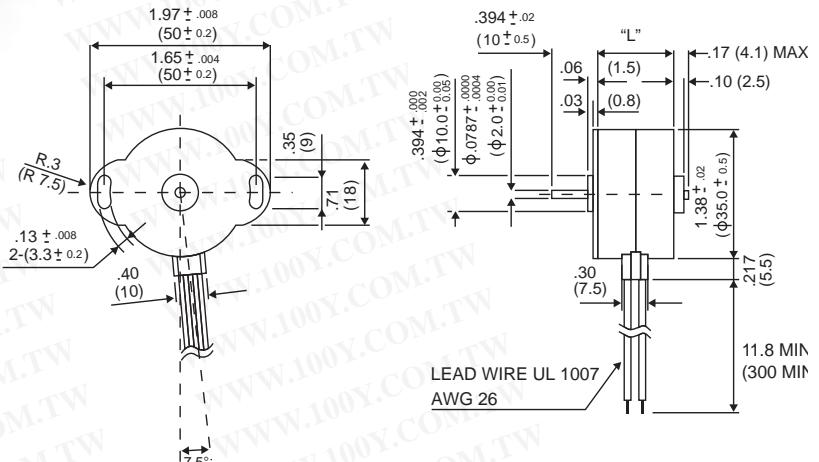
Model: 15BA-H043P
Driver: Bipolar Dual
Supply Voltage: 24.0 (Volt)
Drive Current: 0.80 (A/PH)



15BB-H 7.5° PERMANENT MAGNET



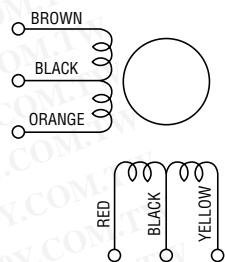
| P/N | "L" |
|-----------|-----------|
| 15BB-H0XX | .867 (20) |
| 15BB-H1XX | .591 (15) |



GENERAL SPECIFICATIONS

| | |
|---------------------------------|---------------------------|
| Step Angle | 7.5° |
| Step Angle Accuracy..... | +/-0.5° |
| Temperature Rise..... | 80° C Max. |
| Ambient Temperature Range | -10° to +50° C |
| Insulation Resistance..... | 100MΩ Min., 500 VDC |
| Dielectric Strength..... | 500 VAC for 1 min. |
| Radial Play..... | 0.03 mm Max. (100 g-load) |
| End Play | 0.3 mm Max. (100 g-load) |
| Switching Sequence..... | See page 31 |

WINDING DIAGRAM

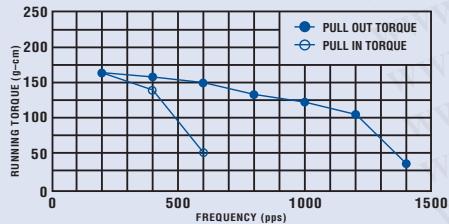


MODEL SPECIFICATIONS

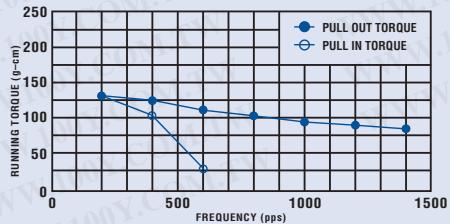
| Model Number | Rated Voltage V | Rated Current/Phase A | Winding Resistance/Phase Ω | Holding Torque g-cm | Inductance mH | Rotor Inertia g-cm² | Detent Torque g-cm | Weight g |
|-----------------|-----------------|-----------------------|----------------------------|---------------------|---------------|---------------------|--------------------|----------|
| Unipolar | | | | | | | | |
| 15BB-H051P | 8.0 | 0.23 | 35.0 | 165 | 27.0 | 4.0 | 30 | 100 |
| 15BB-H073P | 4.0 | 0.40 | 10.0 | 155 | 6.7 | 4.0 | 30 | 100 |
| 15BB-H170P | 6.6 | 0.22 | 30.0 | 190 | 17.0 | 1.5 | 35 | 65 |
| Bipolar | | | | | | | | |
| 15BB-H043P | 2.0 | 0.80 | 2.5 | 205 | 4.5 | 4.0 | 30 | 100 |

TORQUE/SPEED CHARACTERISTICS

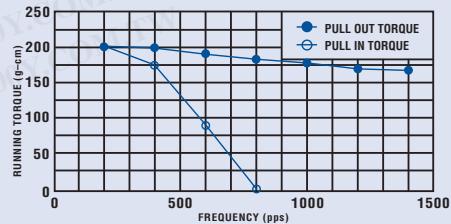
Model: 15BB-H051P
Driver: Unipolar Chopper Dual
Supply Voltage: 24.0 (Volt)
Drive Current: 0.23 (A/PH)



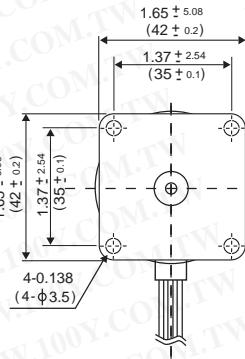
Model: 15BB-H170P
Driver: Unipolar Chopper Dual
Supply Voltage: 24.0 (Volt)
Drive Current: 0.22 (A/PH)



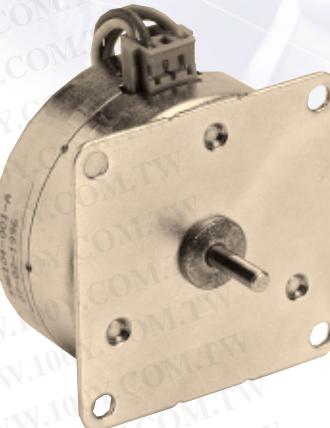
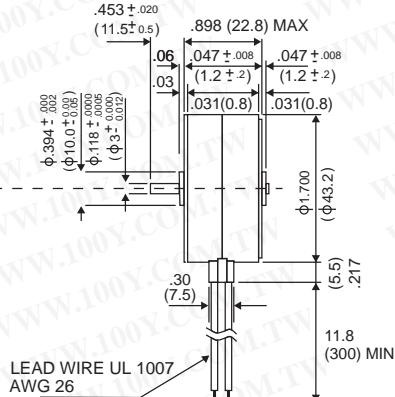
Model: 15BB-H043P
Driver: Bipolar Chopper Dual
Supply Voltage: 24.0 (Volt)
Drive Current: 0.80 (A/PH)



17BB-H 7.5° PERMANENT MAGNET

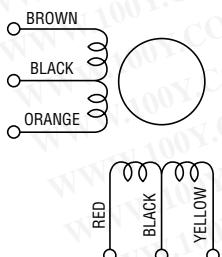


Unit: inches
(mm)



NOTE: Also available with winged mounting brackets.

WINDING DIAGRAM



GENERAL SPECIFICATIONS

| | |
|---------------------------------|---------------------------|
| Step Angle | 7.5° |
| Step Angle Accuracy..... | +/-0.5° |
| Temperature Rise..... | 80° C Max. |
| Ambient Temperature Range | -10° to +50° C |
| Insulation Resistance..... | 100MΩ Min., 500 VDC |
| Dielectric Strength..... | 500 VAC for 1 min. |
| Radial Play..... | 0.03 mm Max. (220 g-load) |
| End Play | 0.3 mm Max. (220 g-load) |
| Switching Sequence..... | See page 31 |

MODEL SPECIFICATIONS

| Model Number | Rated Voltage V | Rated Current/Phase A | Winding Resistance/Phase Ω | Holding Torque g-cm | Inductance mH | Rotor Inertia g-cm² | Detent Torque g-cm | Weight g |
|-----------------|-----------------|-----------------------|----------------------------|---------------------|---------------|---------------------|--------------------|----------|
| Unipolar | | | | | | | | |
| 17BB-H262P | 5.4 | 0.45 | 12.0 | 500 | 11.0 | 12.0 | 80 | 140 |
| 17BB-H267P | 7.5 | 0.30 | 25.0 | 480 | 19.0 | 12.0 | 80 | 140 |
| Bipolar | | | | | | | | |
| 17BB-H240P | 5.4 | 0.45 | 12.0 | 670 | 27.0 | 12.0 | 80 | 140 |

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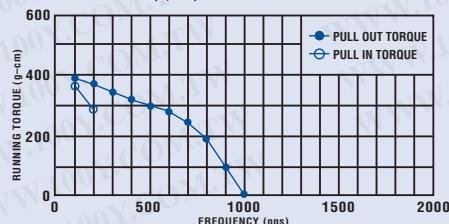
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TORQUE/SPEED CHARACTERISTICS

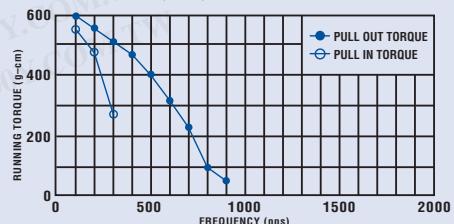
Model: 17BB-H262P
Driver: Unipolar Chopper Dual
Supply Voltage: 24.0 (Volt)
Drive Current: 0.45 (A/PH)



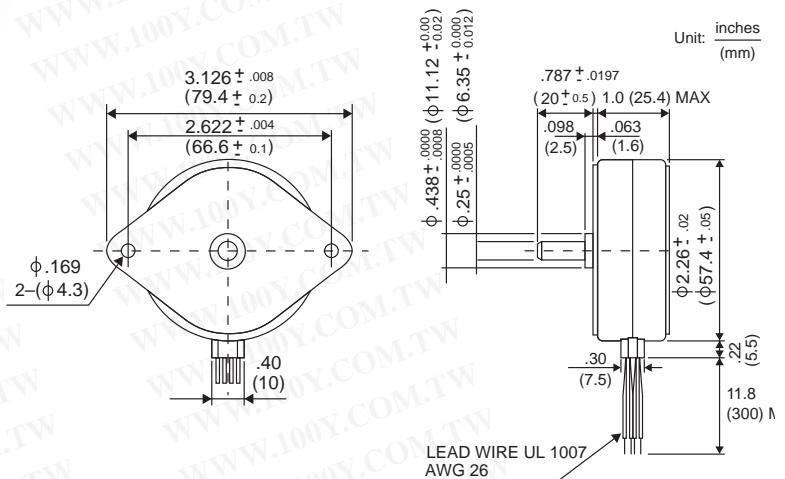
Model: 17BB-H267P
Driver: Unipolar Chopper Dual
Supply Voltage: 24.0 (Volt)
Drive Current: 0.30 (A/PH)



Model: 17BB-H240P
Driver: Bipolar Chopper Dual
Supply Voltage: 24.0 (Volt)
Drive Current: 0.45 (A/PH)



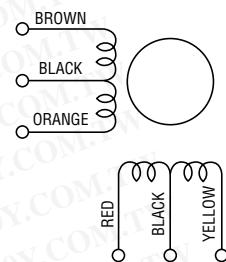
23BB-H 7.5° PERMANENT MAGNET



GENERAL SPECIFICATIONS

| | |
|---------------------------------|---------------------------|
| Step Angle | 7.5° |
| Step Angle Accuracy | +/-0.5% |
| Temperature Rise..... | 80° C Max. |
| Ambient Temperature Range | -10° to +50° C |
| Insulation Resistance..... | 100MΩ Min., 500 VDC |
| Dielectric Strength..... | 500 VAC for 1 min. |
| Radial Play..... | 0.03 mm Max. (220 g-load) |
| End Play | 0.3 mm Max. (220 g-load) |
| Switching Sequence..... | See page 31 |

WINDING DIAGRAM



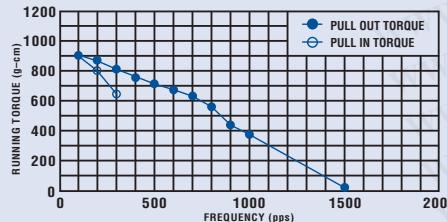
MODEL SPECIFICATIONS

| Model Number | Rated Voltage V | Rated Current/Phase A | Winding Resistance/Phase Ω | Holding Torque g-cm | Inductance mH | Rotor Inertia g-cm² | Detent Torque g-cm | Weight g |
|-----------------|-----------------|-----------------------|----------------------------|---------------------|---------------|---------------------|--------------------|----------|
| Unipolar | | | | | | | | |
| 23BB-H251P | 5.0 | 0.75 | 6.6 | 1,200 | 9.0 | 30.0 | 150 | 280 |
| 23BB-H252P | 12.0 | 0.34 | 36.0 | 1,200 | 32.0 | 30.0 | 150 | 280 |
| Bipolar | | | | | | | | |
| 23BB-H246P | 4.9 | 0.75 | 6.5 | 1,400 | 17.0 | 30.0 | 150 | 280 |

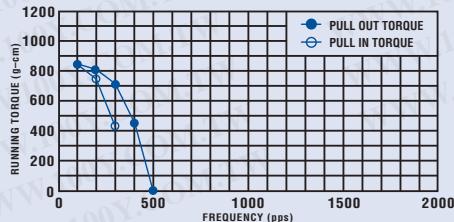
TORQUE/SPEED CHARACTERISTICS

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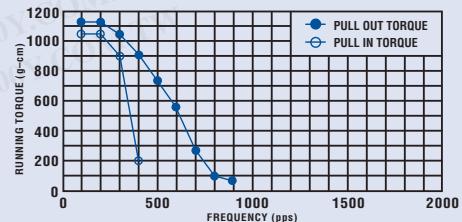
Model: 23BB-H251P
Driver: Unipolar Chopper Dual
Supply Voltage: 24.0 (Volt)
Drive Current: 0.75 (A/PH)



Model: 23BB-H252P
Driver: Unipolar Chopper Dual
Supply Voltage: 24.0 (Volt)
Drive Current: 0.32 (A/PH)



Model: 23BB-H246P
Driver: Bipolar Chopper Dual
Supply Voltage: 24.0 (Volt)
Drive Current: 0.75 (A/PH)



STEP MOTOR CONSTRUCTION

The advantage of step motors is that they can operate *open loop*, that is, they can stop at a predictable angle, rotate clockwise, counterclockwise, and vary speed without feedback. Step motors are electrically commutated, and need either a unipolar or bipolar driver to effect rotation.

Hybrid step motors from page 7 to 22 have electromagnetic poles, or *phases*, located radially around a magnetized rotor. When a phase is energized, it will pull the rotor magnetic pole into alignment. When phases are pulsed in rotation, called a *switching sequence* (refer to page 31) they create a rotating magnetic stator field. The rotor fields will continue to align themselves, thus causing rotation. Applying potential to one pole is called one *pulse*. One pulse will move the motor one step.

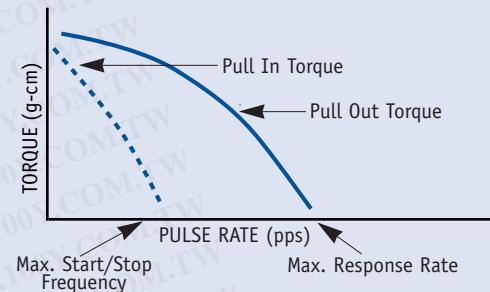
The amount of rotor movement in one pulse is called the *step angle*. On many of the motors, the step angle is 1.8 degrees. The error on each step is generally quite small, usually +/-5% as measured from a fitted centerline, and is referred to as *step angle accuracy*. The step error does not accumulate.

The *permanent magnet step motors*, from page 23 to 28, consist of bobbin wound coils and precision stamping. This construction is easier to assemble, and has a lower cost than hybrid motors. Permanent magnet step motors typically have a larger step angle and lower torque than hybrid motors of the same size.

TORQUE AND SPEED

Motor *torque* is the product of the motor's generated force, multiplied by the radius from the shaft center from where it is measured. The units are either grams-centimeters (g-cm), milliNewton meters (mNm) or ounce-inches (oz-in). Conversions for these rates, and for moments of inertia, are on page 31. At low pulse rates, the motor has a high torque output, and at high speeds, low torque.

TORQUE SPEED GRAPH



At a particular high frequency the motor can only generate enough torque to keep the rotor moving. This is the *maximum response rate* at which the available torque is zero (refer to Figure 1).

To start rotation, some energy is used converting the rotor's inertia from a static to a dynamic state. During this special condition, starting from zero speed, the maximum torque developed is called *pull in torque*. Pull in torque will decrease as you increase frequency. At some point the torque developed from starting will be zero. This is the *maximum start/stop frequency*.

After reaching constant velocity (synchronism), the motor can be accelerated or *slewed up* even further to attain higher torque or higher speed. The maximum torque developed from slewing up is called *pull out torque*.

In this catalog, all torque and speed measurements are made at the rated current. If the motor is run at a current higher than the rated current, the torque speed curve will shift up proportionately. However, most of the increase is lost in heat. At a particular high current, the coil temperature will rise to the point at which the insulation is threatened. The *maximum temperature rise* is the maximum temperature increase the coil can withstand without affecting its insulation.

A major advantage of step motors is that with one or more phases left on, the rotor holds its position. If the rotor is forced from this holding position, it will attempt to move back. The maximum restoring torque a motor develops is called *holding torque*. It is the highest torque the motor can develop. In this catalog, the holding torque is measured at rated current with two phases on.

Figure 1

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MOTOR TERMINOLOGY

WINDINGS

Motors are wound to accept current in one direction, a *unipolar motor*, or in both directions, a *bipolar motor*. In general, a bipolar motor has more torque than a unipolar motor, except at high speeds. The switching sequences for unipolar and bipolar motors are different, and can be found on page 31. Winding diagrams for unipolar motors can be found on the data sheets.

To increase torque, motors can be run with two phases on simultaneously. This drive mode is called *dual phase* or *two phase on*. Motors can also be run *single phase*. A combination of both is called *half step mode*. Half step mode results in a rotor movement of one half the step angle, for example, from 1.8 degrees to 0.9 degrees. Further, by partially turning phases on and off you can continue to reduce the step angle. This drive mode is referred to as *microstepping*.

MOTOR SELECTION

Motor selection usually begins with determining the torque required. Since step motors run open loop, you need to know beforehand what the maximum torque required is. During any duty cycle, the load torque varies. Usually, the highest torque requirement is in accelerating the load from at rest to a set speed. The following variables must be known to determine the torque required to accelerate a load:

- Motor Speed (pps) accelerating from
- Motor Speed (pps) accelerating to
- Rotor Inertia (g-cm^2)
- Load Inertia (must be less than 10X rotor inertia)
- Step Angle (degrees)

The acceleration component of the load, plus frictional loads, can be calculated as follows:

$$T_a = \alpha J + T_f$$

Where:

T_a = Torque required to accelerate (g-cm)

α = Angular acceleration (radians/sec^2)

J = Total inertia (g-cm sec^2)

T_f = Friction torque (g-cm^2)

Inertia will include both load inertia and rotor inertia. Acceleration must be converted from radians per second to steps per second.

Converting for these factors we get:

$$T_a = (J_m + J_1) \times (f_2 - f_1) \frac{(2\pi\theta)}{\Delta t \times 360^\circ}$$

Where:

J_m = Motor rotor inertia (g-cm sec^2)

J_1 = Load inertia (g-cm sec^2)

f_2 = Ending (high speed) frequency (pps)

f_1 = Starting frequency (pps)

Δt = Time for acceleration (sec)

DETERMINING TORQUE NEEDS

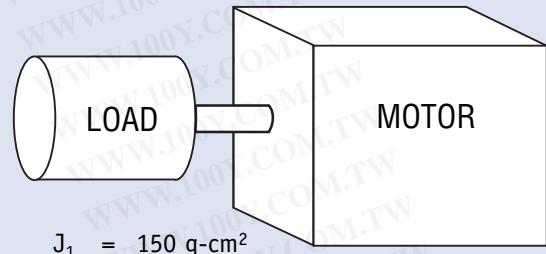


Figure 2

For example, assuming the assembly in Figure 2, what is the required torque to accelerate the load in .10 seconds from 0 to 1,000 pps?

For this example, we estimate the torque required for the load only, and input the acceleration of gravity into the inertia moment by dividing it by 980 cm/sec^2 . From this we get:

$$T_a = \frac{150 \text{ g-cm}^2}{980 \text{ cm/sec}^2} \times \frac{(1000 \text{ pps}) 2\pi \times 1.8^\circ}{.1 \text{ sec} \times 360^\circ} = 52 \text{ g-cm}$$

To accelerate the load we would need at least 52 g-cm of torque, plus about 25% more for the motor rotor. An additional 50-100% is recommended as a safety margin, in case of load variance or worn parts. The total is about 130 g-cm at 1,000 pps. If a small step angle is required, a 14PM on page 7 has ample torque.

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CONVERSION TABLES

ROTARY INERTIA CONVERSION TABLE

To convert from A to B, multiply by entry in table.

| A | B | g-cm ² | oz-in ² | g-cm-s ² | Kg-cm ² | lb-in ² | oz-in-s ² | lb-ft ² | Kg-cm-s ² | lb-in-s ² | lb-ft-s ² or slug-ft ² |
|--|-------------------------|-------------------------|-------------------------|-------------------------|--------------------------|-------------------------|-------------------------|--------------------------|-------------------------|-------------------------|---|
| g-cm ² | 1 | 5.46 × 10 ⁻³ | 1.01 × 10 ⁻³ | 10 ⁻³ | 3.417 × 10 ⁻⁴ | 1.41 × 10 ⁻⁵ | 2.37 × 10 ⁻⁶ | 1.01 × 10 ⁻⁶ | 8.85 × 10 ⁻⁷ | 7.37 × 10 ⁻⁸ | |
| oz-in ² | 182.9 | 1 | .186 | .182 | .0625 | 2.59 × 10 ⁻³ | 4.34 × 10 ⁻⁴ | 1.86 × 10 ⁻⁴ | 1.61 × 10 ⁻⁴ | 1.34 × 10 ⁻⁵ | |
| g-cm-s ² | 980.6 | 5.36 | 1 | .9806 | .335 | 1.38 × 10 ⁻² | 2.32 × 10 ⁻³ | 10 ⁻³ | 8.67 × 10 ⁻⁴ | 7.23 × 10 ⁻⁵ | |
| Kg-cm ² | 1000 | 5.46 | 1.019 | 1 | .3417 | 1.41 × 10 ⁻² | 2.37 × 10 ⁻³ | 1.019 × 10 ⁻³ | 8.85 × 10 ⁻⁴ | 7.37 × 10 ⁻⁵ | |
| lb-in ² | 2.92 × 10 ³ | 16 | 2.984 | 2.926 | 1 | 4.14 × 10 ⁻² | 6.94 × 10 ⁻³ | 2.98 × 10 ⁻³ | 2.59 × 10 ⁻³ | 2.15 × 10 ⁻⁴ | |
| oz-in-s ² | 7.06 × 10 ⁴ | 386.08 | 72.0 | 70.615 | 24.13 | 1 | .1675 | 7.20 × 10 ⁻² | 6.25 × 10 ⁻² | 5.20 × 10 ⁻³ | |
| lb-ft ² | 4.21 × 10 ⁵ | 2304 | 429.71 | 421.40 | 144 | 5.967 | 1 | .4297 | .3729 | 3.10 × 10 ⁻² | |
| Kg-cm-s ² | 9.8 × 10 ⁵ | 5.36 × 10 ³ | 1000 | 980.66 | 335.1 | 13.887 | 2.327 | 1 | .8679 | 7.23 × 10 ⁻² | |
| lb-in-s ² | 1.129 × 10 ⁶ | 6.177 × 10 ³ | 1.152 × 10 ³ | 1.129 × 10 ³ | 386.08 | 16 | 2.681 | 1.152 | 1 | 8.33 × 10 ⁻² | |
| lb-ft-s ² or slug-ft ² | 1.355 × 10 ⁷ | 7.41 × 10 ⁴ | 1.38 × 10 ⁴ | 1.35 × 10 ⁴ | 4.63 × 10 ³ | 192 | 32.17 | 13.825 | 12 | 1 | |

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TORQUE CONVERSION TABLE

To convert from A to B, multiply by entry in table.

| A | B | g-cm | oz-in | Kg-cm | lb-in | N-m | lb-ft | Kg-m |
|-------|-------------------------|--------------------------|-------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| g-cm | 1 | 1.388 × 10 ⁻² | | 10 ⁻³ | 8.679 × 10 ⁻⁴ | 9.806 × 10 ⁻⁵ | 7.233 × 10 ⁻⁵ | 10 ⁻⁵ |
| oz-in | 72.007 | | 1 | 7.200 × 10 ⁻² | 6.25 × 10 ⁻² | 7.061 × 10 ⁻³ | 5.208 × 10 ⁻³ | 7.200 × 10 ⁻⁴ |
| Kg-cm | 1000 | | 13.877 | 1 | .8679 | 9.806 × 10 ⁻² | 7.233 × 10 ⁻² | 10 ⁻² |
| lb-in | 1.152 × 10 ³ | | 16 | 1.152 | 1 | .112 | 8.333 × 10 ⁻² | 1.152 × 10 ⁻² |
| N-m | 1.019 × 10 ⁴ | | 141.612 | 10.197 | 8.850 | 1 | .737 | .101 |
| lb-ft | 1.382 × 10 ⁴ | | 192 | 13.825 | 12 | 1.355 | 1 | .138 |
| Kg-m | 10 ⁵ | | 1.388 × 10 ³ | 100 | 86.796 | 9.806 | 7.233 | 1 |

SWITCHING SEQUENCE TABLES

For clockwise rotation facing the mounting side.

| Dual Phase Excitation | | | | |
|-----------------------|---|---|----------------|----------------|
| Step | A | B | A ¹ | B ¹ |
| 1 | - | - | | + |
| 2 | | - | - | + |
| 3 | | | - | + |
| 4 | - | | - | + |

| Bipolar Dual Phase | | | | |
|--------------------|---|---|----------------|----------------|
| Step | A | B | A ¹ | B ¹ |
| 1 | + | + | - | - |
| 2 | - | + | + | - |
| 3 | - | - | + | + |
| 4 | + | - | - | + |

ORDERING INFORMATION AND WARRANTY

WARRANTY—NMB Corporation motors are warranted to be free of defects in materials and workmanship for a period of one year from date of delivery.

APPLICATION ENGINEERING—For application engineering consultation, contact your local NMB Corporation Sales Office to receive prompt assistance.

SPECIFICATIONS—NMB Corporation reserves the right to change specifications and prices without notice as required to permit improvements in motor design.

INVENTORY—This catalog is a technical guide for the designer of products using stepping motors. Please contact your local NMB Corporation Sales Office for information on the availability of specific stepping motors and drive characteristics listed herein. Most stepping motors shown here were manufactured to specific applications and thus are not available from inventory. NMB can modify any motor in this catalog to meet your particular requirements.