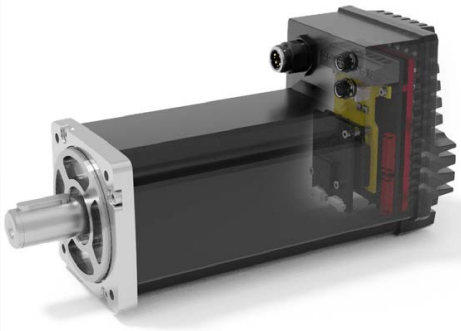
Dynetics

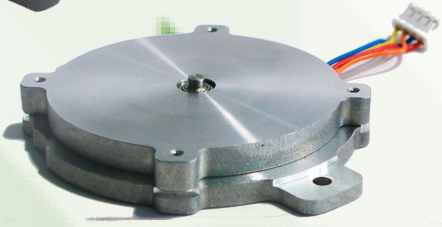
DYNAMIC IN MECHATRONICS

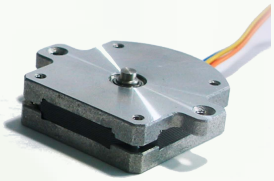
# Stepper Motors (Tin-Can & Hybrid)
# Rotary and Linear actuators

## Piëzo Motors

1-2324





# Introduction:
# Dynetics- dynamic in mechatronics

Dynetics, founded in 1994, with offices in Germany and the Netherlands assists engineers across Europe in selecting the best suitable motor for their mechatronic assignment.
Dynetics represents leading manufacturers for rotating or linear functions with various technologies:
Our motors are available in different technologies, related specs, and with many features and options such as a gearhead, encoder, but can also be modified to suit your needs

- Rotating: Brushed-; brushless, stepper-, Servo-, piezo, synchronous-, torque-motors
- Linear: high precision lead/ball screws; linear shaft motors, stages, motors with integrated high precision lead screw an/or intelligence (driver, sensors, etc) .

Many of our products can be "customized", like with double or modified shafts, encoders, altered windings, fitted with connectors per customer request. See also our electronic options (integrated or external) to drive the motor optimal at the most efficient way.

Equipment cooling:
Dynetics supports engineers in the selection of a suitable axial fans or radial blowers for your application. We represents a broad range of fans for an AC- or DC- power supply. The fans combine long life with high reliability. See for instance the L10 curves of selected fans showing 100.000 hrs at 20° C and 40.000 hrs at 60°C . Technologies can be combined with ball- or sleeve-bearing. Thanks to our close contacts with the engineering departments of the supplier we are involved with their continuous development of efficient and intelligent designs, suitable in a wide variety of applications.

Contact us also for customer specific solutions, like humidity protection, specific wirelength, connecor, etc.)
Dynetics helps economizing your design by offering solutions with optimum price-performance ratio.

logistics and services:
our logistic centre is located in The Netherlands:
“not only perfect for a European Distribution Center, but also as part of a global supply chain”
a logistic/warehouse solution in The Netherlands for various reasons:

- Central location within the European market / Gateway to Europe and worldwide.
- Excellent sea- and airport facilities, and distribution infrastructure with Main ports Schiphol Airport and Rotterdam port
- Efficient Cargo communication
- Close co-operation between carriers, customs, handling agents, forwarders and other parties involved
- Able to interface late cut-off times and short lead times
- International orientation
- Optimising the supply chain management,
- Maximizes fab utilizations
- Matches inventory levels with the customer’s demand
- Drives towards the best possible internal cycle time and schedule performance
- Multilingual capabilities

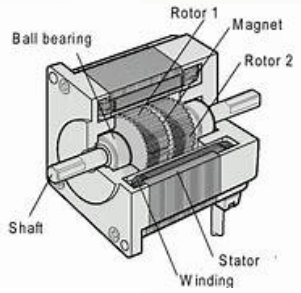
For more details, please visit our website:
www.dynetics.eu

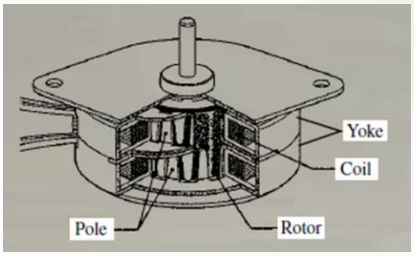
**Stepping motors:**

We have two main groups according to magnet force source:

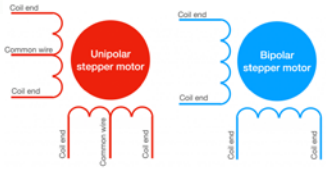
- tin-can steppers (Permanent steppers)
- hybrid stepper (2-, 3- or 5-Phase).

The shaft of a Stepper motor is moved by each pulse with a fixed angle and converts the input pulse into a precisely defined increment in the shaft position. These motors are generally best used for applications up to 1000 revolutions per minute. At higher speeds, a stepper motor starts to lose its torque. Stepper motors are therefore very suitable for applications where predictable torque and speed requirements are present. stepper motors offer a simpler and more cost-effective solution. By adding a gearbox or damper to a stepper motor can improve the motor performance by reducing the inertia ratio of the load, increasing the load torque, and reducing motor vibration.




Bipolar versus unipolar:
In the following overview, we divided the available stepper motors in bipolar and unipolar.
Bipolar stepper motors are generally able to produce more torque than unipolar stepper motors, and are more efficient. However, they are more complicated to drive. The main difference between the two types of stepper motors has to do with the way that the wire winding is constructed.




The unipolar stepper motors, has one winding per phase, with a center tap. This allows the controlling circuit to operate the motor with current that flows always in the same direction. Therefore, there is no need to generate reverse current. Each time the phase is activated, only half of its coil is energized.

The bipolar stepper motor also has a single winding per phase and no centre tap. This means that when the phase is activated, the entire coil is energized. The result is that the bipolar motor is able to produce much more torque compared to the unipolar motor. But, the controlling circuit must be able to generate current that can move both ways through the coil, i.e. "regular" current and "reverse" current. As a result, the controlling circuit for a bipolar stepper motor is more complicated than that of a unipolar stepper motor. Bipolar motors have multiple (at least two) independent windings. A wire comes out of each of the winding's ends, so you get two wires per winding. Unipolar motors may also have multiple (more than two) windings. However, in addition to the ends of each winding are connected to wires, the middle attaches to a third wire. The absence of this third (common) wire means that bipolar motors are slightly easier to make.

Our motors are:
Reach and RoHs compliant
Certificated: UL, VDE; CE; ISO9001, ISO14001
Options: Customizations ; dampers, encoders, drivers controllers etc.

Index:





**Options**

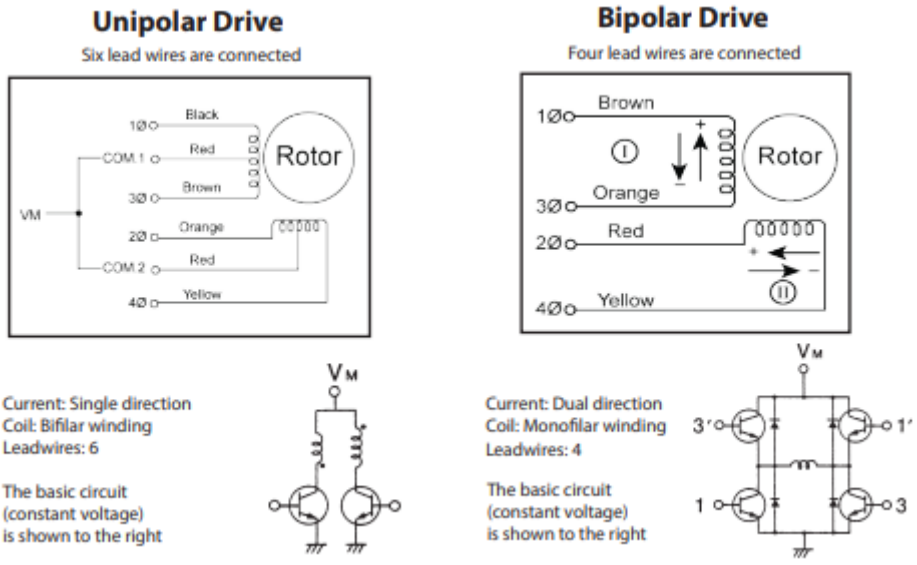
**Tin-can steppers** (Permanent Magnet Motors):

permanent magnet (PM) stepper tin-can stepper motors have many advantages over other kinds of stepper motors. PM motors strike the perfect balance between efficiency and affordability, as they are low-inertia, low-resolution motors that are a low-priced
alternative to hybrid stepper motors in many applications. PM steper motors have a typical step angle between 3.75 and 18 degrees, and offer position resolution on the order of ±5 percent. Its structure demonstrates ferromagnetism, with alternating north and south poles set in a straight, parallel line to the rotor shaft. The rotor is moved through the action of permanent magnets, providing increased magnetic flux intensity. This intensity results in improved torque characteristics for the PM motor, compared to variable resistance step motors.

Nippon Pulse provides high-quality PM motors to industries and professionals all over the world. Take a look at our standard PM motors over the following pages to find the one that most closely fits your needs. Dynetics can work with you to make any customizations necessary to make our PM motors a perfect fit.

Product features of the stepper motor
Several customization options available on all tin-can steppers

- Short time Prototyping
- Available with diameters from 10mm up to 55mm
- Holding torque between 1 and 180 mNm
- Rated voltage of 5V and 12V
- 24 or 48 steps per revolution
- Unipolar and bipolar windings




The tin-can stepper motors are available in the following versions

- as Flying lead joint type (PF)
- as Connector joint type (PFC)
- With gearhead

## Model Number Explanation (for PF and PFC series)

| PF(C) - 42 | T - 48 | C | 1 | G | 1/50 |
|---|---|---|---|---|---|
| 1 2 | 3 4 | 5 | 6 | 7 | 8 |

1 - Series Designation
- PF: Flying lead joint type
- PFC: Connector joint type

2 - Outer Diameter in mm

3 - Type
- Blank: Standard
- T: Thin stack
- H: High torque

4 - Steps per Revolution
- 24: 15˚/step
- 48: 7.5˚/step
- 96: 3.75˚/step

5 - Coil Rating
- C: 12V unipolar
- D: 5V unipolar
- P: 12V bipolar
- Q: 5V bipolar

6 - Magnet Material
- 1: Ferrite Anisotropic
- 3: Ferrite Isotropic
- 4: Neodymium
- 6: Molded Neodymium*

7 - Gear Head
- Blank: No Gear Head
- G: Gear Head Integrated

8 - Gear Ratio
- With geared models only

*Only applicable for PFC10 and PFC20T.

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## Ø10 mm rotary tin can stepping motor

Ø10mm

| type of winding | Model | Step angle | Voltage | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | Ω/Φ | mH/Φ | mN·m | kg.m² | mm | g |
| bipolar | PFC10-20R6 | 18 | 2,7 | 20 | 3,2 | 1 | 0,03 x $10^{7}$ | 10,2 | 5 |

## Ø20 mm rotary tin can stepping motor

Ø20mm

| type of winding | Model | Step angle | Voltage | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | Ω/Φ | mH/Φ | mN·m | kg.m² | mm | g |
| bipolar | PFCU20 | 0,9 | 12 | 160 | 59 | 10 | 0,1 x $10^{7}$ | 20 | 25 |

## Ø25 mm rotary tin can stepping motor

Ø25mm

| type of winding | Model | Step angle | Voltage | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | Ω/Φ | mH/Φ | mN·m | kg.m² | mm | g |
| bipolar | PFC25-48 C1 | 7,5 | 12 | 120 | 37 | 10 | 1 x $10^{7}$ | 26 | 35 |
| bipolar | PFC25-48 C4 | 7,5 | 12 | 120 | 32 | 12 | 1 x $10^{7}$ | 26 | 35 |
| bipolar | PFC25-48 D1 | 7,5 | 5 | 16 | 5 | 10 | 1 x $10^{7}$ | 26 | 35 |
| bipolar | PFC25-48 D4 | 7,5 | 5 | 16 | 4,4 | 12 | 1 x $10^{7}$ | 26 | 35 |
| bipolar | PFC25-48 P1 | 7,5 | 12 | 122 | 81 | 12 | 1 x $10^{7}$ | 26 | 35 |
| bipolar | PFC25-48 P4 | 7,5 | 12 | 122 | 71 | 13 | 1 x $10^{7}$ | 26 | 35 |
| bipolar | PFC25-48 Q1 | 7,5 | 5 | 15 | 9,7 | 12 | 1 x $10^{7}$ | 26 | 35 |
| bipolar | PFC25-48 Q4 | 7,5 | 5 | 15 | 8,5 | 13 | 1 x $10^{7}$ | 26 | 35 |
| unipolar | PFC25-24 C1 | 15 | 12 | 120 | 30 | 8 | 1 x $10^{7}$ | 26 | 35 |
| unipolar | PFC25-24 C4 | 15 | 12 | 120 | 26,4 | 9 | 1 x $10^{7}$ | 26 | 35 |
| unipolar | PFC25-24 D1 | 15 | 5 | 16 | 4,1 | 8 | 1 x $10^{7}$ | 26 | 35 |
| unipolar | PFC25-24 D4 | 15 | 5 | 16 | 3,6 | 9 | 1 x $10^{7}$ | 26 | 35 |
| unipolar | PFC25-24 P1 | 15 | 12 | 122 | 66 | 10 | 1 x $10^{7}$ | 26 | 35 |
| unipolar | PFC25-24 P4 | 15 | 12 | 122 | 58 | 10 | 1 x $10^{7}$ | 26 | 35 |
| unipolar | PFC25-24 Q1 | 15 | 5 | 15 | 7,9 | 10 | 1 x $10^{7}$ | 26 | 35 |
| unipolar | PFC25-24 Q4 | 15 | 5 | 15 | 7 | 10 | 1 x $10^{7}$ | 26 | 35 |

## Gearhear options:

| Gear Ratio | 6/25 | 1/5 | 3/25 | 1/10 | 2/25 | 1/15 | 3/50 | 1/20 |
|---|---|---|---|---|---|---|---|---|
| Ordinary Gear Strength | 20mN·m | | | | 50mN·m | | | |
| Destruction Gear Strength | 60mN·m | | | | 150mN·m | | | |

| Gear Ratio | 1/25 | 1/30 | 1/50 | 1/60 | 2/125 | 1/75 |
|---|---|---|---|---|---|---|
| Ordinary Gear Strength | 70mN·m | | | | | |
| Destruction Gear Strength | 210mN·m | | | | | |

| Gear Ratio | 1/100 | 1/120 | 1/125 | 1/150 | 1/200 | 1/250 | 1/300 |
|---|---|---|---|---|---|---|---|
| Ordinary Gear Strength | 100mN·m | | | | | | |
| Destruction Gear Strength | 300mN·m | | | | | | |

## Ø25 mm rotary tin can stepping motor with gearhead

Ø25mm

| type of winding | Model | Step angle | Voltage | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | Ω/Φ | mH/Φ | mN·m | kg.m² | mm | g |
| bipolar | PFCU25-24C1GM 1/18 | 1 | 6,5 | 32 | 16 | 50 | 0,5 x $10^{7}$ | 28 | 55 |
| bipolar | PFCU25-24D1GM 1/20 | 0,75 | 6,5 | 32 | 16 | 50 | 0,5 x $10^{7}$ | 28 | 55 |
| bipolar | PFCU25-24D1GM 1/30 | 0,5 | 6,5 | 32 | 16 | 50 | 0,5 x $10^{7}$ | 28 | 55 |
| bipolar | PFCU25-24C1GM 1/18 | 1 | 12,6 | 122 | 66 | 50 | 0,5 x $10^{7}$ | 28 | 55 |
| bipolar | PFCU25-24D1GM 1/20 | 0,75 | 12,6 | 122 | 66 | 50 | 0,5 x $10^{7}$ | 28 | 55 |
| bipolar | PFCU25-24D1GM 1/30 | 0,5 | 12,6 | 122 | 66 | 50 | 0,5 x $10^{7}$ | 28 | 55 |

## Ø30 mm rotary tin can stepping motor with gearhead

Ø30mm

| type of winding | Model | Step angle | Voltage | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | Ω/Φ | mH/Φ | mN·m | kg.m² | mm | g |
| bipolar | PFCU30-24V 4GM 3/25 | 1,8 | 6,9 | 30 | 26 | 100 | | 25 | 75 |
| bipolar | PFCU30-24T 4GM 3/25 | 1,8 | 9,8 | 60 | 49 | 100 | | 25 | 75 |

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# Ø35 mm rotary tin can stepping motor

Ø35mm

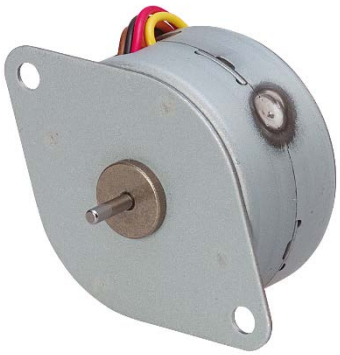
| type of winding | Model | Step angle | Voltage | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | Ω/Φ | mH/Φ | mN·m | kg.m² | mm | g |
| bipolar | PF35-24P1 | 15 | 12 | 100 | 95 | 18 | $4,5 \times 10^{7}$ | 20,6 | 80 |
| bipolar | PF35-24Q1 | 15 | 5 | 17 | 14 | 18 | $4,5 \times 10^{7}$ | 20,6 | 80 |
| bipolar | PF35-48P1 | 7,5 | 12 | 100 | 124 | 25 | $4,5 \times 10^{7}$ | 20,6 | 80 |
| bipolar | PF35-48Q1 | 7,5 | 5 | 17 | 19 | 25 | $4,5 \times 10^{7}$ | 20,6 | 80 |
| Unipolar | PF35-48C1 | 7,5 | 12 | 90 | 48 | 20 | $4,5 \times 10^{7}$ | 20,6 | 80 |
| Unipolar | PF35-48D1 | 7,5 | 5 | 16 | 8,8 | 20 | $4,5 \times 10^{7}$ | 20,6 | 80 |
| Unipolar | PF35-24C1 | 15 | 12 | 90 | 37 | 15 | $4,5 \times 10^{7}$ | 20,6 | 80 |
| Unipolar | PF35-24D1 | 15 | 5 | 16 | 6,7 | 15 | $4,5 \times 10^{7}$ | 20,6 | 80 |

| Gear Ratio | 6/25 | 1/5 | 3/25 | 1/10 |
|---|---|---|---|---|
| Ordinary Gear Strength | 200mN·m | | | |
| Destruction Gear Strength | 600mN·m | | | |

| Gear Ratio | 2/25 | 1/15 | 3/50 | 1/20 | 1/25 |
|---|---|---|---|---|---|
| Ordinary Gear Strength | 250mN·m | | | | |
| Destruction Gear Strength | 750mN·m | | | | |

| Gear Ratio | 1/30 | 1/50 | 1/60 | 2/125 | 1/75 |
|---|---|---|---|---|---|
| Ordinary Gear Strength | 300mN·m | | | | |
| Destruction Gear Strength | 900mN·m | | | | |

| Gear Ratio | 1/100 | 1/120 | 1/125 | 1/150 | 1/200 | 1/250 | 1/300 |
|---|---|---|---|---|---|---|---|
| Ordinary Gear Strength | 400mN·m | | | | | | |
| Destruction Gear Strength | 1200mN·m | | | | | | |



| | L |
|---|---|
| PF35 | 19.1 |

Ø35mm

| type of winding | Model | Step angle | Voltage | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | Ω/Φ | mH/Φ | mN·m | kg.m² | mm | g |
| bipolar | PF35T-48Q1 | 7,5 | 5 | 16 | 16 | 19 | $2,7 \times 10^{7}$ | 15 | 77 |
| bipolar | PF35T-48Q4 | 7,5 | 5 | 16 | 5,5 | 22 | $2,7 \times 10^{7}$ | 15 | 77 |
| bipolar | PF35T-24R1 | 7,5 | 12 | 72 | 60 | 19 | $2,7 \times 10^{7}$ | 15 | 77 |
| bipolar | PF35T-24R1 | 7,5 | 12 | 72 | 53 | 22 | $2,7 \times 10^{7}$ | 15 | 77 |
| Unipolar | PF35T-48C1 | 7,5 | 12 | 70 | 30 | 18 | $2,7 \times 10^{7}$ | 15 | 77 |
| Unipolar | PF35T-48C4 | 7,5 | 12 | 70 | 26 | 24 | $2,7 \times 10^{7}$ | 15 | 77 |
| Unipolar | PF35T-48D1 | 7,5 | 5 | 12 | 5,5 | 18 | $2,7 \times 10^{7}$ | 15 | 77 |
| Unipolar | PF35T-48D4 | 7,5 | 5 | 12 | 4,8 | 24 | $2,7 \times 10^{7}$ | 15 | 77 |

| Gear Ratio | 1/5 | 1/6 | 1/10 | 1/12 | 1/15 | 1/18 | 1/25 | 1/30 |
|---|---|---|---|---|---|---|---|---|
| Ordinary Gear Strength | 100mN·m | | | 200mN·m | | | | |
| Destruction Gear Strength | 300mN·m | | | 600mN·m | | | | |

| Gear Ratio | 1/125 | 1/150 | 1/180 | 1/200 | 1/250 | 1/300 |
|---|---|---|---|---|---|---|
| Ordinary Gear Strength | 600mN·m | | | | | |
| Destruction Gear Strength | 1800mN·m | | | | | |

| Gear Ratio | 1/40 | 1/50 | 1/60 | 1/75 | 1/90 | 1/100 | 1/120 |
|---|---|---|---|---|---|---|---|
| Ordinary Gear Strength | 300mN·m | | | | | | |
| Destruction Gear Strength | 900mN·m | | | | | | |

| | L |
|---|---|
| PF35T | 13.5 |

| Gear Ratio | 1/5 | 1/6 | 1/10 | 1/18 | 1/30 | 1/40 | 1/50 | 1/60 | 1/75 | 1/90 | 1/100 | 1/120 | 1/125 | 1/150 | 1/180 | 1/200 | 1/300 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L | 19.5 | 19.5 | 19.5 | 19.5 | 19.5 | 21.7 | 21.7 | 21.7 | 21.7 | 21.7 | 21.7 | 21.7 | 23.8 | 23.8 | 23.8 | 23.8 | 23.8 |

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# Ø42 mm rotary tin can stepping motor

Ø42mm

| type of winding | Model | Step angle | Voltage | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | Ω/Φ | mH/Φ | mN·m | kg.m² | mm | g |
| bipolar | PF42-24P1 | 15 | 12 | 76 | 74 | 41 | 16,8 x $10^{7}$ | 21,8 | 160 |
| bipolar | PF42-24Q1 | 15 | 5 | 14 | 14 | 41 | 16,8 x $10^{7}$ | 21,8 | 160 |
| bipolar | PF42-48P1 | 7,5 | 12 | 76 | 87 | 54 | 16,8 x $10^{7}$ | 21,8 | 160 |
| bipolar | PF42-48P4 | 7,5 | 12 | 76 | 76,5 | 54 | 16,8 x $10^{7}$ | 21,8 | 160 |
| bipolar | PF42-48Q1 | 7,5 | 5 | 14 | 16 | 54 | 16,8 x $10^{7}$ | 21,8 | 160 |
| bipolar | PF42-48Q4 | 7,5 | 5 | 14 | 14 | 54 | 16,8 x $10^{7}$ | 21,8 | 160 |
| unipolar | PF42-24C1 | 15 | 12 | 70 | 35 | 28 | 16,8 x $10^{7}$ | 21,8 | 160 |
| unipolar | PF42-24D1 | 15 | 5 | 12 | 5,9 | 28 | 16,8 x $10^{7}$ | 21,8 | 160 |
| unipolar | PF42-48C1 | 7,5 | 12 | 70 | 41 | 45 | 16,8 x $10^{7}$ | 21,8 | 160 |
| unipolar | PF42-48C4 | 7,5 | 12 | 70 | 36 | 45 | 16,8 x $10^{7}$ | 21,8 | 160 |
| unipolar | PF42-48D1 | 7,5 | 5 | 12 | 6,9 | 45 | 16,8 x $10^{7}$ | 21,8 | 160 |
| unipolar | PF42-48D4 | 7,5 | 5 | 12 | 6,1 | 45 | 16,8 x $10^{7}$ | 21,8 | 160 |

Ø42mm

| type of winding | Model | Step angle | Voltage | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | Ω/Φ | mH/Φ | mN·m | kg.m² | mm | g |
| bipolar | PF42T-48P1 | 7,5 | 12 | 64 | 51 | 42 | 14,8 x $10^{7}$ | 14,9 | 105 |
| bipolar | PF42T-48P4 | 7,5 | 12 | 64 | 44,9 | 42 | 11,4 x $10^{7}$ | 14,9 | 105 |
| bipolar | PF42T-48Q1 | 7,5 | 5 | 12 | 11 | 42 | 14,8 x $10^{7}$ | 14,9 | 105 |
| bipolar | PF42T-48Q4 | 7,5 | 5 | 12 | 9,7 | 42 | 11,4 x $10^{7}$ | 14,9 | 105 |
| bipolar | PF42T-96P1 | 3,75 | 12 | 64 | 51 | 49 | 14,8 x $10^{7}$ | 14,9 | 105 |
| bipolar | PF42T-96P4 | 3,75 | 12 | 64 | 44,9 | 49 | 11,4 x $10^{7}$ | 14,9 | 105 |
| bipolar | PF42T-96Q1 | 3,75 | 5 | 12 | 12 | 49 | 14,8 x $10^{7}$ | 14,9 | 105 |
| bipolar | PF42T-96Q4 | 3,75 | 5 | 12 | 10,5 | 49 | 11,4 x $10^{7}$ | 14,9 | 105 |
| unipolar | PF42T-48C1 | 7,5 | 12 | 60 | 25 | 34 | 14,8 x $10^{7}$ | 14,9 | 105 |
| unipolar | PF42T-48C4 | 7,5 | 12 | 60 | 22 | 34 | 11,4 x $10^{7}$ | 14,9 | 105 |
| unipolar | PF42T-48D1 | 7,5 | 5 | 10 | 4 | 34 | 14,8 x $10^{7}$ | 14,9 | 105 |
| unipolar | PF42T-48D4 | 7,5 | 5 | 10 | 3,5 | 34 | 11,4 x $10^{7}$ | 14,9 | 105 |
| unipolar | PF42T-96C1 | 3,75 | 12 | 60 | 29 | 30 | 14,8 x $10^{7}$ | 14,9 | 105 |
| unipolar | PF42T-96C4 | 3,75 | 12 | 60 | 25,5 | 30 | 11,4 x $10^{7}$ | 14,9 | 105 |
| unipolar | PF42T-96D1 | 3,75 | 5 | 10 | 4,6 | 36 | 14,8 x $10^{7}$ | 14,9 | 105 |
| unipolar | PF42T-96D4 | 3,75 | 5 | 10 | 4 | 36 | 11,4 x $10^{7}$ | 14,9 | 105 |

Ø42mm

| type of winding | Model | Step angle | Voltage | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | Ω/Φ | mH/Φ | mN·m | kg.m² | mm | g |
| bipolar | PF42H-48P1 | 7,5 | 12 | 70 | 80 | 70 | 27 x $10^{7}$ | 21,8 | 160 |
| bipolar | PF42H-48Q1 | 7,5 | 5 | 12 | 13 | 70 | 27 x $10^{7}$ | 21,8 | 160 |
| bipolar | PF42H-48Q4 | 7,5 | 5 | 13 | 12 | 70 | 27 x $10^{7}$ | 21,8 | 160 |
| unipolar | PF42H-48C1 | 7,5 | 12 | 70 | 39 | 50 | 27 x $10^{7}$ | 21,8 | 160 |
| unipolar | PF42H-48D1 | 7,5 | 5 | 12 | 6,6 | 50 | 27 x $10^{7}$ | 21,8 | 160 |

## Gearhead PF42

| Gear Ratio | 6/25 | 1/5 | 3/25 | 1/10 | 2/25 | 1/15 | 3/50 | 1/20 | 1/25 |
|---|---|---|---|---|---|---|---|---|---|
| Ordinary Gear Strength | 200mN·m | | | | 250mN·m | | | | |
| Destruction Gear Stength | 600mN·m | | | | 750mN·m | | | | |

| Gear Ratio | 1/30 | 1/50 | 1/60 | 2/125 | 1/75 |
|---|---|---|---|---|---|
| Ordinary Gear Strength | 300mN·m | | | | |
| Destruction Gear Stength | 900mN·m | | | | |

| Gear Ratio | 1/100 | 1/120 | 1/125 | 1/150 | 1/200 | 1/250 | 1/300 |
|---|---|---|---|---|---|---|---|
| Ordinary Gear Strength | 400mN·m | | | | | | |
| Destruction Gear Stength | 1200mN·m | | | | | | |

## Gearhead PF42H

| Gear Ratio | 6/25 | 1/5 | 3/25 | 1/10 | 2/25 | 1/15 | 3/50 | 1/20 | 1/25 |
|---|---|---|---|---|---|---|---|---|---|
| Ordinary Gear Strength | 200mN·m | | | | 250mN·m | | | | |
| Destruction Gear Stength | 600mN·m | | | | 750mN·m | | | | |

| Gear Ratio | 1/30 | 1/50 | 1/60 | 2/125 | 1/75 |
|---|---|---|---|---|---|
| Ordinary Gear Strength | 300mN·m | | | | |
| Destruction Gear Stength | 900mN·m | | | | |

| Gear Ratio | 1/100 | 1/120 | 1/125 | 1/150 | 1/200 | 1/250 | 1/300 |
|---|---|---|---|---|---|---|---|
| Ordinary Gear Strength | 400mN·m | | | | | | |
| Destruction Gear Stength | 1200mN·m | | | | | | |

## Gearhead PF(C)42T

| Gear Ratio | 6/25 | 1/5 | 3/25 | 1/10 | 2/25 | 1/15 | 3/50 | 1/20 | 1/25 |
|---|---|---|---|---|---|---|---|---|---|
| Ordinary Gear Strength | 200mN·m | | | | 250mN·m | | | | |
| Destruction Gear Stength | 600mN·m | | | | 750mN·m | | | | |

| Gear Ratio | 1/30 | 1/50 | 1/60 | 2/125 | 1/75 |
|---|---|---|---|---|---|
| Ordinary Gear Strength | 300mN·m | | | | |
| Destruction Gear Stength | 900mN·m | | | | |

| Gear Ratio | 1/100 | 1/120 | 1/125 | 1/150 | 1/200 | 1/250 | 1/300 |
|---|---|---|---|---|---|---|---|
| Ordinary Gear Strength | 400mN·m | | | | | | |
| Destruction Gear Stength | 1200mN·m | | | | | | |

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# Ø55 mm rotary tin can stepping motor

Ø55mm

| type of winding | Model | Step angle | Voltage | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | Ω/Φ | mH/Φ | mN·m | kg.m² | mm | g |
| bipolar | PF55-48P1 | 7,5 | 12 | 40 | 84 | 150 | 40 x $10^{7}$ | 26 | 300 |
| bipolar | PF55-48P4 | 7,5 | 12 | 40 | 73,9 | 150 | 35 x $10^{7}$ | 26 | 300 |
| bipolar | PF55-48Q1 | 7,5 | 5 | 6,75 | 12 | 150 | 40 x $10^{7}$ | 26 | 300 |
| bipolar | PF55-48Q4 | 7,5 | 5 | 7 | 10,5 | 150 | 40 x $10^{7}$ | 26 | 300 |
| unipolar | PF55-48C1 | 7,5 | 12 | 36 | 37 | 120 | 40 x $10^{7}$ | 26 | 300 |
| unipolar | PF55-48C4 | 7,5 | 12 | 36 | 32,5 | 120 | 35 x $10^{7}$ | 26 | 300 |
| unipolar | PF55-48D1 | 7,5 | 5 | 5 | 4,6 | 120 | 40 x $10^{7}$ | 26 | 300 |
| unipolar | PF55-48D4 | 7,5 | 5 | 5 | 4 | 120 | 35 x $10^{7}$ | 26 | 300 |

Ø55mm

| type of winding | Model | Step angle | Voltage | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | Ω/Φ | mH/Φ | mN·m | kg.m² | mm | g |
| bipolar | PF55H-48C1 | 7,5 | 12 | 36 | 84 | 180 | 97x $10^{7}$ | 26 | 300 |
| bipolar | PF55H-48Q1 | 7,5 | 5 | 5 | 12 | 180 | 97x $10^{7}$ | 26 | 300 |
| unipolar | PF55H-48C1 | 7,5 | 12 | 36 | 30 | 150 | 97x $10^{7}$ | 26 | 300 |
| unipolar | PF55H-48D1 | 7,5 | 5 | 5 | 4,4 | 150 | 97x $10^{7}$ | 26 | 300 |

## Gearhead PFC55

| Gear Ratio | 6/25 | 1/5 | 3/25 | 1/10 | 2/25 | 1/15 | 3/50 | 1/20 |
|---|---|---|---|---|---|---|---|---|
| Ordinary Gear Strength | 400mN·m | | | | | | | |

| Gear Ratio | 1/25 | 1/30 | 1/50 | 1/60 | 2/125 | 1/75 |
|---|---|---|---|---|---|---|
| Ordinary Gear Strength | 700mN·m | | | | 1000mN·m | |

| Gear Ratio | 3/250 | 1/100 | 1/125 | 1/150 | 1/250 | 1/300 |
|---|---|---|---|---|---|---|
| Ordinary Gear Strength | 1000mN·m | | | | | |

## Gearhead PF55H

| Gear Ratio | 1/3 | 1/5 | 2/15 | 1/10 | 2/25 | 1/15 | 1/20 |
|---|---|---|---|---|---|---|---|
| Ordinary Gear Strength | 400mN·m | | 500mN·m | | | 600mN·m | 800mN·m |

| Gear Ratio | 1/25 | 1/30 | 1/50 | 1/60 |
|---|---|---|---|---|
| Ordinary Gear Strength | 900mN·m | 1100mN·m | 1600mN·m | |

| Gear Ratio | 1/75 | 1/100 | 1/125 | 1/150 | 1/180 |
|---|---|---|---|---|---|
| Ordinary Gear Strength | 2500mN·m | | | | |


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**www.dynetics.eu**

**HYBRIDS (2-Phase):**

**36mm with 0.9˚ Flat hybrid stepper motor**

With the development of surveillance cameras in mind, a complete New Series 36mm x 0.9˚stepper motors has been developed by Shinano Kenshi. Thanks to its favourable price and performance ratio, this series of motors is also universally applicable for many other applications.

| frame size: Ø36mm | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| wiring | Model | Step angle | Voltage | Current | Resistance | Inductance | Holding torque | Rotor inertia | Mass | Length |
| | | Deg. | V | A/Φ | Ω/Φ | mH/Φ | mN·m | g.cm² | g | mm |
| bipolar | SST36C0030 | 0.9 | 5.0 | 0.3 | 16.80 | 8.50 | 41.2 | 7.3 | 50 | 12.35 |
| bipolar | SST36C0050 | 0.9 | 3.2 | 0.5 | 6.40 | 3.16 | 41.2 | 7.3 | 50 | 12.35 |
| bipolar | SST36C0060 | 0.9 | 2.6 | 0.6 | 4.30 | 2.23 | 41.2 | 7.3 | 50 | 12.35 |
| bipolar | SST36C0080 | 0.9 | 2.0 | 0.8 | 2.53 | 1.24 | 41.2 | 7.3 | 50 | 12.35 |
| bipolar | SST36C1030 | 0.9 | 8.2 | 0.3 | 27.20 | 20.70 | 100 | 19.6 | 90 | 19.7 |
| bipolar | SST36C1050 | 0.9 | 5.2 | 0.45 | 11.50 | 9.00 | 100 | 19.6 | 90 | 19.7 |
| bipolar | SST36C1060 | 0.9 | 4.1 | 0.6 | 6.90 | 5.35 | 100 | 19.6 | 90 | 19.7 |
| bipolar | SST36C1080 | 0.9 | 3.3 | 0.8 | 4.10 | 3.16 | 100 | 19.6 | 90 | 19.7 |

**20mm hybrid stepper motor (NEMA 10)**

motor is ideal for motion control applications where the benefits of smaller size with high torque are essential. They feature superior response characteristics and function in a wide variety of applications.

| frame size: 20mm (NEMA 8) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| wiring | Model | Step angle | Voltage | Current | Resistance | Inductance | Holding torque | Rotor inertia | Mass | Length |
| | | Deg. | V | A/Φ | Ω/Φ | mH/Φ | mN·m | g.cm² | g | mm |
| bipolar | PJE20T-28E14 | 1,8 | 2,47 | 0,95 | 2,6 | 0,8 | 22 | 2 | 60 | 28 |
| bipolar | pJE20T-40E14 | 1,8 | 2,47 | 0,95 | 4,16 | 1,55 | 38 | 2 | 60 | 28 |

**28mm hybrid stepper motor (NEMA11)**

motor is ideal for motion control applications where the benefits of smaller size with high torque are essential. They feature superior response characteristics and function in a wide variety of applications.

| frame size: 28mm (NEMA 11) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| wiring | Model | Step angle | Voltage | Current | Resistance | Inductance | Holding torque | Rotor inertia | Mass | Length |
| | | Deg. | V | A/Φ | Ω/Φ | mH/Φ | mN·m | g.cm² | g | mm |
| bipolar | PJP28T-32E16 | 1,8 | 2,66 | 0,95 | 2,8 | 1 | 45 | 9 | 110 | 31,5 |
| bipolar | PJP28T-40E16 | 1,8 | 3,23 | 0,95 | 3,4 | 1,5 | 60 | 12 | 150 | 39,5 |
| bipolar | PJP28T-45E16 | 1,8 | 3,71 | 0,95 | 3,9 | 1,5 | 75 | 14 | 170 | 44,5 |
| bipolar | KV2832-N2B901 | 1,8 | 1,95 | 1,5 | 1,3 | 0,9 | 85 | 9,2 | 110 | 32 |
| bipolar | PJP28T-51E16 | 1,8 | 4,37 | 0,95 | 4,6 | 1,7 | 90 | 17 | 195 | 50,5 |
| bipolar | DYNSST28D110X | 1,8 | 1,89 | 1.3 | 1,45 | 1,25 | 92,2 | 8 | 110 | 32 |
| bipolar | KV2841-N2B901 | 1,8 | 2,55 | 1,5 | 1,7 | 1 | 120 | 15 | 140 | 41 |
| bipolar | DYNSST28D210X | 1,8 | 2,21 | 1.3 | 1,7 | 1,2 | 123 | 12 | 145 | 39.7 |
| bipolar | KV2851-N2B901 | 1,8 | 3,15 | 1,5 | 2,1 | 1,7 | 165 | 22 | 190 | 51 |
| bipolar | DYNSST28D310X | 1,8 | 2,93 | 1.3 | 2,25 | 1,7 | 183 | 17 | 195 | 51.6 |
| unipolar | KV2832-N2U951 | 1,8 | 3 | 1 | 3 | 1 | 65 | 9,2 | 110 | 32 |
| unipolar | KV2841-N2U951 | 1,8 | 3,6 | 1 | 3,8 | 1,2 | 85 | 15 | 140 | 41 |
| unipolar | KV2851-N2U951 | 1,8 | 3,8 | 1 | 4,3 | 1,7 | 120 | 22 | 190 | 51 |

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## 35mm hybrid stepper motor (NEMA11)

High torque low vibraton, long liftime

frame size: 35mm (NEMA 14)

| wiring | Model | Step angle | Voltage | Current | Resistance | Inductance | Holding torque | Rotor inertia | Mass | Length |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | A/Φ | Ω/Φ | mH/Φ | mN·m | g.cm² | g | mm |
| bipolar | DYNSST35D4225 | 1.8 | 2.75 | 2.2 | 1.25 | 1.15 | 415 | 41 | 280 | 50.5 |
| bipolar | DYNSST35D4205 | 1.8 | 3.00 | 2.0 | 1.50 | 1.70 | 450 | 41 | 280 | 50.5 |
| bipolar | DYNSST35D4185 | 1.8 | 3.15 | 1.8 | 1.75 | 2.40 | 465 | 41 | 280 | 50.5 |
| bipolar | DYNSST35D4165 | 1.8 | 3.60 | 1.6 | 2.25 | 3.90 | 515 | 41 | 280 | 50.5 |
| bipolar | PJE35T-26E14 | 1.8 | 2.95 | 0,95 | 3,1 | 1,99 | 70 | 8 | 100 | 26 |
| bipolar | PJE35T-37E14 | 1.8 | 4,56 | 0,95 | 4,8 | 4,8 | 180 | 8 | 100 | 36,5 |
| bipolar | PJE35T-53E14 | 1.8 | 6,94 | 0,95 | 7,3 | 8,9 | 310 | 8 | 100 | 53 |

frame size: Ø36mm

| wiring | Model | Step angle | Voltage | Current | Resistance | Inductance | Holding torque | Rotor inertia | Mass | Length |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | A/Φ | Ω/Φ | mH/Φ | mN·m | g.cm² | g | mm |
| bipolar | SST36C0030 | 0.9 | 5.0 | 0.3 | 16.80 | 8.50 | 41.2 | 7.3 | 50 | 12.35 |
| bipolar | SST36C0050 | 0.9 | 3.2 | 0.5 | 6.40 | 3.16 | 41.2 | 7.3 | 50 | 12.35 |
| bipolar | SST36C0060 | 0.9 | 2.6 | 0.6 | 4.30 | 2.23 | 41.2 | 7.3 | 50 | 12.35 |
| bipolar | SST36C0080 | 0.9 | 2.0 | 0.8 | 2.53 | 1.24 | 41.2 | 7.3 | 50 | 12.35 |
| bipolar | SST36C1030 | 0.9 | 8.2 | 0.3 | 27.20 | 20.70 | 100 | 19.6 | 90 | 19.7 |
| bipolar | SST36C1050 | 0.9 | 5.2 | 0.45 | 11.50 | 9.00 | 100 | 19.6 | 90 | 19.7 |
| bipolar | SST36C1060 | 0.9 | 4.1 | 0.6 | 6.90 | 5.35 | 100 | 19.6 | 90 | 19.7 |
| bipolar | SST36C1080 | 0.9 | 3.3 | 0.8 | 4.10 | 3.16 | 100 | 19.6 | 90 | 19.7 |

## 39mm hybrid stepper motor (NEMA16)

High torque low vibration, long lifetime

frame size: 39mm (NEMA 16)

| wiring | Model | Step angle | Voltage | Current | Resistance | Inductance | Holding torque | Rotor inertia | Mass | Length |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | A/Φ | Ω/Φ | mH/Φ | mN·m | g.cm² | g | mm |
| bipolar | KH39EM2-801 | 1.8 | 5,6 | 0,4 | 14 | 6,4 | 59 | 14 | 110 | 20,8 |
| bipolar | KH39FM2-801 | 1.8 | 6,3 | 0,42 | 15 | 8,5 | 88 | 19 | 160 | 27 |
| bipolar | KH39GM2-801 | 1.8 | 5,6 | 0,47 | 13,6 | 9,8 | 127 | 27 | 240 | 31 |
| unipolar | KH39EM2-851 | 1.8 | 3,6 | 0,6 | 6 | 5,5 | 78 | 14 | 110 | 20,8 |
| unipolar | KH39FM2-851 | 1.8 | 4 | 0,67 | 6 | 6,8 | 118 | 19 | 160 | 27 |
| unipolar | KH39GM2-851 | 1.8 | 4,6 | 0,65 | 7 | 9,8 | 157 | 27 | 240 | 31 |

## 42mm hybrid stepper motor (NEMA17)

High torque low vibration, long lifetime

frame size: 42mm (NEMA 17)

| wiring | Model | Step angle | Voltage | Current | Resistance | Inductance | Holding torque | Rotor inertia | Mass | Length |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | A/Φ | Ω/Φ | mH/Φ | mN·m | g.cm² | g | mm |
| bipolar | DYNSHSST42C103X | 0,9 | 5,6 | 0,3 | 18,7 | 34,8 | 177 | 33 | 34 | 230 |
| bipolar | DYNSHSST42C106X | 0,9 | 3,2 | 0,6 | 5,4 | 8,6 | 184 | 33 | 34 | 230 |
| bipolar | DYNSHSST42C110X | 0,9 | 1,2 | 1 | 2,2 | 3,9 | 196 | 33 | 34 | 230 |
| bipolar | KV4234-N4B801 | 4,09 | 2,52 | 1,4 | 1,8 | 2,7 | 200 | 42 | 34 | 210 |
| bipolar | KV4234-N4B801 | 4,09 | 2,94 | 1,4 | 2,1 | 4,2 | 215 | 59 | 39 | 260 |
| bipolar | KH4234-B95101 | 1.8 | 3,41 | 1,1 | 3,1 | 4,4 | 250 | 38 | | 34 |
| bipolar | KH4234-B95101 | 1.8 | 3,41 | 1,1 | 3,1 | 4,4 | 250 | 38 | 34 | |
| bipolar | KV4239-T4B801 | 4,09 | 2,94 | 1,4 | 2,1 | 3,8 | 260 | 59 | 39 | 260 |
| bipolar | KV4242-N4B801 | 4,09 | 3,22 | 1,4 | 2,3 | 4,5 | 290 | 69 | 42 | 320 |
| bipolar | PJE42T-34D14 | 1.8 | 2,9 | 1,2 | 2,1 | 3,7 | 300 | 54 | 34 | 300 |
| bipolar | DYNSHSST42C204X | 0,9 | 6 | 0,4 | 15 | 34,5 | 312 | 56 | 40 | 290 |
| bipolar | DYNSHSST42C208X | 0,9 | 3 | 0,8 | 3,8 | 9,2 | 324 | 56 | 40 | 290 |
| bipolar | DYNSHSST42C212X | 0,9 | 2 | 1,2 | 1,7 | 4,5 | 324 | 56 | 40 | 290 |
| bipolar | KF4234-EN2B801 | 1,8 | 4,1 | 1 | 4,1 | 5,3 | 330 | 70 | 34 | 230 |
| bipolar | DYNSHSST42C304X | 0,9 | 6,3 | 0,4 | 15,7 | 32 | 334 | 72 | 47.5 | 360 |
| bipolar | KH4238-B95101 | 1.8 | 3,24 | 1,2 | 2,7 | 4,9 | 340 | 48 | | 38 |
| bipolar | KH4238-B95101 | 1.8 | 3,24 | 1,2 | 2,7 | 4,9 | 340 | 48 | 38 | |
| bipolar | DYNSHSST42C312X | 0,9 | 2 | 1,2 | 1,7 | 4 | 346 | 72 | 47.5 | 360 |
| bipolar | DYNSHSST42C308X | 0,9 | 3,2 | 0,8 | 4 | 9,7 | 358 | 72 | 47.5 | 360 |
| bipolar | PJE42T-48D14 | 1,8 | 4 | 1,2 | 3,1 | 7,2 | 370 | 77 | 49 | 360 |
| bipolar | KH4242-B95101 | 1.8 | 3,41 | 1,1 | 3,1 | 6,9 | 380 | 59 | | 42 |
| bipolar | KH4242-B95101 | 1.8 | 3,41 | 1,1 | 3,1 | 6,9 | 380 | 59 | 42 | |
| bipolar | KV4248-N4B801 | 4,09 | 3,78 | 1,4 | 2,7 | 5 | 390 | 79 | 48 | 370 |
| bipolar | KF4239-EN2B801 | 1,8 | 3,08 | 1,4 | 2,2 | 2,7 | 400 | 100 | 39 | 290 |
| bipolar | KF4239-EN2B802 | 1,8 | 4,85 | 0,85 | 5,7 | 6,9 | 400 | 100 | 39 | 290 |
| bipolar | PJE42T-40D14 | 1.8 | 3,6 | 1,2 | 2,5 | 6 | 400 | 54 | 40 | 300 |
| bipolar | KF4242-EN2B801 | 1,8 | 3,36 | 1,4 | 2,4 | 4 | 460 | 145 | 42 | 330 |
| bipolar | KF4242-EN2B802 | 1,8 | 5,36 | 0,85 | 6,3 | 10 | 460 | 145 | 42 | 330 |
| bipolar | KH4248-B95101 | 1.8 | 3 | 1,5 | 2 | 3,6 | 480 | 78 | | 48 |
| bipolar | KH4248-B95101 | 1.8 | 3 | 1,5 | 2 | 3,6 | 480 | 78 | 48 | |
| bipolar | KH4254-B95101 | 1.8 | 3,22 | 1,4 | 2,3 | 5 | 570 | 98 | | 54 |
| bipolar | KH4254-B95101 | 1.8 | 3,22 | 1,4 | 2,3 | 5 | 570 | 98 | 54 | |

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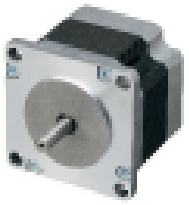

**42mm hybrid stepper motor (NEMA17)**
High torque low vibration, long lifetime

| wiring | Model | Step angle | Voltage | Current | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | A/Φ | Ω/Φ | mH/Φ | mN·m | g.cm² | mm | g |
| unipolar | KV4234-N4U801 | 4,09 | 2,57 | 1,35 | 1,9 | 1,4 | 150 | 42 | 34 | 210 |
| unipolar | KV4239-T4U801 | 4,09 | 3,08 | 1,4 | 2,2 | 2,1 | 160 | 59 | 39 | 260 |
| unipolar | DYNSHSST42C103XU | 0,9 | 11.2 | 0,3 | 37,4 | 34,8 | 177 | 33 | 34 | 230 |
| unipolar | DYNSHSST42C106XU | 0,9 | 6,3 | 0,6 | 10,5 | 8,6 | 184 | 33 | 34 | 230 |
| unipolar | KH4234-B90101 | 1.8 | 2,97 | 1,1 | 2,7 | 2,1 | 190 | 38 | | 34 |
| unipolar | KH4234-B90101 | 1.8 | 2,97 | 1,1 | 2,7 | 2,1 | 190 | 38 | 34 | |
| unipolar | DYNSHSST42C110XU | 0,9 | 4,4 | 1 | 4,4 | 3,9 | 196 | 33 | 34 | 230 |
| unipolar | KV4239-N4U801 | 4,09 | 3,08 | 1,4 | 2,2 | 1,9 | 200 | 59 | 39 | 260 |
| unipolar | KV4234-N2U801 | 1,8 | 2,97 | 1,1 | 2,7 | 2,1 | 210 | 42 | 34 | 210 |
| unipolar | KV4239-T2U801 | 1,8 | 3,36 | 1,2 | 2,8 | 3,2 | 220 | 59 | 39 | 260 |
| unipolar | KV4242-N4U801 | 4,09 | 3,5 | 1,4 | 2,5 | 2,4 | 230 | 69 | 42 | 320 |
| unipolar | KH4238-B90101 | 1.8 | 3,08 | 1,4 | 2,2 | 1,9 | 260 | 48 | | 38 |
| unipolar | KH4238-B90201 | 1.8 | 3,6 | 1,2 | 3 | 2,8 | 260 | 48 | | 38 |
| unipolar | KH4238-B90101 | 1.8 | 3,08 | 1,4 | 2,2 | 1,9 | 260 | 48 | 38 | |
| unipolar | KH4238-B90201 | 1.8 | 3,6 | 1,2 | 3 | 2,8 | 260 | 48 | 38 | |
| unipolar | KV4248-N4U801 | 4,09 | 4,05 | 1,35 | 3 | 2,7 | 280 | 79 | 48 | 370 |
| unipolar | KV4239-N2U801 | 1,8 | 3,36 | 1,2 | 2,8 | 2,9 | 280 | 59 | 39 | 260 |
| unipolar | KH4242-B90101 | 1.8 | 3,25 | 1,3 | 2,5 | 2,6 | 300 | 59 | | 42 |
| unipolar | KH4242-B90201 | 1.8 | 3,74 | 1,1 | 3,4 | 4 | 300 | 59 | | 42 |
| unipolar | KH4242-B90101 | 1.8 | 3,25 | 1,3 | 2,5 | 2,6 | 300 | 59 | 42 | |
| unipolar | KH4242-B90201 | 1.8 | 3,74 | 1,1 | 3,4 | 4 | 300 | 59 | 42 | |
| unipolar | DYNSHSST42C204XU | 0,9 | 12 | 0,4 | 30 | 34,5 | 312 | 56 | 40 | 290 |
| unipolar | KV4242-N2U801 | 1,8 | 3,54 | 1,2 | 3 | 3,2 | 320 | 69 | 42 | 320 |
| unipolar | DYNSHSST42C208XU | 0,9 | 6,2 | 0,8 | 7,7 | 9,2 | 324 | 56 | 40 | 290 |
| unipolar | DYNSHSST42C212XU | 0,9 | 4,1 | 1,2 | 3,4 | 4,5 | 324 | 56 | 40 | 290 |
| unipolar | DYNSHSST42C304XU | 0,9 | 12,6 | 0,4 | 31,5 | 32 | 334 | 72 | 47.5 | 360 |
| unipolar | DYNSHSST42C312XU | 0,9 | 4,1 | 1,2 | 3,4 | 4 | 346 | 72 | 47.5 | 360 |
| unipolar | KH4248-B90101 | 1.8 | 3,6 | 1,2 | 3 | 2,6 | 350 | 78 | | 48 |
| unipolar | KH4248-B90101 | 1.8 | 3,6 | 1,2 | 3 | 2,6 | 350 | 78 | 48 | |
| unipolar | DYNSHSST42C308XU | 0,9 | 6,4 | 0,8 | 8 | 9,7 | 358 | 72 | 47.5 | 360 |
| unipolar | KV4248-N2U801 | 1,8 | 4,08 | 1,2 | 3,4 | 3,7 | 410 | 79 | 48 | 370 |
| unipolar | KH4254-B90101 | 1.8 | 4,2 | 1,2 | 3,5 | 4,1 | 460 | 98 | | 54 |
| unipolar | KH4254-B90101 | 1.8 | 4,2 | 1,2 | 3,5 | 4,1 | 460 | 98 | 54 | |

Non-rare earth magnet models
frame size: 42 mm (NEMA 17)

| wiring | Model | Step angle | Voltage | Current | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | A/Φ | Ω/Φ | mH/Φ | mN·m | g.cm² | mm | g |
| bipolar | KV4234-N2B801 | 1,8 | 2,76 | 1,2 | 2,3 | 3,6 | 260 | 42 | 34 | 210 |
| bipolar | KV4234-N2B802 | 1,8 | 4 | 0,8 | 5 | 7,5 | 260 | 42 | 34 | 210 |
| bipolar | KV4239-T2B801 | 1,8 | 2,94 | 1,4 | 2,1 | 4,5 | 300 | 59 | 39 | 260 |
| bipolar | KV4239-T2B802 | 1,8 | 4,88 | 0,8 | 6,1 | 14 | 300 | 59 | 39 | 260 |
| bipolar | KV4239-N2B801 | 1,8 | 2,94 | 1,4 | 2,1 | 4,1 | 370 | 59 | 39 | 260 |
| bipolar | KV4239-N2B802 | 1,8 | 4,88 | 0,8 | 6,1 | 14 | 370 | 59 | 39 | 260 |
| bipolar | KV4242-N2B801 | 1,8 | 3,72 | 1,2 | 3,1 | 5 | 420 | 69 | 42 | 320 |
| bipolar | KV4248-N2B801 | 1,8 | 3,9 | 1,3 | 3 | 6,1 | 530 | 79 | 48 | 370 |
| unipolar | KV4234-N4U801 | 4,09 | 2,57 | 1,35 | 1,9 | 1,4 | 150 | 42 | 34 | 210 |
| unipolar | KV4234-T4U801 | 4,09 | 3,08 | 1,4 | 2,2 | 2,1 | 160 | 59 | 39 | 260 |
| unipolar | KV4239-N4U801 | 4,09 | 3,08 | 1,4 | 2,2 | 1,9 | 200 | 59 | 39 | 260 |
| unipolar | KV4234-N2U801 | 1,8 | 2,97 | 1,1 | 2,7 | 2,1 | 210 | 42 | 34 | 210 |
| unipolar | KV4239-T2U801 | 1,8 | 3,36 | 1,2 | 2,8 | 3,2 | 220 | 59 | 39 | 260 |
| unipolar | KV4242-N4U801 | 4,09 | 3,5 | 1,4 | 2,5 | 2,4 | 230 | 69 | 42 | 320 |
| unipolar | KV4239-N2U801 | 1,8 | 3,36 | 1,2 | 2,8 | 2,9 | 280 | 59 | 39 | 260 |
| unipolar | KV4248-N4U801 | 4,09 | 4,05 | 1,35 | 3 | 2,7 | 280 | 79 | 48 | 370 |
| unipolar | KV4242-N2U801 | 1,8 | 3,54 | 1,2 | 3 | 3,2 | 320 | 69 | 42 | 320 |
| unipolar | KV4248-N2U801 | 1,8 | 4,08 | 1,2 | 3,4 | 3,7 | 410 | 79 | 48 | 370 |

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**56mm hybrid stepper motor (NEMA18)**
High torque low vibration, long lifetime

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frame size: 56 mm (NEMA 23)

| wiring | Model | Step angle | Voltage | Current | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | A/Φ | Ω/Φ | mH/Φ | mN·m | g.cm² | mm | g |
| bipolar | DYNSHSTA-56D1005 | 1,8 | 4,2 | 1 | 4,2 | | 560 | 125 | 38,5 | 420 |
| bipolar | DYNSHSTA-56D1003 | 1,8 | 2 | 2 | 0,98 | | 570 | 125 | 38,5 | 420 |
| bipolar | DYNSHSTA-56D1001 | 1,8 | 1,5 | 3 | 0,5 | | 580 | 125 | 38,5 | 420 |
| bipolar | DYNSHSTA-56D1006 | 1,8 | 1,1 | 4,2 | 0,25 | | 770 | 125 | 38,5 | 420 |
| bipolar | DYNSHSTA-56D1010 | 1,8 | 2,9 | 1,4 | 2,1 | | 770 | 125 | 38,5 | 420 |
| bipolar | KH5640-B95101 | 1,8 | 2,4 | 2 | 1,2 | 3,1 | 780 | 170 | 40 | 460 |
| bipolar | KH5640-B95201 | 1,8 | 3,5 | 1,4 | 2,5 | 6 | 780 | 170 | 40 | 460 |
| bipolar | DYNSHSTA-56D1008 | 1,8 | 1,4 | 2,8 | 0,49 | | 780 | 125 | 38,5 | 420 |
| bipolar | DYNSHSTA-59D110X | 1,8 | 3,3 | 1,4 | 2,35 | 7,5 | 870 | 145 | 42 | 510 |
| bipolar | DYNSHSTA-59D115X | 1,8 | 2,2 | 2,1 | 1,05 | 3,4 | 870 | 145 | 42 | 510 |
| bipolar | DYNSHSTA-59D130X | 1,8 | 1,3 | 4,2 | 0,31 | 0,9 | 870 | 145 | 42 | 510 |
| bipolar | DYNSHSTA-59D120X | 1,8 | 1,8 | 2,8 | 0,65 | 2 | 880 | 145 | 42 | 510 |
| bipolar | DYNSHSTA-59D125X | 1,8 | 1,5 | 3,5 | 0,43 | 1,3 | 890 | 145 | 42 | 510 |
| bipolar | DYNSHSTA-56D3001 | 1,8 | 2 | 3 | 0,66 | | 1010 | 225 | 48 | 570 |
| bipolar | DYNSHSTA-56D3005 | 1,8 | 5,5 | 1 | 5,5 | | 1010 | 225 | 48 | 570 |
| bipolar | DYNSHSTA-56D3003 | 1,8 | 2,5 | 2 | 1,26 | | 1030 | 225 | 48 | 570 |
| bipolar | DYNSHSTA-59D210X | 1,8 | 3,9 | 1,4 | 2,75 | 9,2 | 1200 | 210 | 48,5 | 620 |
| bipolar | DYNSHSTA-59D215X | 1,8 | 2,5 | 2,1 | 1,2 | 4,1 | 1200 | 210 | 48,5 | 620 |
| bipolar | DYNSHSTA-59D230X | 1,8 | 1,4 | 4,2 | 0,34 | 1,1 | 1200 | 210 | 48,5 | 620 |
| bipolar | DYNSHSTA-59D220X | 1,8 | 2 | 2,8 | 0,7 | 2,4 | 1220 | 210 | 48,5 | 620 |
| bipolar | DYNSHSTA-59D225X | 1,8 | 1,7 | 3,5 | 0,48 | 1,6 | 1240 | 210 | 48,5 | 620 |
| bipolar | DYNSHSTA-56D3006 | 1,8 | 1,4 | 4,2 | 0,33 | | 1280 | 225 | 48 | 570 |
| bipolar | DYNSHSTA-56D3010 | 1,8 | 3,9 | 1,4 | 2,75 | | 1280 | 225 | 48 | 570 |
| bipolar | DYNSHSTA-56D3008 | 1,8 | 1,8 | 2,8 | 0,63 | | 1300 | 225 | 48 | 570 |
| bipolar | KH5652-B95101 | 1,8 | 3,36 | 2 | 1,68 | 4,5 | 1310 | 310 | 52 | 650 |
| bipolar | KH5652-B95201 | 1,8 | 4,9 | 1,4 | 3,5 | 8,8 | 1310 | 310 | 52 | 650 |
| bipolar | DYNSHSTA-59D310X | 1,8 | 4,4 | 1,4 | 3,15 | 11,1 | 1410 | 245 | 54,5 | 710 |
| bipolar | DYNSHSTA-59D315X | 1,8 | 2,9 | 2,1 | 1,4 | 5,1 | 1410 | 245 | 54,5 | 710 |
| bipolar | DYNSHSTA-59D330X | 1,8 | 1,7 | 4,2 | 0,41 | 1,3 | 1410 | 245 | 54,5 | 710 |
| bipolar | DYNSHSTA-59D320X | 1,8 | 2,4 | 2,8 | 0,85 | 3 | 1440 | 245 | 54,5 | 710 |
| bipolar | DYNSHSTA-59D325X | 1,8 | 1,9 | 3,5 | 0,55 | 2 | 1460 | 245 | 54,5 | 710 |
| bipolar | DYNSHSTA-56D5005 | 1,8 | 3,3 | 1 | 8,9 | | 1910 | 460 | 73,5 | 990 |
| bipolar | DYNSHSTA-56D5003 | 1,8 | 4 | 2 | 2 | | 1940 | 460 | 73,5 | 990 |
| bipolar | DYNSHSTA-56D5001 | 1,8 | 3,3 | 3 | 1,1 | | 1960 | 460 | 73,5 | 990 |
| bipolar | KH5674-B95101 | 1,8 | 5,2 | 2 | 2,6 | 7,2 | 2270 | 530 | 74 | 1000 |
| bipolar | KH5674-B95201 | 1,8 | 7,42 | 1,4 | 5,3 | 13,9 | 2270 | 530 | 74 | 1000 |
| bipolar | DYNSHSTA-59D510X | 1,8 | 6,7 | 1,4 | 4,8 | 19 | 2400 | 470 | 77,5 | 1110 |
| bipolar | DYNSHSTA-59D515X | 1,8 | 4,4 | 2,1 | 2,1 | 8,4 | 2400 | 470 | 77,5 | 1110 |
| bipolar | DYNSHSTA-59D530X | 1,8 | 2,5 | 4,2 | 0,6 | 2,2 | 2400 | 470 | 77,5 | 1110 |
| bipolar | DYNSHSTA-59D520X | 1,8 | 3,5 | 2,8 | 1,25 | 4,9 | 2440 | 470 | 77,5 | 1110 |
| bipolar | DYNSHSTA-56D5006 | 1,8 | 2,3 | 4,2 | 0,55 | | 2520 | 460 | 73,5 | 990 |
| bipolar | DYNSHSTA-56D5010 | 1,8 | 6,2 | 1,4 | 4,45 | | 2520 | 460 | 73,5 | 990 |
| bipolar | DYNSHSTA-56D5008 | 1,8 | 2,8 | 2,8 | 1 | | 2560 | 460 | 73,5 | 990 |
| bipolar | DYNSHSTA-59D525X | 1,8 | 3 | 3,5 | 0,85 | 3,3 | 2580 | 470 | 77,5 | 1110 |

| wiring | Model | Step angle | Voltage | Current | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | A/Φ | Ω/Φ | mH/Φ | mN·m | g.cm² | mm | g |
| unipolar | PJP56T-44A16 | 1,8 | 2,8 | 2 | 1,4 | 1,5 | 400 | 120 | 42,5 | 470 |
| unipolar | PJP56T-44B16 | 1,8 | 5,7 | 5,7 | 5,7 | 5,6 | 400 | 120 | 43,5 | 470 |
| unipolar | DYNSHSST56C110XU | 0,9 | 5,3 | 1 | 5,3 | 7 | 425 | 120 | 39,5 | 450 |
| unipolar | DYNSHSST56C120XU | 0,9 | 2,6 | 2 | 1,3 | 1,8 | 460 | 120 | 39,5 | 450 |
| unipolar | DYNSHSST56C130XU | 0,9 | 1,53 | 3 | 0,51 | 0,7 | 460 | 120 | 39,5 | 450 |
| unipolar | KH5640-B90101 | 1,8 | 1,75 | 3 | 0,58 | 0,92 | 680 | 170 | 40 | 460 |
| unipolar | KH5640-B90201 | 1,8 | 2,7 | 2 | 1,35 | 2 | 680 | 170 | 40 | 460 |
| unipolar | PJP56T-55A16 | 1,8 | 3,6 | 3,6 | 1,8 | 3,2 | 850 | 280 | 55 | 700 |
| unipolar | PJP56T-55B16 | 1,8 | 7,4 | 7,4 | 7,4 | 15 | 850 | 280 | 55 | 700 |
| unipolar | DYNSHSST56C310XU | 0,9 | 5,8 | 1 | 5,8 | 13 | 1029 | 306 | 54,5 | 710 |
| unipolar | DYNSHSST56C320XU | 0,9 | 3,2 | 2 | 1,6 | 3,5 | 1029 | 306 | 54,5 | 710 |
| unipolar | DYNSHSST56C330XU | 0,9 | 2,25 | 3 | 0,75 | 1,8 | 1029 | 306 | 54,5 | 710 |
| unipolar | KH5652-B90101 | 1,8 | 2,28 | 3 | 0,76 | 1,4 | 1140 | 310 | 52 | 650 |
| unipolar | KH5652-B90201 | 1,8 | 3,6 | 2 | 1,8 | 3 | 1140 | 310 | 52 | 650 |
| unipolar | PJP56T-78A16 | 1,8 | 4,5 | 4,5 | 2,25 | 3,8 | 1300 | 480 | 77,5 | 1000 |
| unipolar | PJP56T-78B16 | 1,8 | 8,6 | 8,6 | 8,6 | 15,2 | 1350 | 480 | 77,5 | 1000 |
| unipolar | DYNSHSST56C510XU | 0,9 | 8,5 | 1 | 8,5 | 18 | 1569 | 470 | 76 | 1100 |
| unipolar | DYNSHSST56C520XU | 0,9 | 4,8 | 2 | 2,4 | 5 | 1569 | 470 | 76 | 1100 |
| unipolar | DYNSHSST56C530XU | 0,9 | 3,3 | 3 | 1,1 | 2,5 | 1569 | 470 | 76 | 1100 |
| unipolar | KH5674-B90101 | 1,8 | 3,48 | 3 | 1,16 | 2,2 | 1970 | 530 | 74 | 1000 |
| unipolar | KH5674-B90201 | 1,8 | 5,4 | 2 | 2,7 | 4,9 | 1970 | 530 | 74 | 1000 |

## 57mm hybrid stepper motor

| wiring | Model | Step angle | Voltage | Current | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | A/Φ | Ω/Φ | mH/Φ | mN·m | g.cm² | mm | g |
| bipolar | PJE57T-46F14 | 1,8 | 1,71 | 3 | 0,57 | 1,24 | 800 | 180 | 45,5 | 520 |
| bipolar | PJE57T-56N14 | 1,8 | 1,76 | 4 | 0,44 | 1,4 | 1200 | 280 | 55,5 | 720 |
| bipolar | PJE57T-77R14 | 1,8 | 2 | 5 | 0,4 | 1,8 | 2000 | 480 | 76,5 | 1060 |

## 60mm hybrid stepper motor (NEMA 24)

frame size: 60mm (NEMA 24)

| wiring | Model | Step angle | Voltage | Current | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | A/Φ | Ω/Φ | mH/Φ | mN·m | g.cm² | mm | g |
| bipolar | PJE60T-56F14 | 1,8 | 2,25 | 3 | 0,75 | 2,28 | 1280 | 340 | 55,8 | 800 |
| bipolar | KH6054-B9510 | 1,8 | 3,08 | 2,8 | 1,1 | 3,3 | 1950 | 520 | 54 | 830 |
| bipolar | PJE60T-56N14 | 1,8 | 2,4 | 4 | 0,6 | 1,9 | 2200 | 490 | 68,3 | 1000 |
| bipolar | KH6065-B9510 | 1,8 | 3,92 | 2,8 | 1,4 | 3,8 | 2400 | 680 | 65 | 1020 |
| bipolar | PJE60T-56R14 | 1,8 | 2,15 | 5 | 0,43 | 1,7 | 3000 | 690 | 85,3 | 1300 |
| unipolar | DYNSHSST60D110X | 1,8 | 5,9 | 1 | 5,92 | 9,2 | 850 | 280 | 46,3 | 620 |
| unipolar | DYNSHSST60D120X | 1,8 | 3 | 2 | 1,5 | 2,5 | 880 | 280 | 46,3 | 620 |
| unipolar | DYNSHSST60D130X | 1,8 | 2,3 | 3 | 0,77 | 1,1 | 920 | 280 | 46,3 | 620 |
| unipolar | DYNSHSST60D310X | 1,8 | 7,3 | 1 | 7,33 | 14,5 | 1320 | 440 | 55,8 | 880 |
| unipolar | DYNSHSST60D320X | 1,8 | 3,8 | 2 | 1,9 | 3,9 | 1340 | 440 | 55,8 | 880 |
| unipolar | DYNSHSST60D330X | 1,8 | 2,8 | 3 | 0,94 | 1,8 | 1350 | 440 | 55,8 | 880 |
| unipolar | KH6054-B9010 | 1,8 | 3 | 3 | 1 | 1,4 | 1450 | 520 | 54 | 830 |
| unipolar | KH6054-B9020 | 1,8 | 4,6 | 2 | 2,3 | 3,4 | 1450 | 520 | 54 | 830 |
| unipolar | KH6065-B9010 | 1,8 | 3,3 | 3 | 1,1 | 1,5 | 1750 | 680 | 65 | 1020 |
| unipolar | KH6065-B9020 | 1,8 | 5,6 | 2 | 2,8 | 3,7 | 1750 | 680 | 65 | 1020 |
| unipolar | DYNSHSST60D410X | 1,8 | 9,2 | 1 | 9,2 | 17,4 | 1790 | 590 | 67,8 | 1020 |
| unipolar | DYNSHSST60D420X | 1,8 | 4,8 | 2 | 2,4 | 4,9 | 1850 | 590 | 67,8 | 1020 |
| unipolar | DYNSHSST60D430X | 1,8 | 3,6 | 3 | 1,19 | 2,2 | 1910 | 590 | 67,8 | 1020 |
| unipolar | DYNSHSST60D510X | 1,8 | 12,6 | 1 | 12,6 | 29 | 2560 | 920 | 87,8 | 1400 |
| unipolar | DYNSHSST60D520X | 1,8 | 6,4 | 2 | 3,2 | 8 | 2690 | 920 | 87,8 | 1400 |
| unipolar | DYNSHSST60D530X | 1,8 | 4,7 | 3 | 1,55 | 3,7 | 2800 | 920 | 87,8 | 1400 |

## 86mm hybrid stepper motor (NEMA 34)

frame size: 86mm (NEMA 34)

| wiring | Model | Step angle | Voltage | Current | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | A/Φ | Ω/Φ | mH/Φ | mN·m | g.cm² | mm | g |
| bipolar | DYNSHSST86D0205 | 1,8 | 3,8 | 2 | 1,9 | 9,5 | 2660 | 1170 | 62,5 | 1710 |
| bipolar | DYNSHSST86D0405 | 1,8 | 2,2 | 4 | 0,55 | 2,5 | 2660 | 1170 | 62,5 | 1710 |
| bipolar | DYNSHSST86D0605 | 1,8 | 1,5 | 6 | 0,24 | 1,1 | 2660 | 1170 | 62,5 | 1710 |
| bipolar | KH86QM2-951 | 1,8 | 5,04 | 1,4 | 3,6 | 23 | 3300 | 1800 | 66 | 2000 |
| bipolar | KH86QM2-952 | 1,8 | 2,99 | 3,18 | 0,94 | 4,5 | 3300 | 1800 | 66 | 2000 |
| bipolar | DYNSHSST86D1205 | 1,8 | 4,2 | 2 | 2,1 | 13 | 3880 | 1630 | 68,1 | 2000 |
| bipolar | DYNSHSST86D1405 | 1,8 | 2,4 | 4 | 0,6 | 3,4 | 3880 | 1630 | 68,1 | 2000 |
| bipolar | DYNSHSST86D1605 | 1,8 | 1,6 | 6 | 0,27 | 1,5 | 3880 | 1630 | 68,1 | 2000 |
| bipolar | KH86RM2-951 | 1,8 | 5,6 | 1,4 | 4,2 | 31 | 4000 | 2300 | 74 | 2500 |
| bipolar | KH86RM2-952 | 1,8 | 3,12 | 3,18 | 1 | 5,9 | 4000 | 2300 | 74 | 2500 |
| bipolar | PJE86T-74H14 | 1,8 | 2,7 | 4,5 | 0,6 | 4,5 | 4500 | 1800 | 74 | 2100 |
| bipolar | KH86TM2-951 | 1,8 | 7,84 | 1,4 | 5,6 | 47,5 | 6400 | 3700 | 96 | 3000 |
| bipolar | KH86TM2-952 | 1,8 | 4,2 | 3,18 | 1,32 | 9,1 | 6400 | 3700 | 96 | 3000 |
| bipolar | DYNSHSST86D3205 | 1,8 | 7 | 2 | 3,5 | 28 | 7290 | 3200 | 101,5 | 2900 |
| bipolar | DYNSHSST86D3405 | 1,8 | 3,6 | 4 | 0,9 | 7,1 | 7290 | 3200 | 101,5 | 2900 |
| bipolar | DYNSHSST86D3605 | 1,8 | 2,4 | 6 | 0,4 | 3,3 | 7290 | 3200 | 101,5 | 2900 |
| bipolar | PJE86T-112J14 | 1,8 | 3,12 | 6 | 0,52 | 4,8 | 8200 | 3600 | 112 | 3600 |
| bipolar | KH86WM2-951 | 1,8 | 10,64 | 1,4 | 7,6 | 68 | 9300 | 5500 | 127 | 4500 |
| bipolar | KH86WM2-952 | 1,8 | 5,32 | 2,8 | 1,9 | 14 | 9300 | 5500 | 127 | 4500 |
| bipolar | DYNSHSST86D5205 | 1,8 | 9 | 2 | 4,5 | 41 | 10600 | 4800 | 132 | 4000 |
| bipolar | DYNSHSST86D5405 | 1,8 | 4,8 | 4 | 1,2 | 10,5 | 10600 | 4800 | 132 | 4000 |
| bipolar | DYNSHSST86D5605 | 1,8 | 2,9 | 6 | 0,48 | 4,1 | 10600 | 4800 | 132 | 4000 |
| unipolar | KH86QM2-901 | 1,8 | 3,6 | 2 | 1,8 | 5,6 | 2500 | 1800 | 66 | 2000 |
| unipolar | KH86QM2-902 | 1,8 | 2,12 | 4,5 | 0,47 | 1,2 | 2500 | 1800 | 66 | 2000 |
| unipolar | KH86RM2-901 | 1,8 | 4 | 2 | 2,1 | 7,5 | 3000 | 2300 | 74 | 2500 |
| unipolar | KH86RM2-902 | 1,8 | 2,2 | 4,5 | 0,5 | 1,5 | 3000 | 2300 | 74 | 2500 |
| unipolar | KH86TM2-901 | 1,8 | 5,6 | 2 | 2,8 | 11,5 | 4700 | 3700 | 96 | 3000 |
| unipolar | KH86TM2-902 | 1,8 | 2,97 | 4,5 | 0,66 | 2,3 | 4700 | 3700 | 96 | 3000 |
| unipolar | KH86WM2-901 | 1,8 | 7,6 | 2 | 3,8 | 17 | 6700 | 5500 | 127 | 4500 |
| unipolar | KH86WM2-902 | 1,8 | 3,8 | 4 | 0,95 | 3,6 | 6700 | 5500 | 127 | 4500 |

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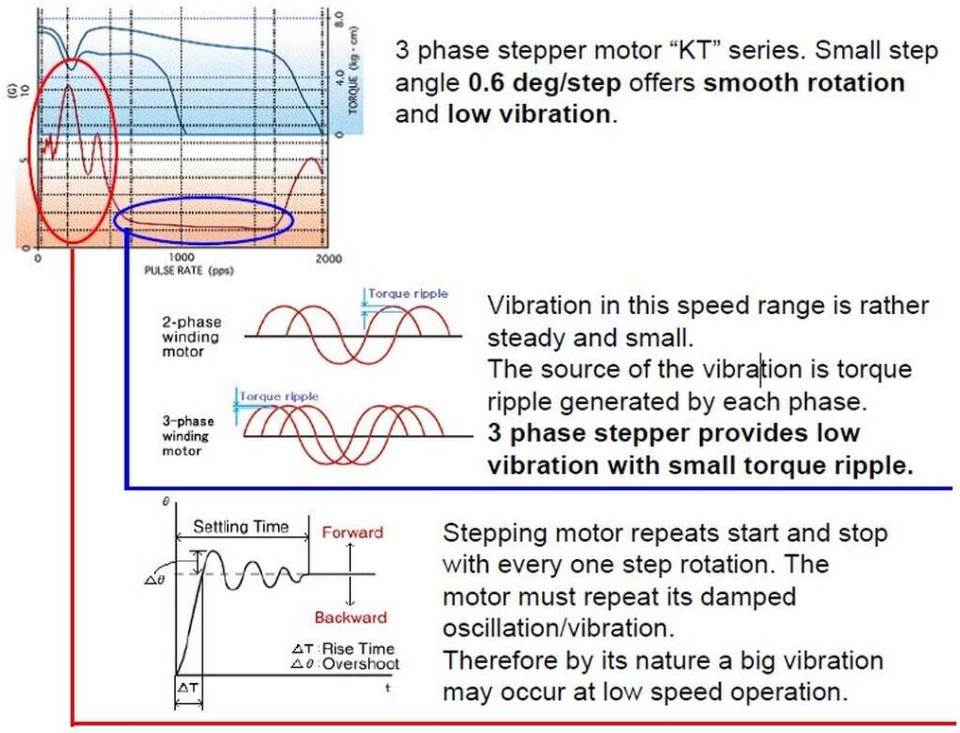
**HYBRIDS (3-Phase):**

Compared to 2-phase motors, 3 phase stepper motor can provide more torque and it has a better performance in over-loading. When the load gains, 3 phase stepper motor will not stall easily, combined with a good dynamic property at the same time. As 3-phase motor has a smaller step angle than 2-phase motors, it moves more smoothly. Under the condition of having the same rotor teeth, 3-phase motors has less vibration and higher precision than 2-phase motors.

Advantages:

- Drive circuit is simplified because the motor is driven with star wiring connection.
- High torque is obtained at low speed with the microstep driver.
- Ultra-low vibration and low noise achieved with our microstep driver.
- The step angle of 1/1, 1/2, 1/4, and 1/8 may be chosen by using our micro-step driver.
- Our 3 phase stepper motor offers more excellent performance than the 5 phase stepper.
- Minimize the source of vibration. Unique tooth shape & small rotor diameter provide high-speed performance. Also superior High grade material rise electrical efficiency. High torque 2 phase stepping motor. A unique tooth profile. Micro step correspondence.

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## Hybrid Stepper motor (3 phase)

3-phase Hybrid

| wiring | Model | Step angle | Voltage | Current | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | A/Φ | Ω/Φ | mH/Φ | mN·m | g.cm² | mm | g |
| bipolar | KT42EM06-551 | 0,6 | 5,3 | 0,9 | 5,9 | 3,1 | 45 | 20 | 20 | 140 |
| bipolar | KT42HM06-551 | 0,6 | 2,88 | 2,4 | 1,2 | 0,8 | 90 | 42 | 34 | 210 |
| bipolar | KT42JM06-551 | 0,6 | 3,12 | 2,4 | 1,3 | 1,3 | 180 | 60 | 40 | 310 |
| bipolar | KT42KM06-551 | 0,6 | 4,6 | 2,3 | 2 | 1,4 | 200 | 85 | 50 | 360 |
| wiring | Model | Step angle | Voltage | Current | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
| | | Deg. | V | A/Φ | Ω/Φ | mH/Φ | mN·m | g.cm² | mm | g |
| bipolar | KT60KM06-551 | 0,6 | 2,09 | 3,8 | 0,55 | 1 | 442 | 170 | 47 | 550 |
| bipolar | KT60KM06-551 | 0,6 | 3,52 | 2,2 | 1,6 | 3 | 442 | 170 | 47 | 550 |
| bipolar | KT60KM06-551 | 0,6 | 2,09 | 3,8 | 0,55 | 1 | 246 | 170 | 47 | 550 |
| bipolar | KT60KM06-551 | 0,6 | 3,52 | 2,2 | 1,6 | 3,1 | 246 | 170 | 47 | 550 |

| wiring | Model | Step angle | Voltage | Current | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | A/Φ | Ω/Φ | mH/Φ | mN·m | g.cm² | mm | g |
| bipolar | KT35FM1-552 | 1,2 | 10,8 | 0,3 | 36 | 26 | 58,9 | 8 | 28 | 110 |
| wiring | Model | Step angle | Voltage | Current | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
| | | Deg. | V | A/Φ | Ω/Φ | mH/Φ | mN·m | g.cm² | mm | g |
| bipolar | KT42EM1-551 | 1,2 | 5,3 | 0,9 | 5,9 | 2,6 | 70 | 20 | 20 | 140 |
| bipolar | KT42HM1-551 | 1,2 | 2,64 | 2,4 | 1,1 | 0,5 | 140 | 42 | 34 | 210 |
| bipolar | KT42JM1-551 | 1,2 | 2,88 | 2,4 | 1,2 | 0,8 | 210 | 60 | 40 | 310 |
| bipolar | KT42KM1-551 | 1,2 | 3,6 | 2,4 | 1,5 | 1 | 280 | 85 | 50 | 360 |
| wiring | Model | Step angle | Voltage | Current | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
| | | Deg. | V | A/Φ | Ω/Φ | mH/Φ | mN·m | g.cm² | mm | g |
| bipolar | KT60LM1-551 | 1,2 | 2,77 | 3,8 | 0,73 | 1 | 600 | 265 | 58 | 720 |
| bipolar | KT60LM1-552 | 1,2 | 4,84 | 2,2 | 2,2 | 3,3 | 600 | 265 | 58 | 720 |
| bipolar | KT60RM1-551 | 1,2 | 6 | 3 | 2 | 3,2 | 1680 | 840 | 85,8 | 1340 |

| wiring | Model | Step angle | Voltage | Current | Resistance | Inductance | Holding torque | Rotor inertia | Length | Mass |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | A/Φ | Ω/Φ | mH/Φ | mN·m | g.cm² | mm | g |
| bipolar | KT42EM4-551 | 3,75 | 5,28 | 0,8 | 6,6 | 5,7 | 70 | 20 | 20 | 140 |
| bipolar | KT42HM4-551 | 3,75 | 4,42 | 1,3 | 3,4 | 4,7 | 130 | 38 | 34 | 210 |
| bipolar | KT42HM4-552 | 3,75 | 7,04 | 0,8 | 8,8 | 12,3 | 130 | 38 | 34 | 210 |
| bipolar | KT42JM4-551 | 3,75 | 5,16 | 1,2 | 4,3 | 8,7 | 180 | 60 | 40 | 240 |
| bipolar | KT42JM4-552 | 3,75 | 8,8 | 0,8 | 11 | 22 | 180 | 60 | 40 | 240 |


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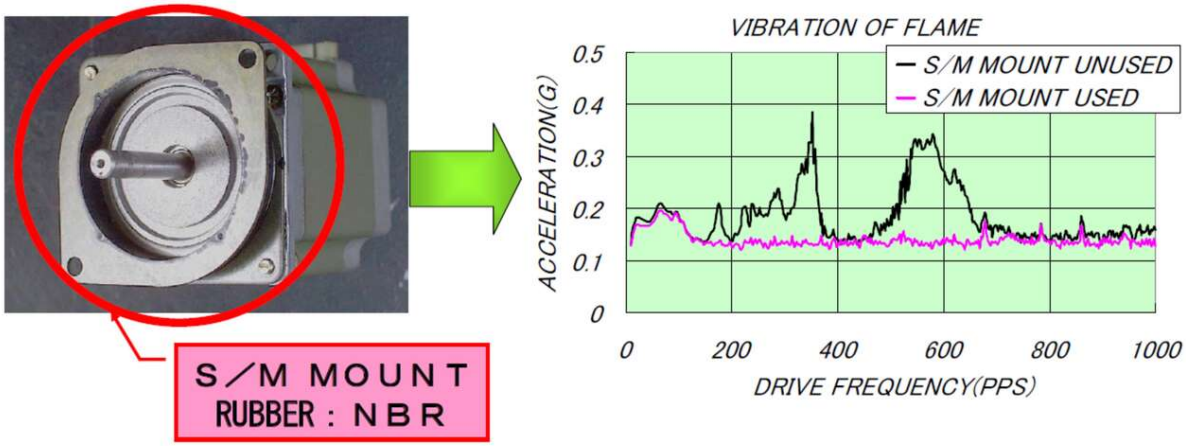
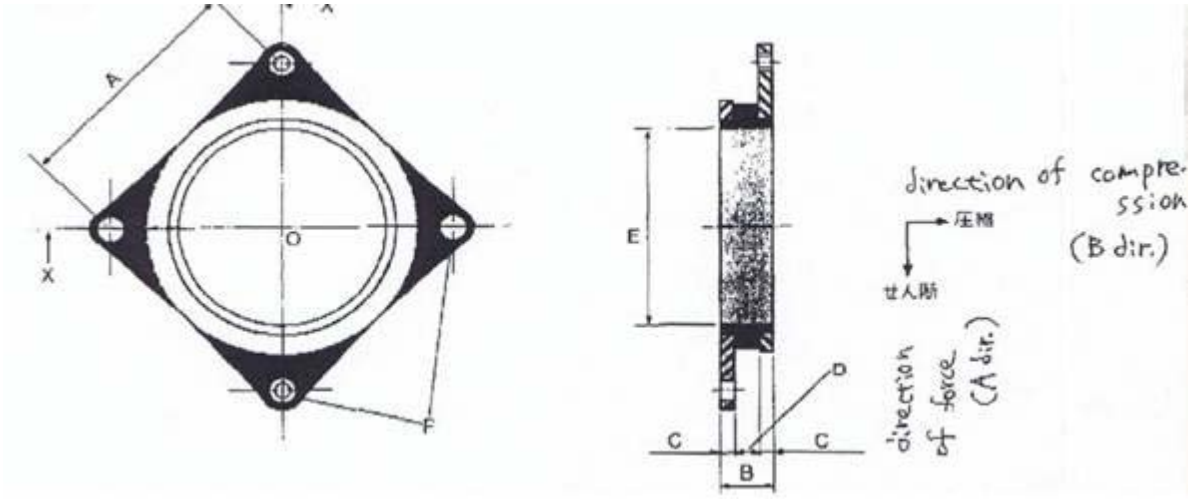
e-Mail: info@dynetics.eu
www.dynetics.eu

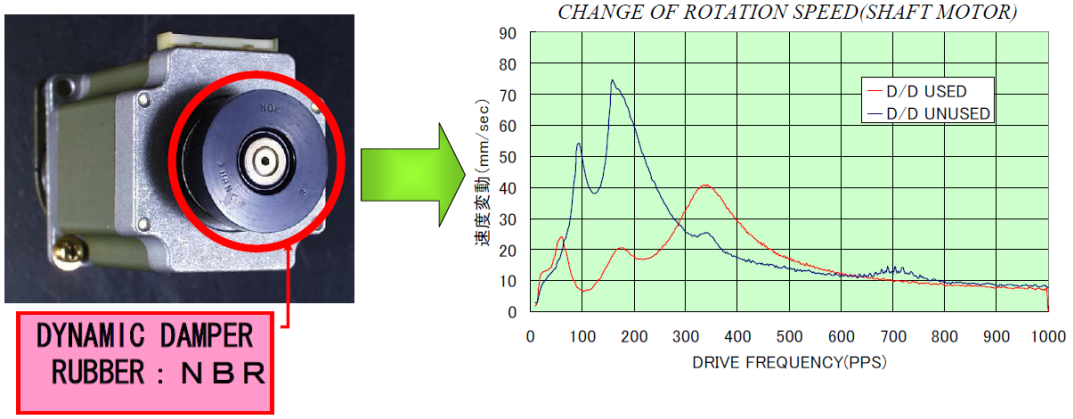
- Damper:
  This Specially developed anti-vibration rubber is efficient in damping the vibrations as generated by the stepping motor.
  The damper will reduce the transfer on flame of vibration generated by stepped rotation of a stepper motor.
  Phenol resin adhesive was applied on metal part surface for cost reduction. (It has little
  antirust effects)




**·Reduce transfer on flame of vibration by stepped rotation of S/M.**
**·Phenol resin adhesive was applied on metal part surface for cost reduction. (It has little antirust effects)**
**·Prepared in-low type, positioning with motor is easy.**

| | Dimensions | | | | | | Product code | Hardness | spring constant | load | spring constant |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Motor size | A | B | C | D | E | F | | HS | A-direction (N) | A-direction (N) | B-direction (N) |
| 42mm sq | 31 | 8,8 | 1,6 | 5,6 | ø23 | M3-ø3,5 | RF1400-A2 | 45 | 295 | 24 | 1570 |
| 42mm sq | 31 | 8,8 | 1,6 | 5,6 | ø23 | M3-M3 | RF2400-A2 | 45 | 295 | 24 | 1570 |
| 42mm sq | 31 | 8,8 | 1,6 | 5,6 | ø23 | M3-ø3,5 | RF1400-A5 | 60 | 490 | 41 | 2550 |
| 42mm sq | 31 | 8,8 | 1,6 | 5,6 | ø23 | M3-M3 | RF2400-A5 | 60 | 490 | 41 | 2550 |
| 42mm sq | 31 | 6 | 1,6 | 2,8 | ø23 | M3-ø3,5 | RF1401-A2 | 45 | 588 | 28 | 4410 |
| 42mm sq | 31 | 6 | 1,6 | 2,8 | ø23 | M3-M3 | RF2401-A2 | 45 | 588 | 28 | 4410 |
| 42mm sq | 31 | 6 | 1,6 | 2,8 | ø23 | M3-ø3,5 | RF1401-A5 | 60 | 980 | 45 | 7840 |
| 42mm sq | 31 | 6 | 1,6 | 2,8 | ø23 | M3-M3 | RF2402-A5 | 60 | 980 | 45 | 7840 |
| 56mm sq | 47 | 10 | 2,3 | 5,4 | ø40 | M4-ø5 | RF1500-A2 | 45 | 780 | 63 | 4410 |
| 56mm sq | 47 | 10 | 2,3 | 5,4 | ø40 | M4-M4 | RF2500-A2 | 45 | 780 | 63 | 4410 |
| 56mm sq | 47 | 10 | 2,3 | 5,4 | ø40 | M4-ø5 | RF1500-A5 | 60 | 1180 | 95 | 6860 |
| 56mm sq | 47 | 10 | 2,3 | 5,4 | ø40 | M4-M4 | RF2500-A5 | 60 | 1180 | 95 | 6860 |
| 60mm sq | 50 | 10 | 2,3 | 5,4 | ø40 | M4-ø4,5 | RF1600-A2 | 45 | 780 | 63 | 4410 |
| 60mm sq | 50 | 10 | 2,3 | 5,4 | ø40 | M4-M4 | RF2600-A2 | 45 | 780 | 63 | 4410 |
| 60mm sq | 50 | 10 | 2,3 | 5,4 | ø40 | M4-ø4,5 | RF1600-A5 | 60 | 1180 | 95 | 6860 |
| 60mm sq | 50 | 10 | 2,3 | 5,4 | ø40 | M4-M4 | RF2600-A5 | 60 | 1180 | 95 | 6860 |






**Customization Options**

**Coil**

An encapsulated and welded stator design gives stronger design, greater dimensional control and improved thermal characteristics.

**Mounting Plate**

Custom and standard shaped mounting plates are available. Mounting holes can be threaded, tapped, slotted or customized to your application requirements.

**Permanent Magnet Rotor**

Three types of permanent magnets are available: ferrite anisotropic, ferrite isotropic, and neodymium.

**Bushings and Bearings**

Long life oil-impregnated bushings are standard in our PF, PFC, NFC, PTM and PTMC motors. Ball bearings can be requested, and are standard in the PFL series Linearstep motors.

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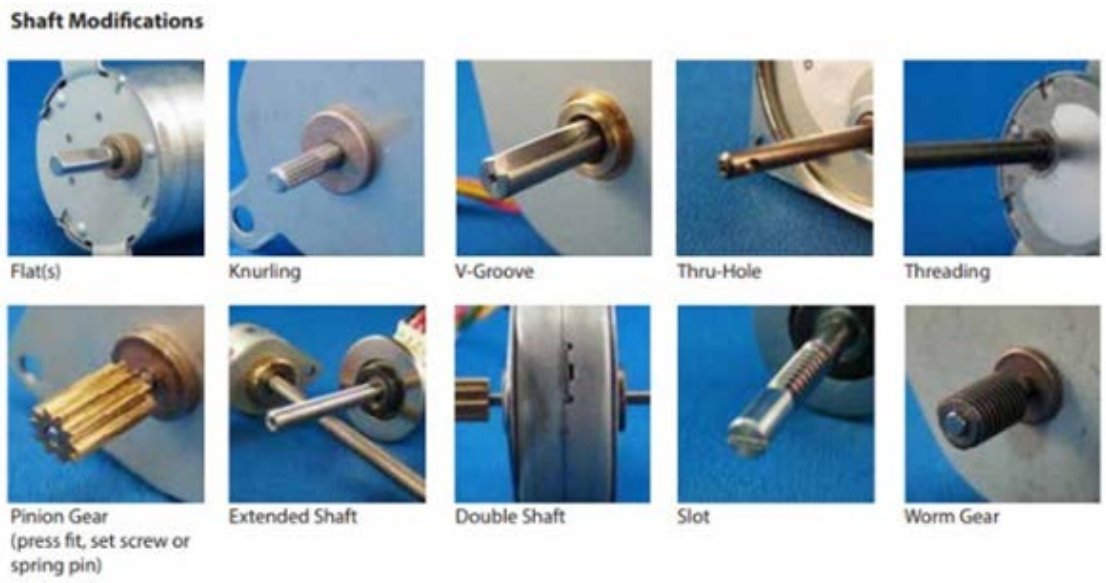
**www.dynetics.eu**

**Shaft**
A variety of shaft options are available.

- Custom lengths
- Single and double shafts
- D-cut(s)
- Turn downs
- Threaded
- Knurled
- Grooved




**Gears & Pulleys**
A variety of gear and pulley options are available.

- Machined
- Plastic molded
- Powdered metal (sintered)

**Connector**
Motor side connection method. Lead wire options available.

**Lead Wire**
Options to change the lead wire exit direction and exit angle.

**Wire Leads**

- Driver side connector options.
- Standard flying leads
- Customer-selected connectors


- <u>Driver/Controler:</u>
  Stepper motors require special circuits to drive them because of their complex construction. Dynetics offer cost effective high efficient electronics for driving and controlling stepping motors (please ask for our special brochure “electronics” or visit our website for further details

- Intelligent motors (with integrated electronics)
- Encoders

**Linear motor & actuators**

convert rotational motion into linear or straight push/pull movements. Linear actuators are optimal for many types of applications, like pulling or pushing and tilting, or lifting. Electric linear actuators are often the preferred solution for simple moving profile with an accurate precision and smooth motion control. We offer three versions: captive (with integrated twist-lock), non-captive; and external linear versions.

| | | |
|---|---|---|
| PFCL | PM-Linear stepper (LINEARSTEP®) |  |
| PFCL/captive | PM-Linear stepper captive (LINEARSTEP®) |  |
| PJPL | Linear Hybrid stepper motor |  |
| External Linear Actuator<br><br>Ball Screws with integrated motors | Compact Unit product with Ball Screw and Motor combined without Coupling.<br>● MB = C3 high prec. ball screw + 5-ph stepper<br>● TMB = rolled ball srew + 5-ph stepper<br>● 2TMB = Ct7 rolled ball screw + 2 ph stepper<br>● SiMB = C3 high prec ball screw +servo motor |  |

| | | |
|---|---|---|
| Linear Actuator /cylinder (AR, CL = captive series) | ● **AR-type:Compact Cylinder with 2-phase Hollow Stepping Motor built in Ball Screw with Ball Spline (BSSP). Ball Spline Nut in BSSP plays a role of anti-rotating device, so slim body became reality.**<br>● **CL-type Cylinder without anti-rotating /captive device is also available** |  |
| VZθ Actuator | this is the 3-functional Actuator within one Unit, which is: Linear(Z), Rotary(θ;Theta)and Vacuum(V).<br>You can choose Drive system and Motor type as well as Actuator size.<br>● **Direct Drive**<br>● **Hybrid drive**<br>● **Belt Drive**<br>● **Belt Drive High speed** |  |
| Miniature Actuators (FAS) | Super compact Actuators by making full use of advantages of miniature sized Ball Screw manufacturer.There are Cylinder type and Slider type Actuator.<br>● FAS-R = Rolled Ball Screw type<br>● FAS-Re = Resin Lead Screw type<br>● FAS-G = Precision Ball Screw type |  |
| compact actuator NEMA 6 (CAS) | The most compact single axis actuator in KSS with NEMA 6 size of 2 phase stepping motor<br>● CAS = compact actuator |  |

**Linear captive actuators**

The movable shaft doesn't rotate and the result is a pure linear motion

PFCL25-series Captive

- PM Captive Linear Stepper 25mm Size 48step 0.48mm Lead
- stroke length range 19mm
- Unipolar- or Bipolar windings

| type of winding | Model | Step angle | Voltage | Resistance | Inductance | thrust/force | travel/step | stroke | Mass |
|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | Ω/Φ | mH/Φ | N | mm | mm | g |
| bipolar | PFCL25-48P4-048-19 | 7,5 | 12 | 122 | 73 | 26 | 0,01 | 19 | 60 |
| bipolar | PFCL25-48Q4-048-19 | 7,5 | 5 | 15 | 8,7 | 26 | 0,01 | 19 | 60 |
| unipolar | PFCL25-48C4-048-19 | 7,5 | 12 | 120 | 33 | 12,1 | 0,01 | 19 | 60 |
| unipolar | PFCL25-48D4-048-19 | 7,5 | 5 | 16 | 4,5 | 12,1 | 0,01 | 19 | 60 |

AR / CL-Series captive:

- 2-phase Hybrid nema sized Stepping Motor 28mm or 42mm
- integrated with Ball Screw or Ball Screw with Ball Spline（BSSP.
- Stroke length range 40- and 50mm
- Bipolar windings

| sq28mm 2ph hybrid captive (anti rotating) linear stepper + precision ball screw | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| type of winding | Model | screw lead | Voltage | Resistance | repeatability | thrust/force | max speed | stroke | Mass |
| | | mm | V | Ω/Φ | mm | N | mm/sec | mm | g |
| bipolar | DDAAR28-G01 040N | 1 | 3,8 | 5,6 | 0,005 | 50 | 20 | 40 | 270 |
| bipolar | PBAAR28-G01-040 | 1 | 3,8 | 5,6 | 0,005 | 50 | 20 | 40 | 270 |
| bipolar | DDAAR28-G02 040N | 2 | 3,8 | 5,6 | 0,005 | 25 | 40 | 40 | 270 |
| bipolar | PBAAR28-G02 040N | 2 | 3,8 | 5,6 | 0,005 | 25 | 40 | 40 | 270 |
| | | | | | | | | | |
| sq42mm 2ph hybrid captive (anti rotating) linear stepper + precision ball screw | | | | | | | | | |
| type of winding | Model | screw lead | Voltage | Resistance | repeatability | thrust/force | max speed | stroke | Mass |
| | | mm | V | Ω/Φ | mm | N | mm/sec | mm | g |
| bipolar | DDAAR42-G02 050N | 2 | 2,5 | 2,1 | 0,005 | 80 | 40 | 50 | 660 |
| bipolar | PBAAR42-G02 050N | 2 | 2,5 | 2,1 | 0,005 | 80 | 40 | 50 | 660 |
| bipolar | DDAAR42-G05 050N | 5 | 2,5 | 2,1 | 0,005 | 30 | 100 | 50 | 660 |
| bipolar | PBAAR42-G05 050N | 5 | 2,5 | 2,1 | 0,005 | 30 | 100 | 50 | 660 |

**PM-linear stepper PF(C)L series (LINEARSTEP )**

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is designed to provide a simple system at a fraction of the cost of a conventional rotary stepper motor. Offered in diameters of 20mm, 25mm and 35mm, the LINEARSTEP® series can also be ordered with one of three pitches on the lead thread screw (0.48mm, 0.96mm, and 1.2mm). The LINEARSTEP® series comes with either a bipolar or unipolar winding, and Captive and non-captive models are available. Easily controllable. ball-bearings support the low-friction screw for long product life

Screw Lead : 3 Types (0.48 mm, 0.96 mm, 1.20 mm)

Advantages of LinearStep Motors:

- Sizes available in 20mm, 25mm and 35mm diameters
- Captive and non-captive models available
- Easily controllable
- Additional winding options are available to meet application requirements
- Simple structure (threaded rotor hub and lead screw) - ball-bearings support the low-friction screw for long product life

**20mm Linear hybrid stepper motor**

| Ø20mm linear | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| type of winding | Model | Step angle | Voltage | Resistance | Inductance | thrust/force | travel/step | stroke | Mass |
| | | Deg. | V | Ω/Φ | mH/Φ | N | mm | mm | g |
| bipolar | PFL20-24Q4 | 15 | 5 | 33 | 12 | 6 | 0,05 | 30 | 31 |

**25mm Linear hybrid stepper motor**

| Ø25mm linear | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| type of winding | Model | Step angle | Voltage | Resistance | Inductance | thrust/force | travel/step | stroke | Mass |
| | | Deg. | V | Ω/Φ | mH/Φ | N | mm | mm | g |
| bipolar | PFCL25-24P4-048-30 | 15 | 12 | 122 | 59 | 16 | 0,02 | 30 | 60 |
| bipolar | PFCL25-24P4-048-60 | 15 | 12 | 122 | 59 | 16 | 0,02 | 60 | 60 |
| bipolar | PFCL25-24P4-096-30 | 15 | 12 | 122 | 59 | 14 | 0,02 | 30 | 60 |
| bipolar | PFCL25-24P4-096-60 | 15 | 12 | 122 | 59 | 14 | 0,02 | 60 | 60 |
| bipolar | PFCL25-24P4-120-30 | 15 | 12 | 122 | 59 | 11 | 0,05 | 30 | 60 |
| bipolar | PFCL25-24P4-120-60 | 15 | 12 | 122 | 59 | 11 | 0,05 | 60 | 60 |
| bipolar | PFCL25-24Q4-048-30 | 15 | 5 | 15 | 7,1 | 16 | 0,02 | 30 | 60 |
| bipolar | PFCL25-24Q4-048-60 | 15 | 5 | 15 | 7,1 | 16 | 0,02 | 60 | 60 |
| bipolar | PFCL25-24Q4-096-30 | 15 | 5 | 15 | 7,1 | 14 | 0,04 | 30 | 60 |
| bipolar | PFCL25-24Q4-096-60 | 15 | 5 | 15 | 7,1 | 14 | 0,04 | 60 | 60 |
| bipolar | PFCL25-24Q4-120-30 | 15 | 5 | 15 | 7,1 | 11 | 0,05 | 30 | 60 |
| bipolar | PFCL25-24Q4-120-60 | 15 | 5 | 15 | 7,1 | 11 | 0,05 | 60 | 60 |
| bipolar | PFCL25-48P4-048-30 | 7,5 | 12 | 122 | 73 | 31 | 0,01 | 30 | 60 |
| bipolar | PFCL25-48P4-048-60 | 7,5 | 12 | 122 | 73 | 31 | 0,01 | 60 | 60 |
| bipolar | PFCL25-48P4-096-30 | 7,5 | 12 | 122 | 73 | 22,5 | 0,02 | 30 | 60 |
| bipolar | PFCL25-48P4-096-60 | 7,5 | 12 | 122 | 73 | 22,5 | 0,02 | 60 | 60 |
| bipolar | PFCL25-48P4-120-30 | 7,5 | 12 | 122 | 73 | 20,5 | 0,025 | 30 | 60 |
| bipolar | PFCL25-48P4-120-60 | 7,5 | 12 | 122 | 73 | 20,5 | 0,025 | 60 | 60 |
| bipolar | PFCL25-48Q4-048-30 | 7,5 | 5 | 15 | 8,7 | 31 | 0,01 | 30 | 60 |
| bipolar | PFCL25-48Q4-048-60 | 7,5 | 5 | 15 | 8,7 | 31 | 0,01 | 60 | 60 |
| bipolar | PFCL25-48Q4-096-30 | 7,5 | 5 | 15 | 8,7 | 22,5 | 0,02 | 30 | 60 |
| bipolar | PFCL25-48Q4-096-60 | 7,5 | 5 | 15 | 8,7 | 22,5 | 0,02 | 60 | 60 |
| bipolar | PFCL25-48Q4-120-30 | 7,5 | 5 | 15 | 8,7 | 20,5 | 0,025 | 30 | 60 |
| bipolar | PFCL25-48Q4-120-60 | 7,5 | 5 | 15 | 8,7 | 20,5 | 0,025 | 60 | 60 |

## 25mm Linear hybrid stepper motor

| type of winding | Model | Step angle | Voltage | Resistance | Inductance | thrust/force | travel/step | stroke | Mass |
|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | Ω/Φ | mH/Φ | N | mm | mm | g |
| unipolar | PFCL25-24C4-048-30 | 15 | 12 | 120 | 26,4 | 11 | 0,02 | 30 | 60 |
| unipolar | PFCL25-24C4-048-60 | 15 | 12 | 120 | 26,4 | 11 | 0,02 | 60 | 60 |
| unipolar | PFCL25-24C4-096-30 | 15 | 12 | 120 | 26,4 | 9,5 | 0,04 | 30 | 60 |
| unipolar | PFCL25-24C4-096-60 | 15 | 12 | 120 | 26,4 | 9,5 | 0,04 | 60 | 60 |
| unipolar | PFCL25-24C4-120-30 | 15 | 12 | 120 | 26,4 | 8 | 0,05 | 30 | 60 |
| unipolar | PFCL25-24C4-120-60 | 15 | 12 | 120 | 26,4 | 8 | 0,05 | 60 | 60 |
| unipolar | PFCL25-24D4-048-30 | 15 | 5 | 16 | 3,6 | 11 | 0,02 | 30 | 60 |
| unipolar | PFCL25-24D4-048-60 | 15 | 5 | 16 | 3,6 | 11 | 0,02 | 60 | 60 |
| unipolar | PFCL25-24D4-096-30 | 15 | 5 | 16 | 3,6 | 9,5 | 0,04 | 30 | 60 |
| unipolar | PFCL25-24D4-096-60 | 15 | 5 | 16 | 3,6 | 9,5 | 0,04 | 60 | 60 |
| unipolar | PFCL25-24D4-120-30 | 15 | 5 | 16 | 3,6 | 8 | 0,05 | 30 | 60 |
| unipolar | PFCL25-24D4-120-60 | 15 | 5 | 16 | 3,6 | 8 | 0,05 | 60 | 60 |
| unipolar | PFCL25-48C4-048-30 | 7,5 | 12 | 120 | 33 | 22 | 0,01 | 30 | 60 |
| unipolar | PFCL25-48C4-048-60 | 7,5 | 12 | 120 | 33 | 22 | 0,01 | 60 | 60 |
| unipolar | PFCL25-48C4-096-30 | 7,5 | 12 | 120 | 33 | 17,5 | 0,02 | 30 | 60 |
| unipolar | PFCL25-48C4-096-60 | 7,5 | 12 | 120 | 33 | 17,5 | 0,02 | 60 | 60 |
| unipolar | PFCL25-48C4-120-30 | 7,5 | 12 | 120 | 33 | 15 | 0,025 | 30 | 60 |
| unipolar | PFCL25-48C4-120-60 | 7,5 | 12 | 120 | 33 | 15 | 0,025 | 60 | 60 |
| unipolar | PFCL25-48D4-048-30 | 7,5 | 5 | 16 | 4,5 | 22 | 0,01 | 30 | 60 |
| unipolar | PFCL25-48D4-048-60 | 7,5 | 5 | 16 | 4,5 | 22 | 0,01 | 60 | 60 |
| unipolar | PFCL25-48D4-096-30 | 7,5 | 5 | 16 | 4,5 | 17,5 | 0,02 | 30 | 60 |
| unipolar | PFCL25-48D4-096-60 | 7,5 | 5 | 16 | 4,5 | 17,5 | 0,02 | 60 | 60 |
| unipolar | PFCL25-48D4-120-30 | 7,5 | 5 | 16 | 4,5 | 15 | 0,025 | 30 | 60 |
| unipolar | PFCL25-48D4-120-60 | 7,5 | 5 | 16 | 4,5 | 15 | 0,025 | 60 | 60 |

## 35mm Linear hybrid stepper motor

Ø35mm linear

| type of winding | Model | Step angle | Voltage | Resistance | Inductance | thrust/force | travel/step | stroke | Mass |
|---|---|---|---|---|---|---|---|---|---|
| | | Deg. | V | Ω/Φ | mH/Φ | N | mm | mm | g |
| bipolar | PFL35T-48Q4-048-30 | 7,5 | 5 | 16 | 6,4 | 39,5 | 0,01 | 30 | 95 |
| bipolar | PFL35T-48Q4-048-60 | 7,5 | 5 | 16 | 6,4 | 39,5 | 0,01 | 60 | 95 |
| bipolar | PFL35T-48Q4-096-30 | 7,5 | 5 | 16 | 6,4 | 38 | 0,02 | 30 | 95 |
| bipolar | PFL35T-48Q4-096-60 | 7,5 | 5 | 16 | 6,4 | 38 | 0,02 | 60 | 95 |
| bipolar | PFL35T-48Q4-120-30 | 7,5 | 5 | 16 | 6,4 | 35 | 0,025 | 30 | 95 |
| bipolar | PFL35T-48Q4-120-60 | 7,5 | 5 | 16 | 6,4 | 35 | 0,025 | 60 | 95 |
| bipolar | PFL35T-48R4-048-30 | 7,5 | 12 | 72 | 54 | 39,5 | 0,01 | 30 | 95 |
| bipolar | PFL35T-48R4-048-60 | 7,5 | 12 | 72 | 54 | 39,5 | 0,01 | 60 | 95 |
| bipolar | PFL35T-48R4-096-30 | 7,5 | 12 | 72 | 54 | 38 | 0,02 | 30 | 95 |
| bipolar | PFL35T-48R4-096-60 | 7,5 | 12 | 72 | 54 | 38 | 0,02 | 60 | 95 |
| bipolar | PFL35T-48R4-120-30 | 7,5 | 12 | 72 | 54 | 35 | 0,025 | 30 | 95 |
| bipolar | PFL35T-48R4-120-60 | 7,5 | 12 | 72 | 54 | 35 | 0,025 | 60 | 95 |
| unipolar | PFL35T-48C4-048-30 | 7,5 | 12 | 70 | 27 | 35 | 0,01 | 30 | 95 |
| unipolar | PFL35T-48C4-048-60 | 7,5 | 12 | 70 | 27 | 35 | 0,01 | 60 | 95 |
| unipolar | PFL35T-48C4-096-30 | 7,5 | 12 | 70 | 27 | 32 | 0,02 | 30 | 95 |
| unipolar | PFL35T-48C4-096-60 | 7,5 | 12 | 70 | 27 | 32 | 0,02 | 60 | 95 |
| unipolar | PFL35T-48C4-120-30 | 7,5 | 12 | 70 | 27 | 30 | 0,025 | 30 | 95 |
| unipolar | PFL35T-48C4-120-60 | 7,5 | 12 | 70 | 27 | 30 | 0,025 | 60 | 95 |
| unipolar | PFL35T-48D4-048-30 | 7,5 | 5 | 12 | 5 | 35 | 0,01 | 30 | 95 |
| unipolar | PFL35T-48D4-048-60 | 7,5 | 5 | 12 | 5 | 35 | 0,01 | 60 | 95 |
| unipolar | PFL35T-48D4-096-30 | 7,5 | 5 | 12 | 5 | 32 | 0,02 | 30 | 95 |
| unipolar | PFL35T-48D4-096-60 | 7,5 | 5 | 12 | 5 | 32 | 0,02 | 60 | 95 |
| unipolar | PFL35T-48D4-120-30 | 7,5 | 5 | 12 | 5 | 30 | 0,025 | 30 | 95 |
| unipolar | PFL35T-48D4-120-60 | 7,5 | 5 | 12 | 5 | 30 | 0,025 | 60 | 95 |

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**Hybrid Stepper Motors with built-in ball screws**

NPM PJPL-series hybrid linear motors are ideal for motion control applications where the benefits of smaller size with high force are essential. Offered in the sizes 28- and 42-mm, and as bipolar or unipolar winding. They feature superior response characteristics and function in a wide variety of applications

| product code | PJPL2832E6(100) | PJPL2832E4(100) | PJPL4233D6(100) | PJPL4233D4(100) | |
|---|---|---|---|---|---|
| type of winding | unipolar | bipolar | unipolar | bipolar | |
| excitation mode | full step (2-2) | | | | |
| resolution (travel/step) | 0,005 | | | | mm |
| steps per revolution | 200 | | | | |
| stroke | 40 | | | | mm |
| rated Voltage | 2,66 | 2,57 | 2,8 | 2,5 | V |
| rated current | 0,95 | | 1,2 | | A/Ø |
| resistance | 2,8 | 2,7 | 2,3 | 2,1 | Ω |
| inductance | 1,2 | 2,1 | 2,1 | 3 | mH/Ø |
| operating temp. | min 10 to plus 50 | | | | °C |
| insolation class | B | | | | |
| insolation resistance | 100 | | | | MΩ |
| dielectric strength | 500 (1 min.) | | | | AC V |
| weight | 110 | | 200 | | g |

**Linear Actuator External type 2-phase Motor & Rolled Ball Screw type(2TMB)(2-phase Rolled MoBo)**

Features

- 2-phase Stepping Motor is mounted directly onto the shaft end of a Ct7 grade Rolled Ball
  Screw,which means compact and multipurpose type product.
- Ball Screw Shaft is ideally constructed to form the Motor Rotor Shaft.
- Since combining the Motor Shaft and Ball Screw Shaft, Coupling-less, saving total length and reducing labour cost can be achieved.
- Recommended Driver for 2-phase Stepping Motor is available.
- Flexible length can be provided by the end journal turning.
- Stable mounting is secured by the exclusive Support

| Model | Shaft Nominal Dia. (mm) | Lead (mm) | Travel (mm) | Travel per pulse (μm) | Reference Thrust (N) | Mass (g) |
|---|---|---|---|---|---|---|
| 2TMB0801 | ϕ8 | 1 | 150 | 5 | 75 | 350 |
| 2TMB0802 | ϕ8 | 2 | 150 | 10 | 100 | 400 |
| 2TMB0805 | ϕ8 | 5 | 150 | 25 | 50 | 400 |
| 2TMB0812 | ϕ8 | 12 | 150 | 60 | 25 | 400 |

***Linear Actuator External type Precision Ball Screw type( MB)(MoBo-series)*** Features:

- 5-phase Stepping Motor is mounted directly onto the shaft end of a C3 grade precision Ball Screw, which is suitable for high accurate positioning system.
- Ball Screw Shaft is ideally constructed to form the Motor Rotor Shaft.
- Since combining the Motor Shaft and Ball Screw Shaft, Coupling-less, saving total length, low lost-motion can be achieved.
- Recommended Driver for 5-phase Stepping Motor is available. Accessories
- are also provided as mounting kit, such as Nut Block and Motor plate

.

| Model | Shaft Nominal Dia. (mm) | Lead (mm) | Travel (mm) | Travel per pules (μm) | Reference Thrust (N) | Mass (g) |
|---|---|---|---|---|---|---|
| MB04005A | ϕ4 | 0.5 | 20 | 1 | 10 | 84 |
| MB0401A | ϕ4 | 1 | 30 | 2 | 20 | 84 |
| MB0401 | ϕ4 | 1 | 30 | 2 | 50 | 100 |
| MB0601 | ϕ6 | 1 | 75 | 2 | 100 | 170 |
| MB0602 | ϕ6 | 2 | 75 | 4 | 50 | 180 |
| MB0801 | ϕ8 | 1 | 150 | 2 | 300 | 310 |
| MB0802 | ϕ8 | 2 | 150 | 4 | 150 | 320 |

***Linear Actuator External type Rolled Ball Screw type (TMB) (Rolled MoBo)*** Features:

- 5-phase Stepping Motor is mounted directly onto the shaft end of a Ct7 grade Rolled Ball Screw, which is all-round performance drive unit.
- Ball Screw Shaft is ideally constructed to form the Motor Rotor Shaft.
- Since combining the Motor Shaft and Ball Screw Shaft, Coupling-less, saving total length, and reducing labour cost can be achieved.
- Recommended Driver for 5-phase Stepping Motor is available.
- Accessories are also provided as mounting kit, such as Nut block and Motor plate.

| Model | Shaft Nominal Dia. (mm) | Lead (mm) | Travel (mm) | Travel per pules (μm) | Reference Thrust (N) | Mass (g) |
|---|---|---|---|---|---|---|
| TMB0401 | ϕ4 | 1 | 30 | 2 | 50 | 100 |
| TMB0504 | ϕ5 | 4 | 75 | 8 | 25 | 180 |
| TMB0601 | ϕ6 | 1 | 75 | 2 | 100 | 180 |
| TMB0602 | ϕ6 | 2 | 75 | 4 | 50 | 180 |
| TMB0606 | ϕ6 | 6 | 75 | 12 | 15 | 180 |
| TMB0801 | ϕ8 | 1 | 150 | 2 | 300 | 320 |
| TMB0802 | ϕ8 | 2 | 150 | 4 | 150 | 320 |
| TMB0805 | ϕ8 | 5 | 150 | 10 | 120 | 450 |
| TMB0812 | ϕ8 | 12 | 150 | 24 | 50 | 450 |

Constant current drive:
With the fixed current drive method, a voltage sufficiently higher than the specified voltage, of the motor, is finely sliced in the switching circuit than applied to the motor coil. The current is maintained at a constant level whether the motor is rotating at low or high speed. With this method the output torque during high speed rotation is greatly improved with power consumption minimized

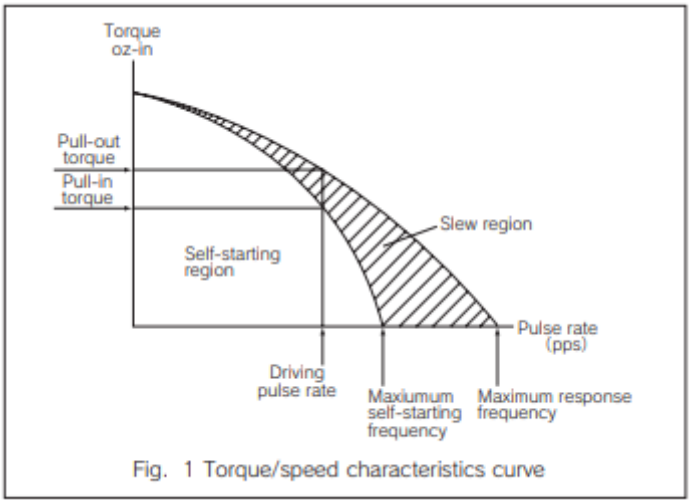

Fig. 1 Torque/speed characteristics curve

Micro-step driver:
With the micro-step drive method, the mechanically determined step angle (3.75°, 1.2°or 0.60°) is divided by an electronic circuit and the motor is gradually rotated by a fine angle. The conventional excitation method makes a rotor rotates by a fixed angle by turning the magnetizing phase on and off through an input pulse. On the other hand, with the micro-step driving method, the current of one phase of the magnetizing phase can be gradually increased while the current of other phase is decreased thereby further dividing the step angle of the motor and making rotation even smoother. THE FTD3S3P17 driver, the FTD3S2P22 enable to set to step divisions of 1/4 and 1/8. Micro stepping drive is effective to reduce mechanical driving noise particularly when divisions not exceeding 1/8

Self-starting region:
This is the region in which motors can be started and stopped instantaneously.

Pulse rate:
The number of pulses in a unit of time, and is shown in the unit “pps” which means“ pulses per second”. The relation between pulse rate, speed (rpm) and angular velocity (rad/s) is given below

$$\omega = \frac{\pi}{180}\,\theta s \cdot P \rightarrow P = \frac{180}{\pi} \cdot \frac{\omega}{\theta s}$$

$$N = \frac{1}{6}\theta s \cdot P \rightarrow P = \frac{6N}{\theta s}$$

where
ω：Angular velocity（rad/s）
θs：Step angle（deg.）
N：Speed（rpm）
P：Driving pulse rate（pps）

Slow acceleration/slow deceleration:

This is a kind of control to raise or lower the pulse rate to drive stepping motors in the slew region so they exhibit their full capability. There are various methods but one example, called trapezoidal driving, is shown in Fig. 2

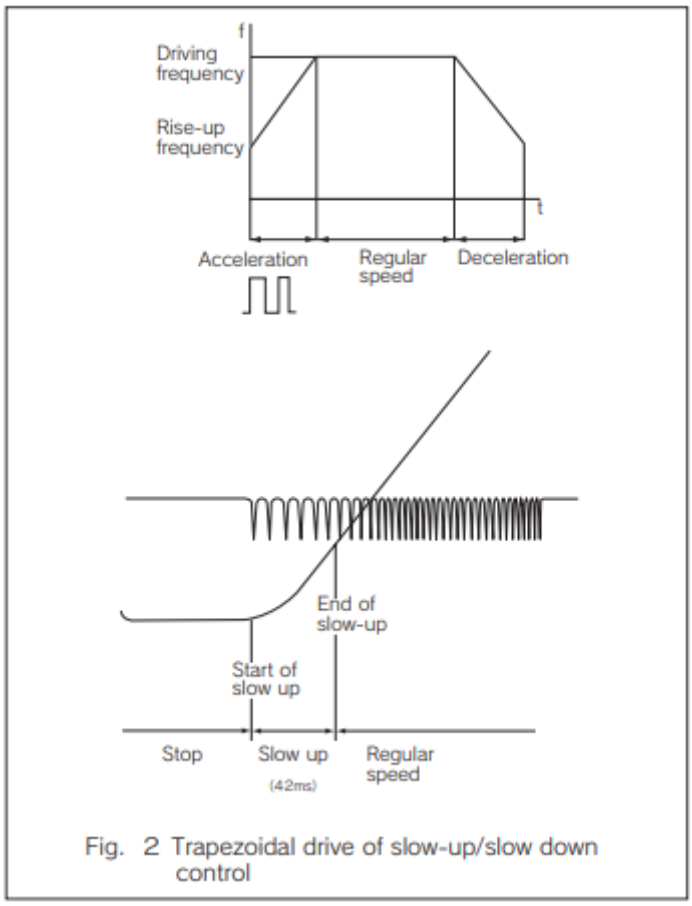


Fig. 2 Trapezoidal drive of slow-up/slow down control

Maximum self-starting frequency (pps):
This is the maximum pulse rate in the self-starting region. Care must be taken, because it varies depending on the load inertia. Slew region In this region, driving is possible only by slow acceleration/slow deceleration control. Maximum response frequency (pps) This is the maximum pulse rate in the slew region. Pull-in torque This is the torque generated when started in the self-starting region. It is also called the “synchronization torque”. Pull-out torque This is the torque generated when driven in the slew region. Pull-out This means the motor is coming out of synchronized operation by being not able to follow the pulse signal from the pulse generator. Over-loading is the general cause, but noise (Electric/ Electro-magnetic) is also a cause in some cases.

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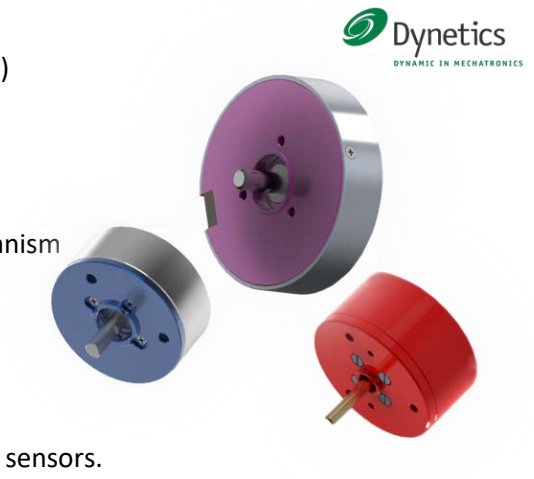
**e-Mail: info@dynetics.eu**
**www.dynetics.eu**

**PIEZOELECTRIC ACTUATORS**

The WAVELLING ™ Technology developed and patented by TEKCELEO relies on the piezoelectric actuation technology using mechanical waves. This operating mode provides a high power density combined with good efficiency for small motors (<20W mechanical).

The motor has a very simple and purely mechanical structure (no winding) facilitating integration. Benefiting from its expertise, TEKCELEO has developed a range of piezoelectric motors incorporating speed/position sensors and torque sensors giving these motors outstanding properties for light weight robotics applications, haptic interfaces, low-energy electro-valves, mini metered dose pumps and optronic equipment control applications

- Light and compact design (built-in sensors)
- Pancake shape ultrasonic motor
- Stepper motors competitors (or direct drive high torque motors)
- High torque / low speed. No-reducer (direct drive)
- No-power supply holding torque (built-in brake)
- No electromagnetic disturbances
- Silent, vibration-free
- Modular design : it can be fitted into the very core of the mechanism
- 0.01° precision (depends on the sensor)
- Fast mechanical response <1ms
- Operating temperatures : -20 + 140°C
- High shocks and vibrations resistance (compact)
- Torque or speed control (depends on the built-in sensors)
- Very easy to control thanks to its responsiveness and its built-in sensors.




Our line of piezoelectric motors ranges from 20mm (for miniature motors) to 75mm diameters. We offers the following actuators, all of which allow non-magnetic configurations for MRI environments:

- WLG-75-R : Diameter 75mm (external casing diameter : 80,5 mm)
- WLG-30-R : Diameter 30 mm (external casing diameter : 33,9 mm)
- WLG-20-R : Diameter 20 mm (external casing diameter : 23,9 mm)

| | Rated Power | Max Torque | Rated Torque | Max speed | Min Speed | Max standard Encoder precision | Non-magnetic version |
|---|---|---|---|---|---|---|---|
| WLG-75-R | 12W | 1,2 N.m | 0,75 N.m | 175 RPM | 1 RPM | 0,0156° | Yes |
| WLG-30-R | 1.3W | 100 mN.m | 75 mN.m | 250 RPM | 1 RPM | 0,0450° | Yes |
| WLG-20-R | 0.55W | 30 mN.m | 20 mN.m | 380 RPM | 1 RPM | 0,0625° | Yes |

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| | WLG-75-R | WLG-75-R AMAG (Non-Magnetic) |
|---|---|---|
| No Load Speed | 175 RPM | 175 RPM |
| Nominal Speed | 150 RPM | 150 RPM |
| Max Torque | 1.2 N.m | 1.2 N.m |
| Nominal Torque | 0.75 N.m | 0.75 N.m |
| Holding Torque | 1.5 N.m | 1.5 N.m |
| Built-in encoder | Yes, optical with quadrature output | Yes, optical with quadrature output |
| Max Encoder Resolution | 0,0156° / 273 µr | 0,0156° / 273 µr |
| Possible Max encoder Resolution (custom) | 0,0039° / 68 µr | 0,0039° / 68 µr |
| Operating Voltage | 24 VDC | 24 VDC |
| Maximal Power Consumption | 24 VDC/2.9 A | 24 VDC/ 2.9 A |
| Weight | 282 g | 282 g |
| Operating Temperature | 0°C – 45°C | 0°C – 45°C |
| Connector | Molex ref. 87438-0843 | Molex ref. 87438-0843 |
| Max Radial Load | 10 N | 10 N |
| Max Axial Load Dynamics | 10 N | 10 N |
| Max Force for Press Fits | 120 N | 120 N |
| Shaft Concentrictiy | ±0,04 mm | ±0,04 mm |

| | WLG-30-R | WLG-30-R AMAG (Non-Magnetic) |
|---|---|---|
| No Load Speed | 250 RPM | 235 RPM |
| Nominal Speed | 165 RPM | 165 RPM |
| Max Torque | 100 mN.m | 100 mN.m |
| Nominal Torque | 75 mN.m | 65 mN.m |
| Holding Torque | 125 mN.m | 125 mN.m |
| Built-in encoder | Yes, optical with quadrature output | Yes, optical with quadrature output |
| Max Encoder Resolution | 0,0450° / 789 µr | 0,0450° / 789 µr |
| Possible Max encoder Resolution (custom) | 0,0104° / 181 µr | 0,0104° / 181 µr |
| Operating Voltage | 7.5 VDC | 7.5 VDC |
| Maximal Power Consumption | 7.5 VDC/1.35 A | 7.5 VDC/1.35 A |
| Weight | 37,7 g | 37,7 g |
| Operating Temperature | 0°C – 60°C | 0°C – 60°C |
| Connector | JST - SHR-08V-S-B | JST - SHR-08V-S-B |
| Max Radial Load | 10 N | 10 N |
| Max Axial Load Dynamics | 2 N | 2 N |
| Max Force for Press Fits | 80 N | 80 N |
| Shaft Concentrictiy | ±0,075 mm | ±0,075 mm |

| | WLG-20-R | WLG-20-R AMAG (Non-Magnetic) |
|---|---|---|
| No Load Speed | 380 RPM | 380 RPM |
| Nominal Speed | 265 RPM | 265 RPM |
| Max Torque | 30 mN.m | 30 mN.m |
| Nominal Torque | 20 mN.m | 20 mN.m |
| Holding Torque | 40 mN.m | 40 mN.m |
| Built-in encoder | Yes, optical with quadrature output | Yes, optical with quadrature output |
| Max Encoder Resolution | 0,0625° / 1091 µr | 0,0625° / 1091 µr |
| Possible Max encoder Resolution (custom) | 0,0156° / 273 µr | 0,0156° / 273 µr |
| Operating Voltage | 9 VDC | 9 VDC |
| Maximal Power Consumption | 9 VDC/0.8 A | 9 VDC/0.8 A |
| Weight | 14 g | 14 g |
| Operating Temperature | 0°C – 45°C | 0°C – 45°C |
| Connector | JST - SHR-08V-S-B | JST - SHR-08V-S-B |
| Max Radial Load | 5 N | 5 N |
| Max Axial Load Dynamics | 1 N | 1 N |
| Max Force for Press Fits | 18 N | 18 N |
| Shaft Concentrictiy | ±0,2 mm | ±0,2 mm |

**Controllers**

Dynetics offers two types of Piezo controllers depending on the size of the motor. These controllers can be shared through license agreement for customers who want to incorporate the electronics into their own systems.

All our controller can directly control continuous movement with switches. For precise motion control it is necessary to use a micro-controller connected to the controller.

In our evaluation kit we offer specific STM32 microcontroller with embedded demo software for easily handle our motors. Software can be shared and/or customized on demand.

**E aluation kit**

Dynetics offers evaluation/starter kit in order to easily get started with WAVELLING® motor technology. These kits are available with all our range of motor, standard and non-magnetic. They are delivered with the following items :

- One motor ;
- One controller and its power supply ;
- One STM32 Microcontroller ;
- Free demo software to get started ;
- A heat dissipation plate ;

Evaluation kit are made to learn how to handle our motor and comes with technical support. Our customer can always summon a technical meeting to discuss how to control and set up our motor.

# Compact drive technology, ventilation and cooling

Dynetics
DYNAMIC IN MECHATRONICS


Nidec
All for dreams

**stepper motors**

Hybrid, PM, tin-can low vibration, low noise
Compact design up to 50 Nm, linearstep, 2 & 3-phase versions
0.6 ° -3.75 ° step angle, integrated driver electronics
Manufacturers: Nidec Servo, Shinano Kenshi, NPM, KSS

NPM

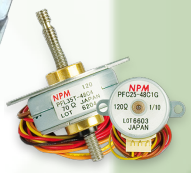
**Stepper and BLDC motor controller / driver boards and modules**

Single & Multi axes 2,3,4 & 5 phases unipolar, bipolar
Up to 4 axes, microstep, up to 8A. Various communication
Fieldbus (CANopen, MODBUS) Ethernet, RS485, USB
Manufacturers: Nidec Servo, SHS, NPM, Panasonic, Synapticon


ケーエスエス KSS

**Brushed motors and geared motors**

Torque up to 35Nm
Manufacturers: Nidec Servo, Tsukasa, 3P



**Brushless Motors and gears**

Outside, or inside runners; Optionally with integrated driver electronics
Manufacturers: Nidec, Tsukasa, 3P, Mellor

DKM

**Motors with ironless rotor and gearbox**

Brushed, or brushless 0.4-46W torque to 20Nm planetary gear
Manufacturers: E-DriveSystem


TEKCELEO
We Accelerate Innovation

**Piëzomotoren**

10 to 150 mm, up to 3Nm, noiseless, short response time integrated speed / position torque sensors
Manufacturers: Tekceleo

System E-Drive

**Linear servo motors / Electric cylinders and stages**

Ultra-precise, Dynamic, Stable.
Height reproducibility, compact direct drive. Maintenance and cogging free shaft diameter from 4mm to 100mm stroke from 20mm to 4600mm captive / non-captive. Top thrust force up to 10kN;
Manufacturer: NPM, KSS


synapticon
INTEGRATED MOTION

**AC geared motors**

Shaded pole & EC motors
Motors up to 90W torque up to 30Nm
Manufacturer: Nidec Servo, Mellor, DKM


TSUKASA

**Fans and blowers**

Reliable, Ball bearing / sleeve bearing
Lifetime up to 100,000 hours. Tested to VDE / UL / CSA IP54-65 versions
Manufacturer: Nidec Servo, Nidec, Dynetics


Mellor
MOTORS & GEARED MOTORS

**Embedded IC's**

One-chip stepper motor driver ICs, programmable pulse generators, integrated homing, anti-feedback, S-curve. Reduces engine noise Linear spiral, helical / circular interpolation
Manufacturer: Nippon Pulse


SHINANO KENSHI
CORPORATION

**Linear Lead & Ball Screw  Linear bearings & Guides**

High accuracy, minimal friction, integr. Ball feedback, high rigidity, smooth running
Manufacturer: KSS

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