# Megatorque Motor™

-UL Standard/CE Marking Comliant PS/PN Model
-PN Model With Brake
-Environment-Resistant PNZ Model (Dustproof, Waterlight)

Agile motion, smart control: the ultimate Bearing.

NSK introduced the Megatorque Motor in 1984 with a simple mission: to help industrial Bearing move and stop. Since then, we have continually enhanced the Megatorque Motor as the ultimate solution for automatic control in countless industries. Thanks to our specialized technologies and extensive bearing knowhow, Megatorque Motor provides quick, responsive motion combined with smooth, accurate control.

# Agile motion, smart control: the ultimate Bearing. MEGATORQUE MOTOR™

## PS Model Features

| | |
|---|---|
| Outer rotor | Small footprint |
| Small cylindrical shape | For high-speed positioning of medium/light loads |
| Fixed from the bottom | |
| High rotational speed | Compact, clean, high accuracy, hollow structure, maintenance-free |

Output shaft (rotating part)

Bearing

Fixed section
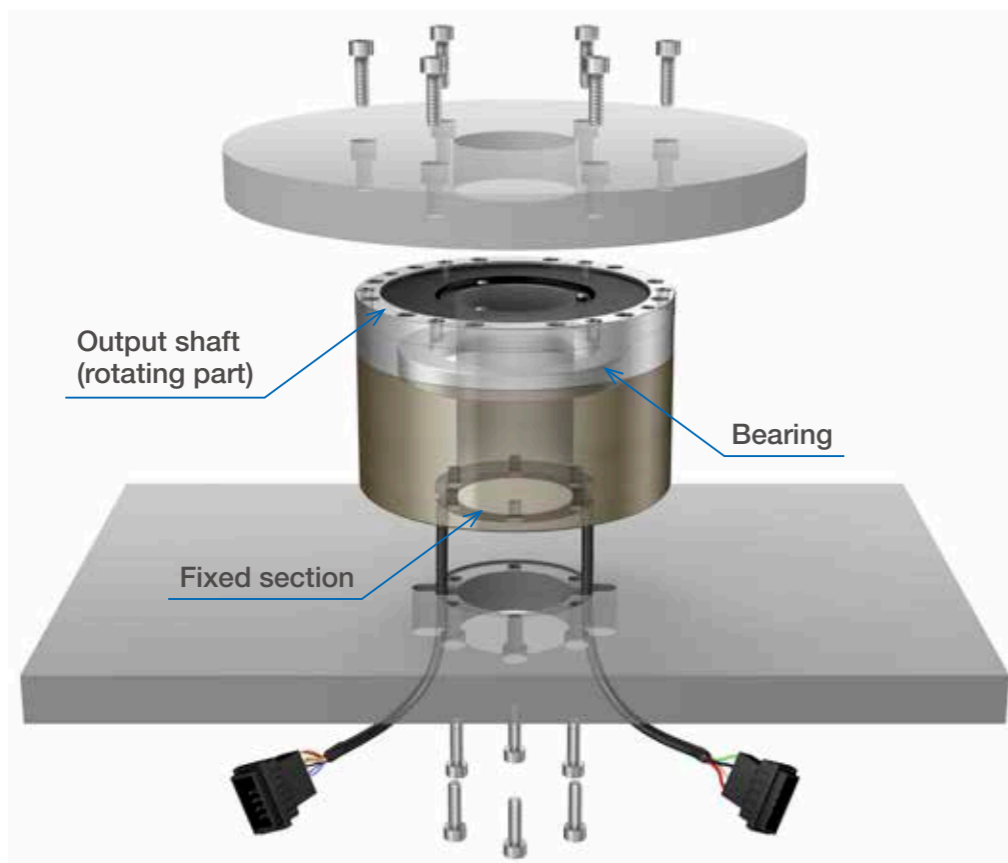
## PN/PNZ Model Features

| | |
|---|---|
| Inner rotor | Low center of gravity, large diameter output shaft |
| Low profile | For high-speed positioning of heavy loads |
| Fixed from the top | |
| High rigidity | Compact, clean, high accuracy, hollow structure, maintenance-free |

Output shaft (rotating part)

Bearing

Fixed section
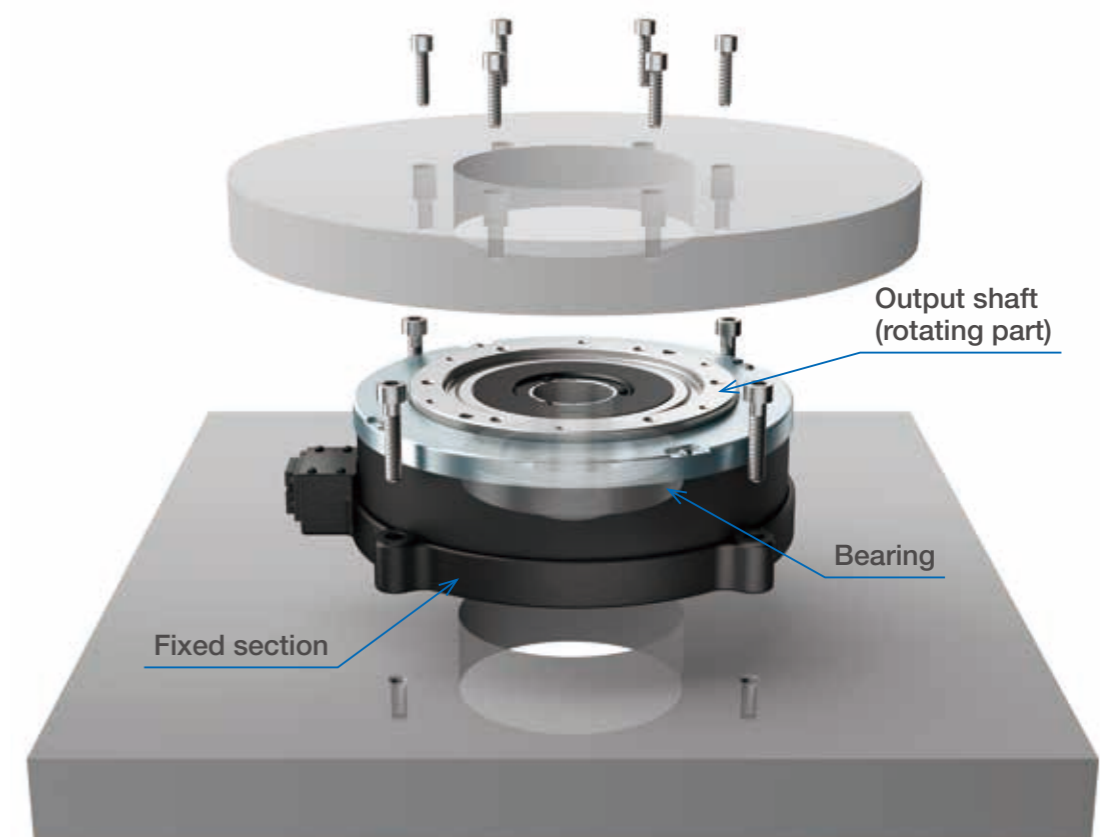
# Fast, accurate, and reliable motors for today's needs: Megatorque Motor™

Through an optimal configuration of highly accurate positioning features, NSK's Megatorque Motor aims to boost productivity in all kinds of devices, without any sacrifice in bearing reliability.

## High reliability, safety-focused

We build Megatorque Motor to last without compromising on safety. The PS/PN Model comply with global standards, including UL standards, CE marking, and the EU's RoHS Directive.

**UL Standard**
**CE Marking**
**EU RoHS Directive**
**Compliant**

## High torque

Throughput improved by reduced positioning time.

Max. **180** (N·m)

## High-speed rotation & high rigidity

Our superior bearings provide both high-speed rotation and high rigidity.

Max. rotation speed **10** (s⁻¹) (PS Model)

## Compact

Through advanced design technology, we offer two unique motor series: the low-profile PN Model (PN2 height: 35 mm) and the small-sized PS Model (PS1 outer diameter: φ100 mm), allowing for lighter and more compact devices.

Height **35** (mm) (PN2)

Outer diameter **φ100** (mm) (PS1)

## High resolution and accuracy

Featuring an absolute position sensor capable of a high resolution 2 621 440 counts/turn and a repeatability of ±2 arc-sec, our motors require no homing operations, facilitating development of highly accurate devices.

Resolution of position sensor **2.62** million counts/turn

## Intelligent

Driver Unit Model EDD positioning controller is a standard feature. Using the EDD Megaterm software makes it easy to set parameters and check motor operation.

Positioning controller comes standard

## Extensive lineup

Specialized products include the PN Model with brake and the Environment-Resistant PNZ Model (dustproof, watertight).

With brake

**IP66M** compliant
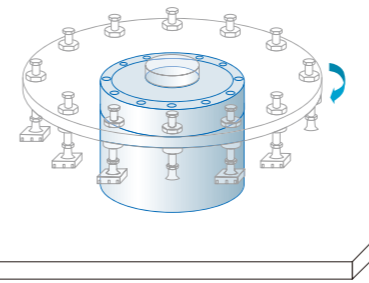
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Resolution of built-in absolute position sensor **2.62** million counts per turn

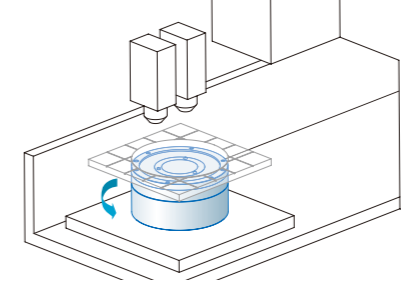PS Model Maximum rotational speed **10** s⁻¹ (varies by motor model)

## Megatorque Motor excels in a variety of applications and installations.

**Application 1: PS Model**
Inspection equipment for electronic parts



- High speed and high accuracy
- Compact ● Clean
- Hollow structure (convenient for wiring/tubing)

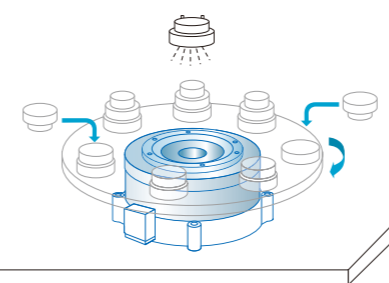**Application 2: PS Model**
Semiconductor inspection machine



- High speed and high accuracy
- Clean ● Maintenance-free
- Hollow structure (convenient for wiring/tubing)

**Application 3: PS Model**
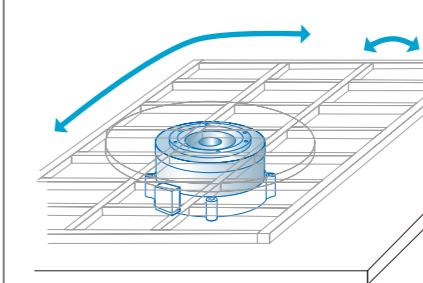Rotating conveyor for food-based products
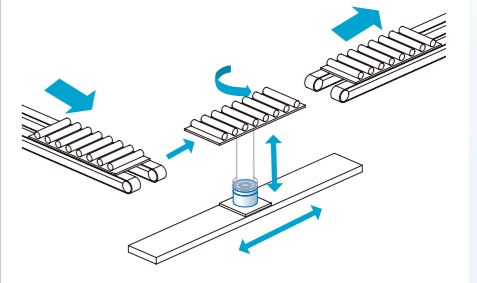


- Clean ● Maintenance-free
- Continuous operation

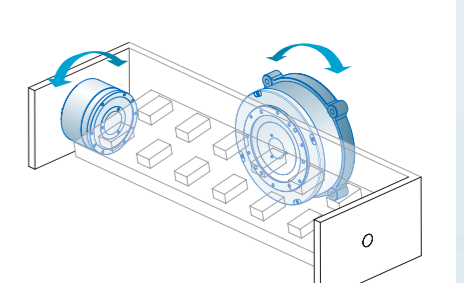**Application 4: PN Model**
Automatic part assembly



- High speed and high accuracy ● Compact
- Advanced functions (unequal partitioned positioning and shortcut positioning)

**Application 5: PN Model**
Turn table and alignment for flat panels



- Compact ● Maintenance-free
- Advanced functions (fine positioning)
- High torque

**Application 6: PN, PS Model**
Sensor inspection machine



- Smooth rotational operation ● Compact

**Application 7: PN Model With Brake**
Transverse installation
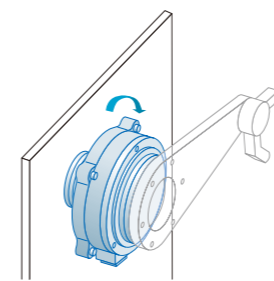


- Prevents unwanted rotation

**Application 8: PN Model With Brake**
With external force applied



- Holds position

**Application 9: Environment-Resistant PNZ Model**
For manufacturing automotive components



- Environmental resistance (Environmental protection Protects against against water, oil, particulates, etc.)

# 1 Comparison of Megatorque Motor™ Products

Maximum output torque (N·m)

18 (135)

Motor height (mm)

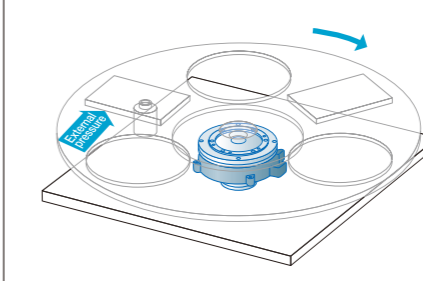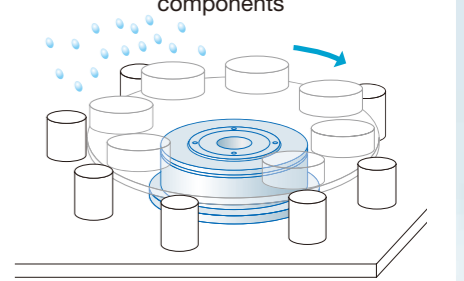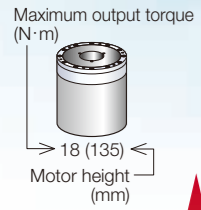| | PS1 Model | PS3 Model | PN2 Model | PN3 Model | PN3 Model (with brake) | PN4 Model | PN4 Model (with brake) | PNZ3 Model | PNZ4 Model |
|---|---|---|---|---|---|---|---|---|---|

**200 (N·m)**

**100 (N·m)**

**50 (N·m)**

**30 (N·m)**

**10 (N·m)**

**5 (N·m)**

180 (112)

175 (137)

135 (95)

135 (111)
∗Excluding brake

130 (120)

90 (170)

60 (136)

45 (85)

45 (97)
∗Excluding brake

40 (100)

30 (102)

18 (135)

15 (85)

12 (110)

12 (35)

6 (85)

## Ingress Protection (IP) Test

Environment-Resistant PNZ model comply with IP66M under IEC standards certified by TUV Rheinland, Japan Ltd.

Environment-Resistant PNZ model was certified with an IP rating after compliance testing under the following two standards:

◇IEC60529 Degrees of protection provided by enclosures for electrical equipment (IP Code)

◇IEC60034-5 Rotating electrical machines - Part 5

The first characteristic numeral of the IP code stands for the degree of protection against entry of solid foreign objects, such as dust, with "6" (IP6X) indicating a completely dustproof product.

The second characteristic numeral of the IP code represents the degree of protection against entry of water, with "6" (IPX6) indicating protection from high-pressure streams.

Nozzle φ12.5mm
100ℓ/min; 3min

IP6X: Dust-tight Dustproof test

IPX6M: Powerful jet test

| | PS1 Model | PS3 Model | PN2 Model | PN3 Model | PN3 Model (with brake) | PN4 Model | PN4 Model (with brake) | PNZ3 Model | PNZ4 Model |
|---|---|---|---|---|---|---|---|---|---|
| Output shaft diameter (mm) | φ100 | φ150 | φ130 | φ155 | φ155 | φ205 | φ205 | φ135 | φ170 |
| Motor outer diameter (mm) | φ100 | φ150 | φ170 | φ210 | φ210 | φ280 | φ280 | φ220 | φ286 |
| Hollow diameter (mm) | φ35 | φ56 | φ36 | φ56 | φ32 | φ50 | φ32 | φ44 | φ37 |

Driver Unit
( Dimensions W×D×H (mm) )

70×140×160

90×140×160

70×140×160

90×140×160

Complies with UL and CE

# 2.1 PS Model

## 2.1.1 Designation

Example Designation: **M-PS** **1** **006** **KN** **002**

PS Model
Motor size code
Maximum output torque (N·m)

Design serial number
002: Standard
KN: Standard
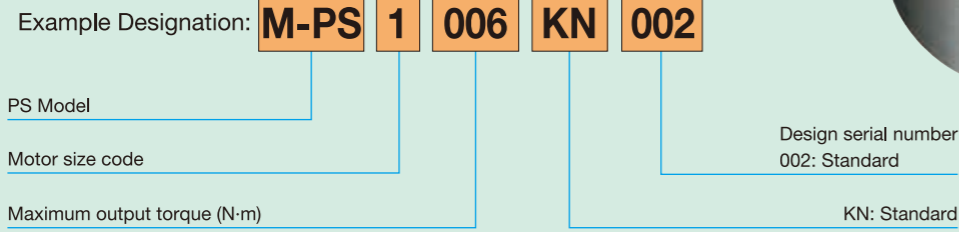
## 2.1.2 Specifications

| Item | Designation | M-PS1006KN002 | M-PS1012KN002 | M-PS1018KN002 |
|---|---|---|---|---|
| Motor outer diameter (mm) | | | φ100 | |
| Maximum output torque (N·m)[*5] | | 6/6 | 12/12 | 18/18 |
| Rated output torque (N·m)[*5] | | 2/2 | 4/3 | 6/6 |
| Axial runout accuracy (A in the figure) (μm) | | | 50 | |
| Radial runout accuracy (B in the figure) (μm) | | | 50 | |
| Motor height (mm) | | 85 | 110 | 135 |
| Motor hollow diameter (mm) | | | φ35 | |
| Maximum rotational speed (s⁻¹)[*5] | | 10/5 | 10/4 | 10/4 |
| Rated rotational speed (s⁻¹)[*5] | | 5/3 | 5/3 | 5/2 |
| Resolution of position sensor (count/turn) | | | 2 621 440 | |
| Absolute positioning accuracy (arc-sec)[*1] | | | 60 (±30)[*2] | |
| Repeatability (arc-sec) | | | ±2 | |
| Allowable axial load (N)[*3] | | | 1 000 | |
| Allowable radial load (N)[*4] | | | 820 | |
| Allowable moment load (N·m) | | | 28 | |
| Rotor inertia (kg·m²) | | 0.0024 | 0.0031 | 0.0038 |
| Allowable range of inertia (kg·m²) | | 0.015 to 0.24 | 0.03 to 0.31 | 0.03 to 0.38 |
| Mass (kg) | | 2.4 | 3.5 | 4.5 |
| Environmental conditions | | Ambient temperature 0 to 40 °C ; humidity: 20 to 80 % ; use indoors, free from dust, condensation and corrosive gas. IP30 or equivalent. | | |

[*1] At ambient temperature of 25±5 °C
[*2] Absolute positioning accuracy is 90 arc-sec when cable length exceeds 8 m.
[*3] With no radial load
[*4] With no axial load
[*5] At power voltage of 200 VAC / 100 VAC
· Please consult NSK if the motor bears radial, axial, and moment loads at the same time.
· If bearing an unbalanced load, the moment and radial loads generated by centrifugal force should be less than the allowable load.
· For oscillating operation less than 45°, turn the motor 90° or more at least once a day.
· Depending on operating conditions, use outside the allowable range of inertia may be possible. Contact NSK for details.

## 2.1.3 Rotational Speed and Output Torque Characteristics

PS1006



PS1012



PS1018



100 (VAC)  200 (VAC)
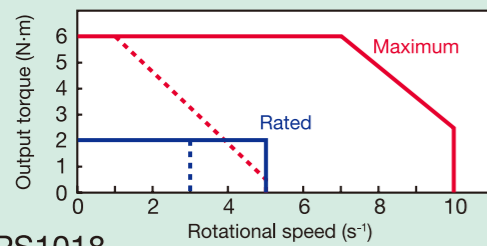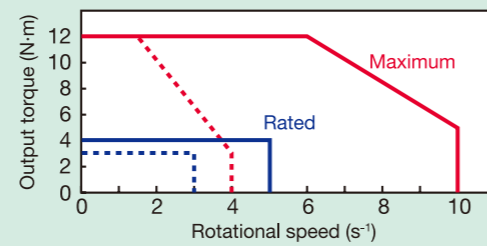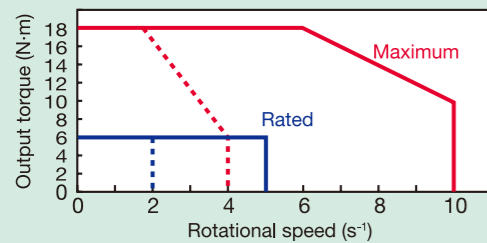
These represent typical values.

## 2.1.4 Dimensions

### M-PS1006KN002
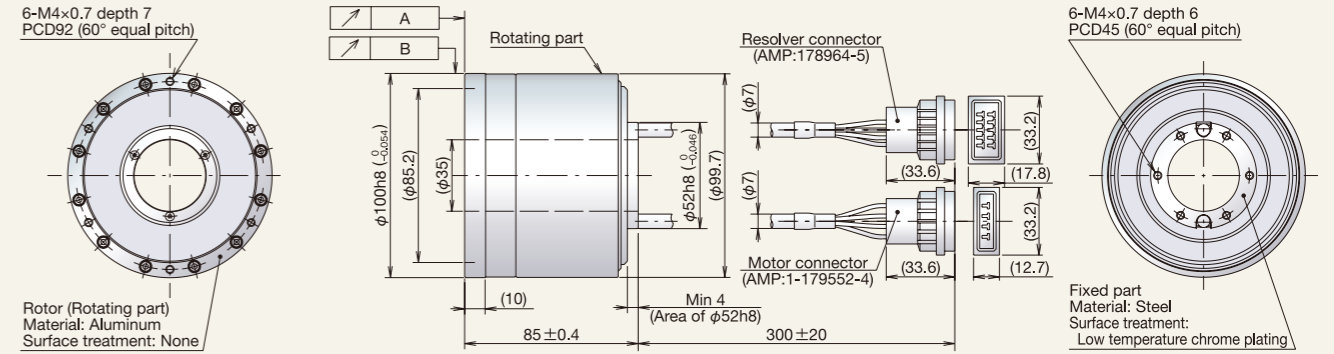


### M-PS1012KN002
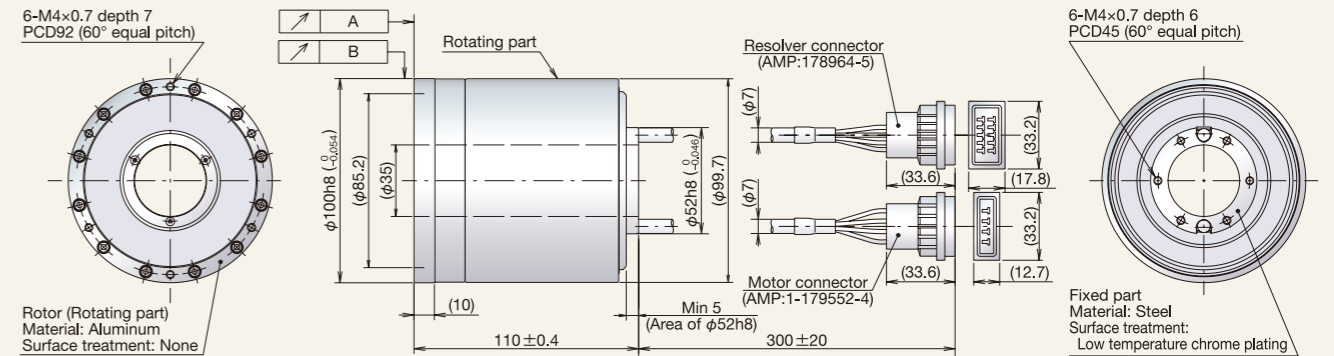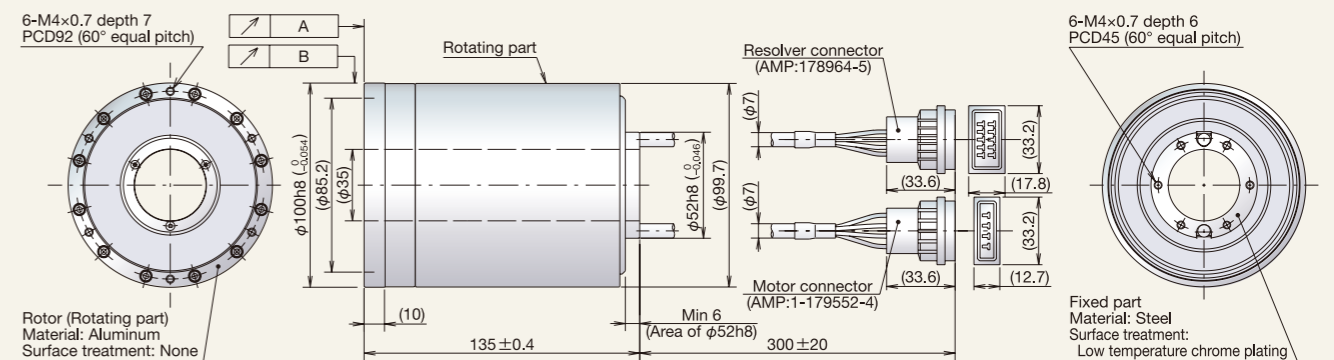


### M-PS1018KN002



1. The bend radius of the motor cable lead (φ7) and the resolver cable lead (φ7) should be R30 mm or more.
2. Do not flex cable leads.
3. Avoid stress (tension, vibration, etc.) where the lead and connector join. Stress can cause loose or broken connections.

Complies with UL and CE

# 2.2 PS Model

## 2.2.1 Designation

Example Designation: **M-PS** | **3** | **015** | **KN** | **002**

PS Model

Motor size code

Maximum output torque (N·m)

Design serial number
002: Standard
701: Axial runout accuracy 10 (μm)

KN: Standard

## 2.2.2 Specifications

| Item | Designation | M-PS3015KN*** | M-PS3030KN*** | M-PS3060KN*** | M-PS3090KN*** |
|---|---|---|---|---|---|
| Motor outer diameter (mm) | | φ150 | | | |
| Maximum output torque (N·m)*6 | | 15/15 | 30/30 | 60/60 | 90/90 |
| Rated output torque (N·m)*6 | | 5/5 | 10/10 | 20/20 | 30/30 |
| Axial runout accuracy (A in the figure) (μm)*1 | KN002 | 50 | 50 | 50 | 50 |
| | KN701 | 10 | 10 | 10 | 10 |
| | Special*1 | (5) | (5) | (5) | — |
| Radial runout accuracy (B in the figure) (μm)*1 | | 50 (10,5) | 50 (10,5) | 50 (10,5) | 50 (10) |
| Motor height (mm) | | 85 | 102 | 136 | 170 |
| Motor hollow diameter (mm) | | φ56 | | | |
| Maximum rotational speed (s⁻¹)*6 | | 10/4 | 10/3 | 8/2.5 | 5/1.5 |
| Rated rotational speed (s⁻¹)*6 | | 5/3 | 5/2 | 1/1 | 1/1 |
| Resolution of position sensor (count/revolution) | | 2 621 440 | | | |
| Absolute positioning accuracy (arc-sec)*2 | | 60 (±30)*3 | | | |
| Repeatability (arc-sec) | | ±2 | | | |
| Allowable axial load (N)*4 | | 2 000 | | | |
| Allowable radial load (N)*5 | | 1 700 | | | |
| Allowable moment load (N·m) | | 42 | | | |
| Rotor inertia (kg·m²) | | 0.011 | 0.014 | 0.019 | 0.024 |
| Allowable range of inertia (kg·m²) | | 0 to 1.1 | 0 to 1.4 | 0.12 to 1.9 | 0.12 to 2.4 |
| Mass (kg) | | 5.5 | 6.9 | 11.0 | 13.8 |
| Environmental conditions | | Ambient temperature 0 to 40 °C ; humidity: 20 to 80 % ; use indoors, free from dust, condensation and corrosive gas. IP30 or equivalent. | | | |

∗1 Motor dimensions of products with runout accuracy shown in parentheses ( ) may vary. Please contact NSK for details.
∗2 At ambient temperature of 25±5 °C
∗3 Absolute positioning accuracy is 90 arc-sec when cable length exceeds 8 m.
∗4 With no radial load
∗5 With no axial load
∗6 At power voltage of 200 VAC/100 VAC
· Please consult NSK if the motor bears radial, axial, and moment loads at the same time.
· If bearing an unbalanced load, the moment and radial loads generated by centrifugal force should be less than the allowable load.
· For oscillating operation less than 45°, turn the motor 90° or more at least once a day.
· Depending on operating conditions, use outside the allowable range of inertia may be possible. Contact NSK for details.

## 2.2.3 Rotational Speed and Output Torque Characteristics



PS3015
PS3030
PS3060
PS3090

··· 100 (VAC)  — 200 (VAC)

These represent typical values.

## 2.2.4 Dimensions
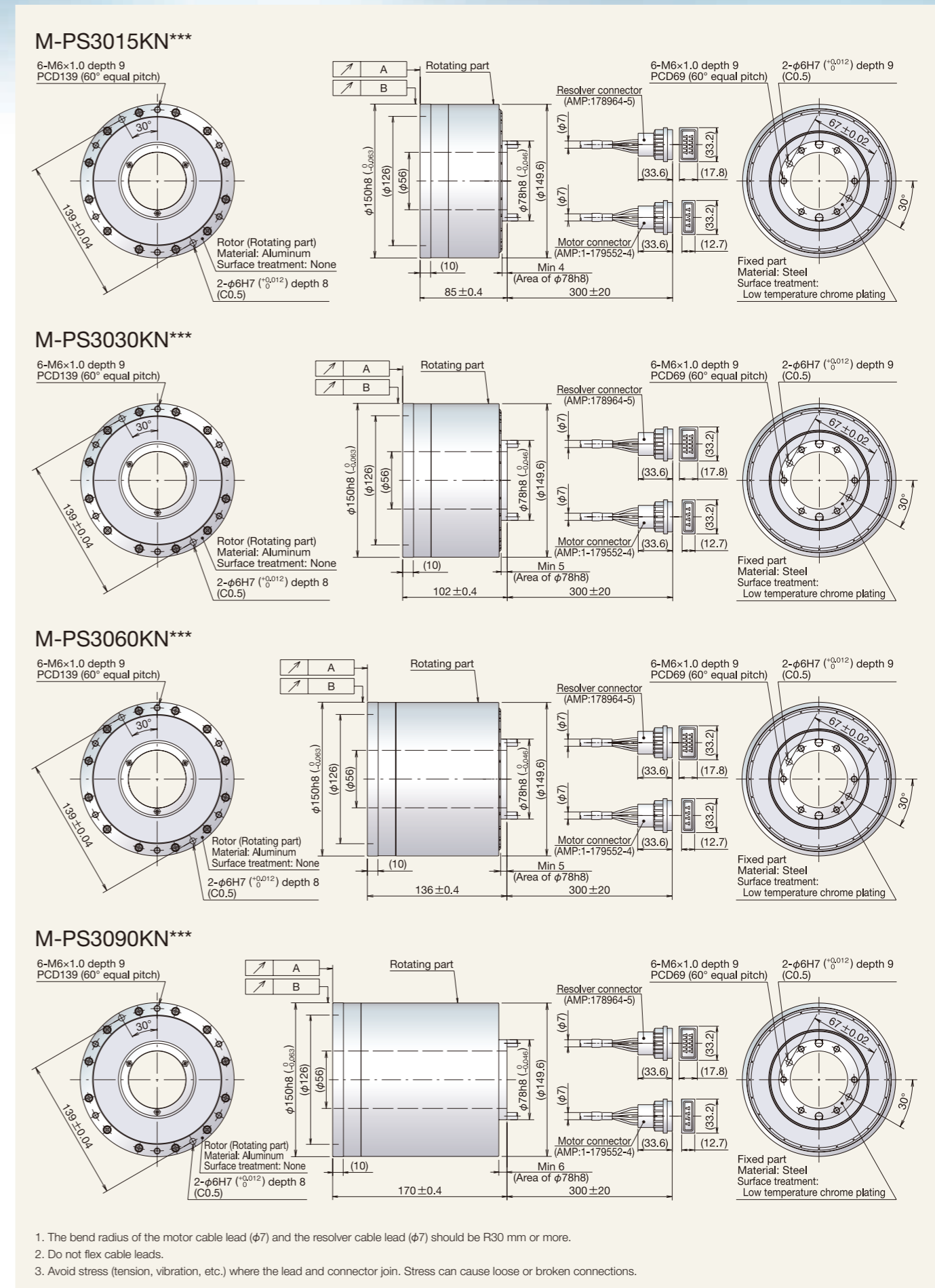
### M-PS3015KN***



### M-PS3030KN***



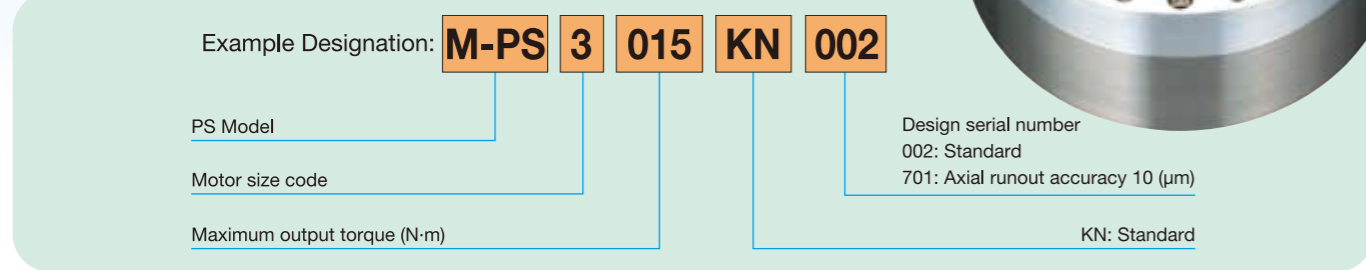### M-PS3060KN***



### M-PS3090KN***



1. The bend radius of the motor cable lead (φ7) and the resolver cable lead (φ7) should be R30 mm or more.
2. Do not flex cable leads.
3. Avoid stress (tension, vibration, etc.) where the lead and connector join. Stress can cause loose or broken connections.

Complies with UL and CE

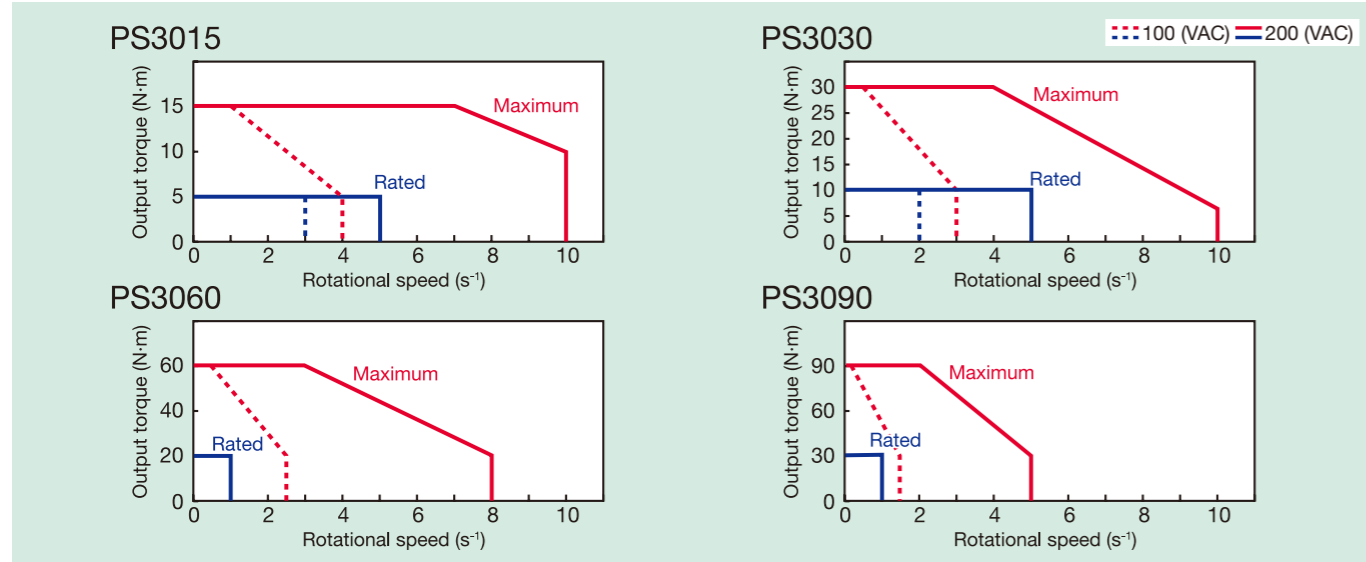# 2.3 PN Model

## 2.3.1 Designation

Example Designation: **M-PN** **3** **045** **KN** **001**

PN Model

Motor size code

Maximum output torque (N·m)

Design serial number  201: Standard (PN2 Model)
001: Standard (PN3/PN4 Model)
701: Axial runout accuracy 10 (µm)

KN: Standard

## 2.3.2 Specifications

| Item | Designation | M-PN2012KN201 *1 | M-PN3045KN*** | M-PN4135KN*** | M-PN4180KN*** |
|---|---|---|---|---|---|
| Motor outer diameter (mm) | | φ170 | φ210 | φ280 | |
| Maximum output torque (N·m)*7 | | 12 / 10 | 45 / 45 | 135 / — | 180 / — |
| Rated output torque (N·m)*7 | | 2 / 2 | 15 / 15 | 45 / — | 60 / — |
| Axial runout accuracy (A in the figure) (µm)*2 | KN001 | 50 | 30 | | |
| | KN701 | | 10 | | |
| | Special*2 | | (5) | | |
| Radial runout accuracy (B in the figure) (µm)*2 | | 50 | 50 (10,5) | | |
| Motor height (mm) | | 35 | 85 | 95 | 112 |
| Motor hollow diameter (mm) | | φ36 | φ56 | φ50 | |
| Maximum rotational speed (s⁻¹)*7 | | 2 / 2 | 3 / 1.5 | 3 / — | |
| Rated rotational speed (s⁻¹)*7 | | 1 / 1 | 1 / 1 | 1 / — | |
| Resolution of position sensor (count/revolution) | | 2 621 440 | | | |
| Absolute positioning accuracy (arc-sec)*3 | | 90 (±45)*1 | 60 (±30)*4 | | |
| Repeatability (arc-sec) | | ±2 | | | |
| Allowable axial load (N)*5 | | 1 000 | 4 500 | 9 500 | |
| Allowable radial load (N)*6 | | 300 | 4 500 | 9 500 | |
| Allowable moment load (N·m) | | 20 | 80 | 160 | 200 |
| Rotor inertia (kg·m²) | | 0.0024 | 0.011 | 0.057 | 0.065 |
| Allowable range of inertia (kg·m²) | | 0.02 to 0.24 | 0.11 to 0.77 | 0.57 to 3.99 | 0.65 to 4.55 |
| Mass (kg) | | 3.7 | 13 | 26 | 31 |
| Environmental conditions | | Ambient temperature 0 to 40 °C ; humidity: 20 to 80 % ; use indoors, free from dust, condensation and corrosive gas. IP30 or equivalent. | | | |

*1 Absolute positioning accuracy is 120 arc-sec when cable length exceeds 8m.
*2 Motor dimensions of products with runout accuracy shown in parentheses ( ) may vary. Please contact NSK for details.
*3 At ambient temperature of 25±5 °C
*4 Absolute positioning accuracy is 90 arc-sec when cable length exceeds 8 m.
*5 With no radial load
*6 With no axial load
*7 At power voltage of 200 VAC/100 VAC
· Please consult NSK if the motor bears radial, axial, and moment loads at the same time.
· If bearing an unbalanced load, the moment and radial loads generated by centrifugal force should be less than the allowable load.
· For oscillating operation less than 45°, turn the motor 90° or more at least once a day.
· Use the pinhole for positioning only. Do not use the pinhole to bear loads.
· Depending on operating conditions, use outside the allowable range of inertia may be possible. Contact NSK for details.

## 2.3.3 Rotational Speed and Output Torque Characteristics

100 (VAC)   200 (VAC)

### PN2012

Output torque (N·m) / Rotational speed (s⁻¹)

Maximum, Rated

### PN3045

Output torque (N·m) / Rotational speed (s⁻¹)

Maximum, Rated

### PN4135

Output torque (N·m) / Rotational speed (s⁻¹)

Maximum, Rated

### PN4180

Output torque (N·m) / Rotational speed (s⁻¹)

Maximum, Rated
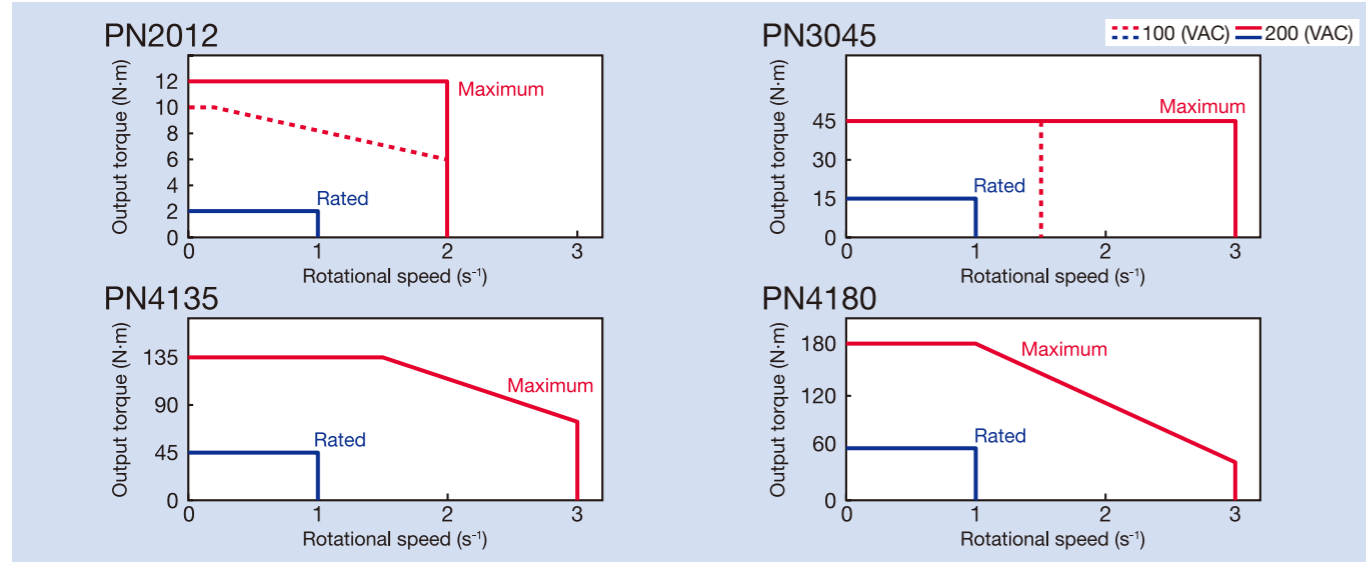
These represent typical values.

## 2.3.4 Dimensions

### M-PN2012KN201



### M-PN3045KN***



### M-PN4135KN***



### M-PN4180KN***



1. Dimensions marked with *1 require an extra margin of 3 mm or more due to their casting surface.
2. For PN2012K201, the bend radius of the motor cable lead (φ7) and the resolver cable lead (φ7) should be R30 mm or more.
3. For PN2012K201, do not use leads that flex.
4. Avoid stress (tension, vibration, etc.) where the lead and connector join. Stress can cause loose or broken connections

5. When inserting the pin into the rotor pinhole:
· Set the tolerance of the insert pin for a clearance fit.
· Do not apply excessive load or impacts to the motor when inserting the pin.
· Use the pinhole for positioning only. Do not use the pinhole to bear load on the rotor.

# 2.4 PN Model With Brake

## 2.4.1 Designation

Example Designation: **M-PN** **3** **045** **KG** **001**

- PN Model
- Motor size code
- Maximum output torque (N·m)
- Design serial number
  001: Standard
- KG: With brake
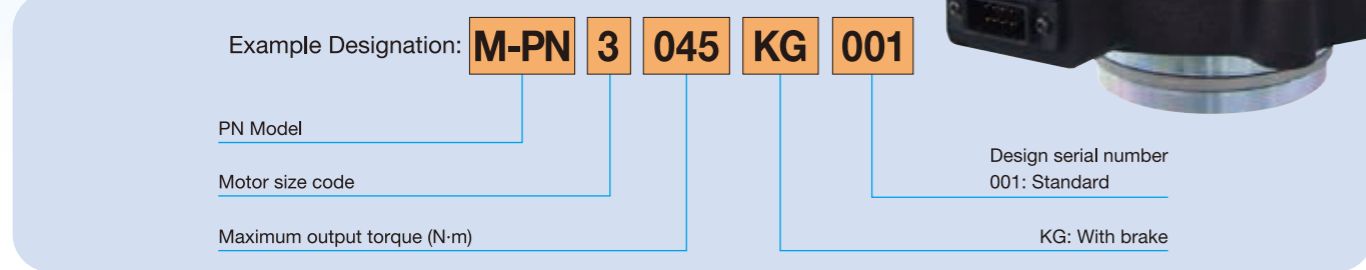
## 2.4.2 Specifications

| Item / Designation | M-PN3045KG001 | M-PN4135KG001 |
|---|---|---|
| Motor outer diameter (mm) | φ210 | φ280 |
| Maximum output torque (N·m)[*6] | 45 / 45 | 135 / — |
| Rated output torque (N·m)[*6] | 15 / 15 | 45 / — |
| Axial runout accuracy (A in the figure) (μm) | 50 | |
| Radial runout accuracy (B in the figure) (μm) | 50 | |
| Motor height (mm) | 97 | 111 |
| Motor hollow diameter (mm) | φ32 | |
| Maximum rotational speed (s⁻¹)[*6] | 3 / 1.5 | 3 / — |
| Rated rotational speed (s⁻¹)[*6] | 1 / 1 | 1 / — |
| Resolution of position sensor (count/revolution) | 2 621 440 | |
| Absolute positioning accuracy (arc-sec)[*1*2] | 60 (±30)[*3] | |
| Repeatability (arc-sec) | ±2.0[*2] | |
| Allowable axial load (N)[*4] | 4 500 | 9 500 |
| Allowable radial load (N)[*5] | 4 500 | 9 500 |
| Allowable moment load (N·m) | 80 | 160 |
| Brake type | Negative actuated type electromagnetic brake (Brake ON when power is OFF) Non- backlash type | |
| Braking torque (N·m) | 36 | 72 |
| Brake power supply (VDC) | 24 | |
| Brake power consumption (W) | 26 | 40 |
| Rotor inertia (kg·m²) | 0.018 | 0.080 |
| Allowable range of inertia (kg·m²) | 0.11 to 0.77 | 0.57 to 3.99 |
| Mass (kg) | 18 | 34 |
| Environmental conditions | Ambient temperature 0 to 40 °C ; humidity: 20 to 80 % ; use indoors, free from dust, condensation and corrosive gas. IP30 or equivalent. | |

[*1] Ambient temperature of 25±5 °C
[*2] Positioning accuracy with brake released
[*3] Absolute positioning accuracy is 90 arc-sec when cable length exceeds 8 m.
[*4] With no radial load
[*5] With no axial load
[*6] At power voltage of 200 VAC/100 VAC
· Please consult NSK if the motor bears radial, axial, and moment loads at the same time.
· If bearing an unbalanced load, the moment and radial loads generated by centrifugal force should be less than the allowable load.
· For oscillating operation less than 45°, turn the motor 90° or more at least once a day.
· Depending on operating conditions, use outside the allowable range of inertia may be possible. Contact NSK for details.
· Manuals and technical data are available upon request for brake holding accuracy, operating time, and frequency of use.

<Note on compliance with UL Standards and CE Marking>
· PN Model With Brake
  PN Model With Brake does not comply with UL Standards or CE Marking.
· Driver Unit Model EDD
  Driver Unit Model EDDs comply with UL Standards and CE Marking when used with PS and PN Model. However, they do not comply with UL Standards or CE Marking when used with the PN Model With Brake.

## 2.4.3 Rotational Speed and Output Torque Characteristics



PN3045

PN4135

[···] 100 (VAC)  [—] 200 (VAC)
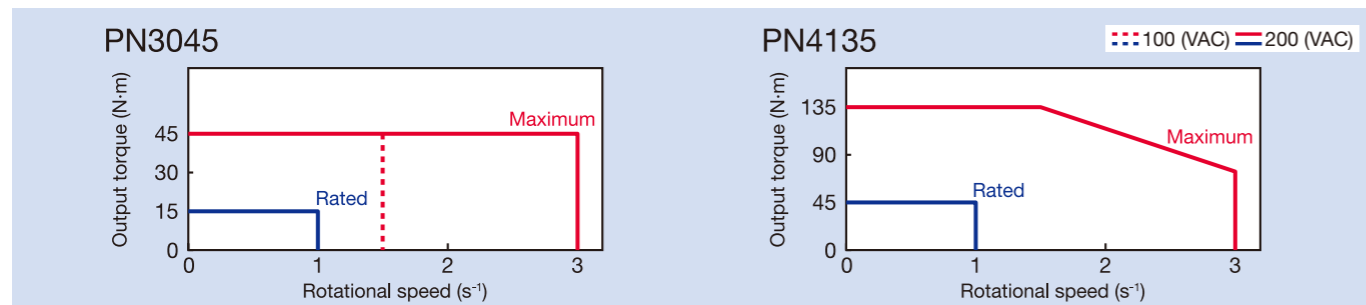
These are typical values.

## 2.4.4 Dimensions

### M-PN3045KG001
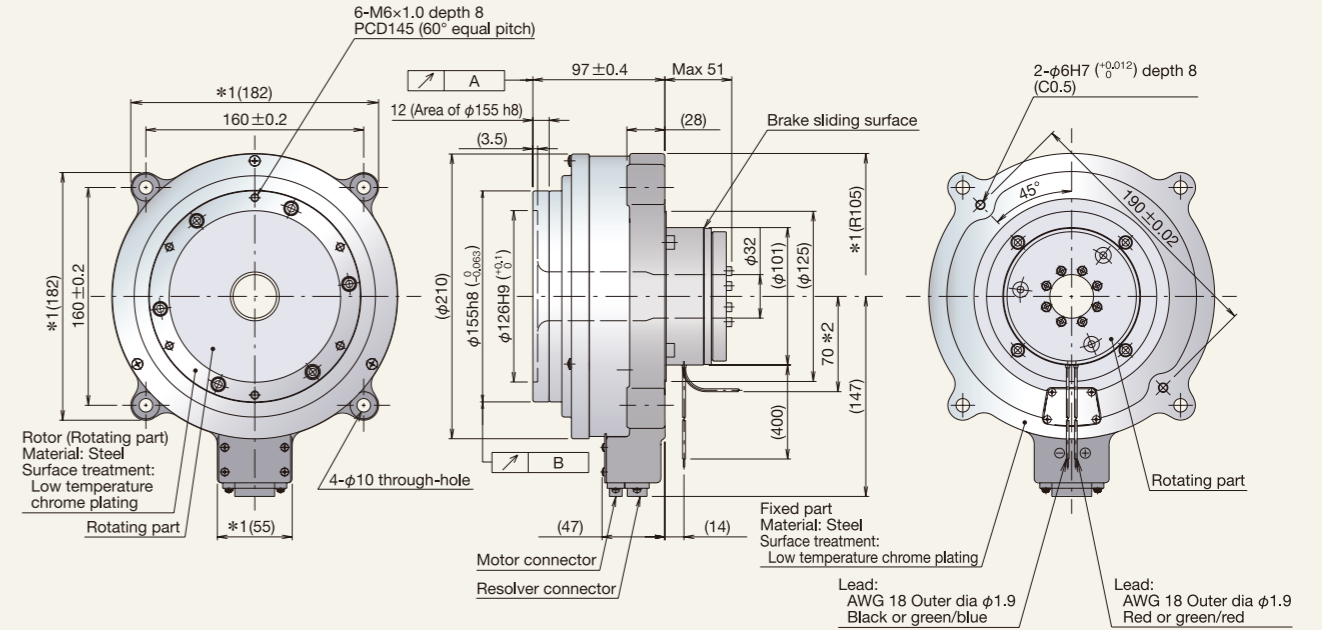


### M-PN4135KG001
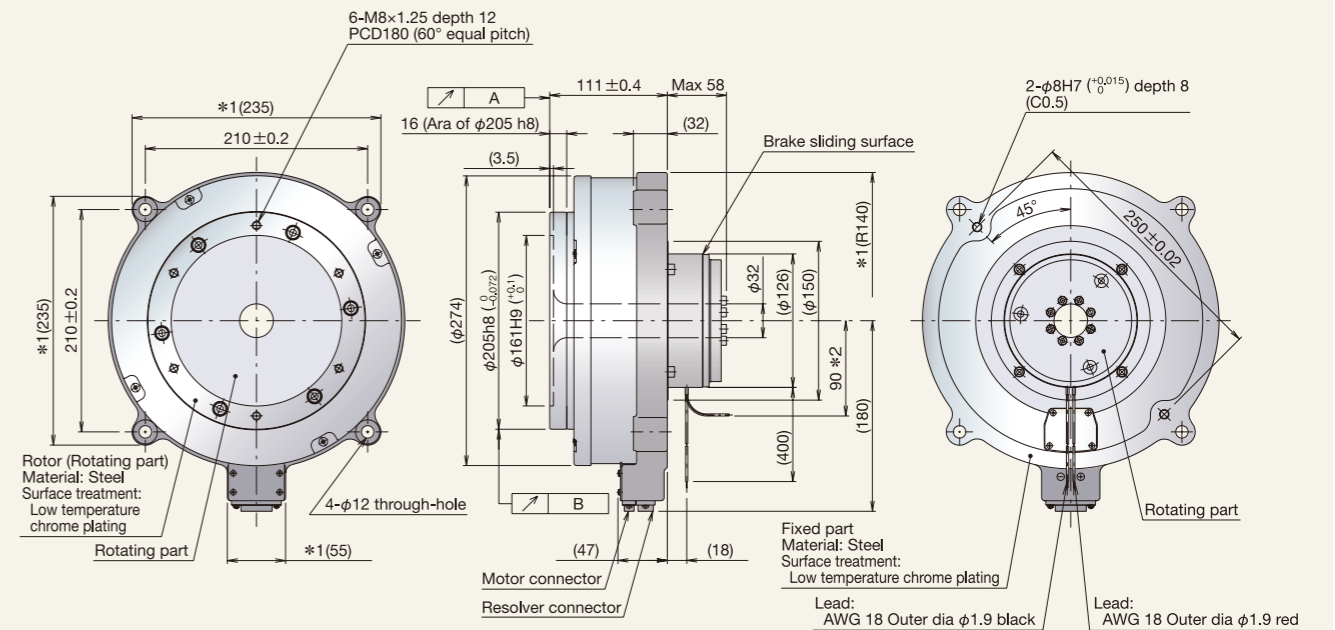


1. Dimensions marked with *1 require an extra margin of 3 mm or more due to their casting surface.
2. *2 indicates the minimum lead bend distance. When bending the lead, maintain a greater distance than specified regardless of bend direction. The bend radius of leads should be at least R15 mm.
3. Be sure to keep iron powders and oil away from brake sliding surfaces.
4. Iron materials near a brake may interrupt operation; therefore, ensure at least 15 mm of space around the brake during installation.

# 2.5 Environment-Resistant PNZ Model

## 2.5.1 Designation

Example Designation: **M-PNZ** **3** **040** **KN** **001**

- Environment-Resistant PNZ Model
- Motor size code
- Maximum output torque (N·m)
- Design serial number 001: Standard
- KN: Standard
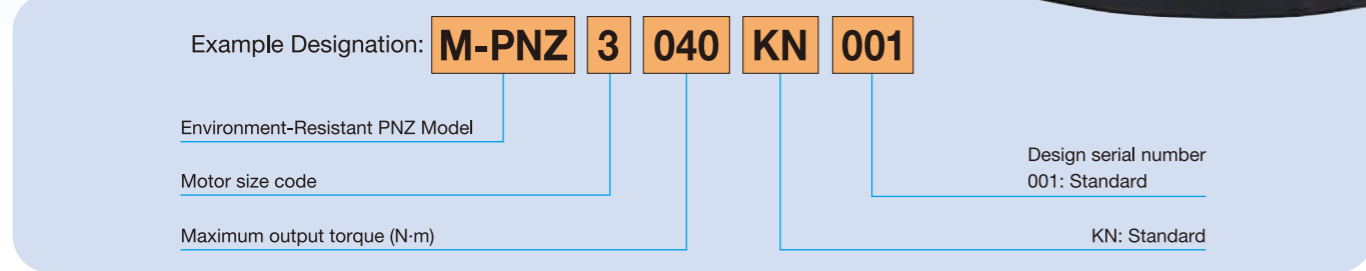
## 2.5.2 Specifications

| Item \ Designation | M-PNZ3040KN001 | M-PNZ4130KN001 | M-PNZ4175KN001 |
|---|---|---|---|
| Motor outer diameter (mm) | φ220 | φ286 | |
| Maximum output torque (N·m)[*5] | 40/40 | 130/— | 175/— |
| Rated output torque (N·m)[*5] | 5/5 | 30/— | 45/— |
| Axial runout accuracy (A in the figure) (μm) | 10 | | |
| Radial runout accuracy (B in the figure) (μm) | 10 | | |
| Motor height (mm) | 100 | 120 | 137 |
| Motor hollow diameter (mm) | φ44 | φ37 | |
| Maximum rotational speed (s⁻¹)[*5] | 3/1.5 | 3/— | |
| Rated rotational speed (s⁻¹)[*5] | 1/1 | 1/— | |
| Resolution of position sensor (count/revolution) | 2 621 440 | | |
| Absolute positioning accuracy (arc-sec)[*1] | 70 (±35)[*2] | | |
| Repeatability (arc-sec) | ±2 | | |
| Allowable axial load (N)[*3] | 4 500 | 9 500 | |
| Allowable radial load (N)[*4] | 4 500 | 9 500 | |
| Allowable moment load (N·m) | 80 | 160 | 200 |
| Rotor inertia (kg·m²) | 0.028 | 0.12 | 0.13 |
| Allowable range of inertia (kg·m²) | 0.11 to 0.77 | 0.57 to 3.99 | 0.65 to 4.55 |
| Mass (kg) | 21 | 42 | 48 |
| Environmental conditions | Ambient temperature 0 to 40 °C ; use indoors, free from corrosive gas | | |
| Degree of protection | IP66M (IEC/EN 60529, IEC/EN 60034-5) | | |

[*1] Ambient temperature of 25±5 °C
[*2] Absolute positioning accuracy is 90 arc-sec when cable length exceeds 8 m.
[*3] With no radial load
[*4] With no axial load
[*5] At power voltage of 200 VAC/100 VAC
· Please consult NSK if the motor bears radial, axial, and moment loads at the same time.
· If bearing an unbalanced load, the moment and radial loads generated by centrifugal force should be less than the allowable load.
· For oscillating operation less than 45°, turn the motor 90° or more at least once a day.
· Contact NSK for calculation of allowable effective torque
· Depending on operating conditions, use outside the allowable range of inertia may be possible. Contact NSK for details.
· Dust and water resistance testing do not constitute a guarantee against malfunction or accident, or a guarantee of the product life. IP classifications specified by the IEC constitute indexes for protective performance under fixed conditions, and do not constitute a guarantee of ingress protection in all conditions or for all liquids and solids.
· An anti-rust surface treatment is applied on the motor outer surface. However, NSK does not guarantee antirust performance in any condition or environment. Please take your own measures to prevent rust. (NSK tests the surface treatment with a neutral salt spray. Please contact us for details.)
· Sealing parts, such as oil seals, O-rings, and gaskets for connectors are made of nitrile rubber (NBR). Confirm compatibility with the specific liquid used in the environment in advance. The operating temperature of the liquid should be 0 to 40 °C. Consult with NSK before use in environments with exposure to other liquids, dust, or particulates.
· The outer layer sheath of the cable set uses heat-resistant PVC, which is not resistant to all types of liquid or oil. Consult with NSK before use if you are concerned about a specific operating environment or liquids.
· Oil seals, O-rings, gaskets, and cables are consumable parts. Periodic inspection of sealing performance is strongly recommended to prevent motor failure or stoppage due to the entry of water. NSK can replace components, issue an overhaul evaluation report, and conduct performance inspections (excluding operations checking) for a fee.
· Purge the air out of the oil seal section to ensure protection from ingress of water.
· Though rust may occur on the motor outer surface, it does not affect motor performance.

< Note on compliance with UL Standards and CE Mark >
· Environment-Resistant PNZ Model
  Environment-Resistant PNZ Model does not comply with UL Standards or CE Mark.
· Driver Unit Model EDD
  Driver Unit Model EDDs comply with UL Standards and CE Mark when used with PS and PN Model. However, they do not comply with UL Standards or CE Mark when used with a Environment-Resistant PNZ Model.

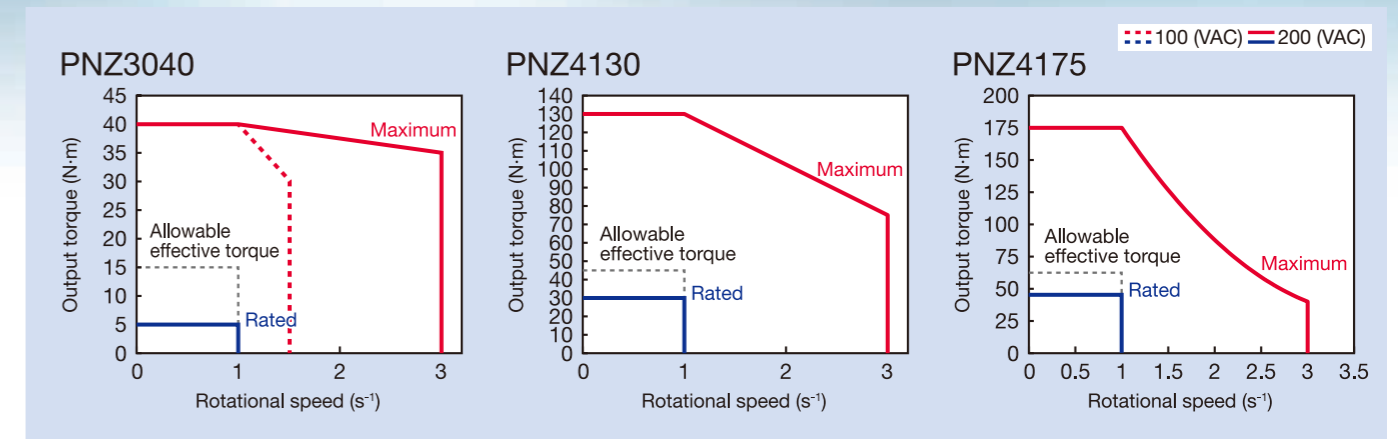## 2.5.3 Rotational Speed and Output Torque Characteristics

····· 100 (VAC)   ▬▬ 200 (VAC)



Please contact NSK for calculation of allowable effective torque.
These are typical values at 200 VAC.

## 2.5.4 Dimensions



**M-PNZ3040KN001**

**M-PNZ4130KN001**

**M-PNZ4175KN001**

1. Do not install upside-down, as liquid will drop to the bottom of the rotating part.
2. Maintain the required space (about 30 mm) around the connector of the motor resolver for fitting. Be sure to install the protective cap (supplied with the motor) when the cable set is not connected, such as during maintenance or inspection.
3. Carefully place and secure the cable set so that bending stress does not occur on the watertight bushing of the cable set.
4. The air used for purging should be dry and at a specified pressure, which can be controlled by a regulator, filter, etc.

# 3 Driver Unit Model EDD

## 3.1 Features

● **Achieves settling time of 1 ms with a unique servo algorithm.**
The Driver Unit Model EDD adopts an original disturbance observer and preview-based feed-forward control, which significantly reduces positioning time, especially settling time (approach time).

● **Positioning controller function**
Positioning can be controlled without complicated communication or an upper controller.

● **Variety of control I/Os**
Offers various positioning input/output controls, including an encoder output, servo control, and program control. No additional sensors are needed for status monitoring.

## 3.2 Components and Functions

**Rear mounting hole**
Optional mounting bracket available for front mounting.

**Independent inputs for main power and control power**
Separate power lines assure system safety.

**Motor cable connector**
Makes it quicker to setup electric components and prevents incorrect wiring.

**7 segment LED indicators**
Driver Unit status can be recognized at a glance.

**Analog monitor output terminal**
Speed, positioning error, torque, motor current, etc. can be monitored by analog voltage.
Effective for making adjustments and monitoring operating status.

**RS-232C communication port**
Can connect with the Handy Terminal to set parameters.
＊This port cannot be used with the EDD Megaterm software. Please use the USB port instead.

**USB port**
Provides a PC connection with EDD Megaterm software (free download from NSK's website).

**Control I/O port**
A variety of signals are available, including servo on, in-position, emergency stop, area signal, override, various alarm outputs, $\phi A/\phi B/\phi Z$, etc.

## 3.3 Control Technology

### Control Technology and Example High-Speed Positioning

● **Control block diagram**
Our proprietary servo algorithm
↓
Settling time: Less than 1 (ms)

Position command → Preview-based feed-forward controller → Feedback controller → Torque command → Motor → Position output

Minimizes deviations in operation
⇒**Short settling time**

Disturbance (friction, etc.)

Observer controller
Negates disturbances.
⇒**High servo rigidity**

● **Comparison of 180° positioning**
Positioning time = Command time + Settling time

**Conventional NSK Motor (JS2014)**
3.2 (s⁻¹)
Rotational speed
Command
Command time 285 (ms)  Settling time 45 (ms)
Positioning time 330 (ms)  In-position signal
50 (ms)
Following error
Following error  Maximum 20 500 pulses (2.85°)

**PS1012**
7.0 (s⁻¹)
Rotational speed
Command
Command time 146.5 (ms)  Settling time 1 (ms)
Positioning time 147.5 (ms)  In-position signal
50 (ms)
Following error
Following error  Maximum 40 pulses (0,006°)

| | | | |
|---|---|---|---|
| Settling time | 45 (ms) | ⇒ | 1 (ms) |
| Following error | 20 500 pulses | ⇒ | 40 pulses |
| Positioning time | 330 (ms) | ⇒ | 147.5 (ms) |

## 3.4 Designation

Example Designation:  **M-EDD** - **PS1006** **A** **B** **5** **01** **-03**

Driver Unit Model EDD

Motor size code

Power voltage A: 100 to 240 (VAC) (single-phase)
(PN4, PNZ4 models: 200 to 240 (VAC) only)

Position sensor code B: Absolute position sensor code

Function 5: Standard

Design serial number 01: Standard

-03: Connectors, Fixing brackets and startup Guide are included

Environment-Resistant PNZ Model, PN Model With Brake, and PN Model use the same Driver Units. Refer to Section 9 "Motor and Driver Unit Combination" for more details on applicable models.

**Standard accessories**
(1) CN2 connector (user side)  Plug: DF02P050F22A1(JAE) Hood: DF02D050C21 (JAE), or equivalent
(2) CN5 connector (user side)  Connector: FKC2, 5/5-ST-5, 08-LR (Phoenix Contact), or equivalent
(3) Driver unit fixing brackets
(4) Startup Guide

## 3.5 System Configuration

### System Configuration of PS/PN Model, Environment-Resistant PNZ Model

Main power and control power Single-phase 100 to 240 (VAC)
Circuit breaker (MCCB)
Noise filter

Driver Unit＊

Application＊ EDD Megaterm PC

PLC, Motor controller, etc.

Megatorque Motor＊

Eelctromagnetic contactor

USB communication

24 (VDC) power supply

Power supply for control input

Signal for control I/O

Handy Terminal＊

Air purge line (Only for Environment-Resistant PNZ Model)

Cable set＊ { Resolver cable / Motor cable }

RS-232C communication

＊NSK Product

＊For PN Model With Brake, refer to 3.9 Example of system configuration of PN Model With Brake.

## 3.6 General Specifications

| Item | Motor model | PS1006 | PS1012 | PS1018 | PS3015 | PS3030 | PS3060 | PS3090 | PN2012 | PN3045 | PN4135 | PN4180 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Input power | Rated capacity (kVA) | 0.3 | 0.4 | 0.6 | 0.6 | 0.9 | 0.5 | 0.6 | 0.2 | 0.5 | 0.8 | 1.0 |
| | Maximum capacity (AC200V) (kVA) | 1.0 | 1.4 | 2.2 | 2.2 | 2.7 | 4.6 | 4.7 | 2.3 | 4.1 | 4.8 | 4.8 |
| | Maximum capacity (AC100V) (kVA) | 0.4 | 0.6 | 0.9 | 1.0 | 1.2 | 2.0 | 2.2 | 0.8 | 1.9 | – | – |
| | Control capacity (kVA) | 0.06 | | | | | | | | | | |
| | Control power source | Single phase 100 to 240 VAC 50 to 60 Hz Voltage fluctuation +10/-15% or less | | | | | | | | | Single phase 200 to 240 VAC 50 to 60 Hz Voltage fluctuation +10/-15% or less | |
| | Main power | | | | | | | | | | | |
| Resolution of position sensor count/turn | | 2 621 440 | | | | | | | | | | |
| Control mode | Positional control | Program operation (up to 256 Program channels: Position commands and parameter settings are programmable), Pulse train command, RS-232C serial communication command, Jogging, Home Return | | | | | | | | | | |
| | Speed control | RS-232C serial communication command, analog input | | | | | | | | | | |
| | Torque control | RS-232C serial communication command, analog input | | | | | | | | | | |
| Input signal | Pulse train command | Photocoupler input Maximum frequency: 2 (MHz) Input format: CW/CCW, Pulse and direction or $\phi$A/$\phi$B Resolution changer for universal multiplication is available (1 000 to 5 242 880 count/turn) | | | | | | | | | | |
| | Analog input | Analog command voltage input  Input voltage: ±10 (V) | | | | | | | | | | |
| | Control input | Photocoupler input ([± common], 17 input ports) (Input voltage: 24 (VDC)) | | | | | | | | | | |
| Output signal | Position feedback signal | Signal format: $\phi$A/$\phi$B/$\phi$Z line driver. Universal resolution setting to $\phi$A/$\phi$B is available. Resolution of $\phi$A/$\phi$B: Shipping set: 20 480 (count/revolution) (Quadrupled: 81 920) Maximum: 1 310 720 (count/revolution) (Quadrupled: 5 242 880) ∗As the maximum frequency is 781 kHz, the resolution setting limits the maximum velocity. Maximum rotational speed (s⁻¹)=781 (kHz)/ Resolution of $\phi$A/$\phi$B Resolution of $\phi$Z: 80 (count/revolution) | | | | | | | | | | |
| | Control output | Photocoupler output ([± common], 8 outputs) (Max. switching capacity: 24 (VDC) / 50 (mA)) | | | | | | | | | | |
| | Alarms | Excess position error, Program error, Automatic tuning error, Position command/feedback error, Software thermal error, Home position undefined, Main AC Line under voltage, Travel limit over, RAM error, ROM error, System error, Interface error, ADC error, Emergency stop, CPU error, Position sensor error, Absolute position error, Motor cable disconnect, Excessive velocity, Commutation error, Overheat, Main AC Line over voltage, Excess current, Control AC line under voltage, Power module alarm | | | | | | | | | | |
| | Monitors | Analog monitor x 2, (Free range and offset setting), RS-232C monitor, USB monitor | | | | | | | | | | |
| | Communication | RS-232C serial communication (asynchronous, 9 600 (bps)), USB (USB 2.0 compatible) | | | | | | | | | | |
| | Others | Automatic tuning Function set to Input/output ports available Cam curve drive (Deformation sine, Modified trapezoidal, Cycloid, Harmonic motion) | | | | | | | | | | |
| Environmental conditions | Operating/Storing temperatures | 0 – 50 (°C)/-20 – +70 (°C) | | | | | | | | | | |
| | Operating/Storing humidity | 90% or less with no moisture | | | | | | | | | | |
| | Vibration resistance | 4.9 (m/s²) or less | | | | | | | | | | |
| Internal functions | Regenerative energy absorption | Optional regenerative resistor | | | | | | | | | | |
| | Dynamic brake | Functions at power off, servo off, and in the occurrence of an alarm. | | | | | | | | | | |
| Compatible safety regulation | UL | UL61800-5-1 | | | | | | | | | | |
| | CE | LVD | EN61800-5-1 | | | | | | | | | |
| | | EMC | EN61800-3 | | | | | | | | | |
| Connector | USB | CN0 | USB mini-B | | | | | | | | | |
| | RS-232C | CN1 | D-sub 9 pin | | | | | | | | | |
| | Control I/O | CN2 | Half-pitch connector 50 pins | | | | | | | | | |
| | Position sensor | CN3 | Half-pitch connector 14 pins | | | | | | | | | |
| | Motor | CN4 | Plastic connector | | | | | | | | | |
| | Optional regenerative resistor | | | | | | | | | | | |
| | Main/control power source | CN5 | Plastic connector | | | | | | | | | |

## 3.7 Signal Specifications for CN2 (Control I/O)

Pin-out

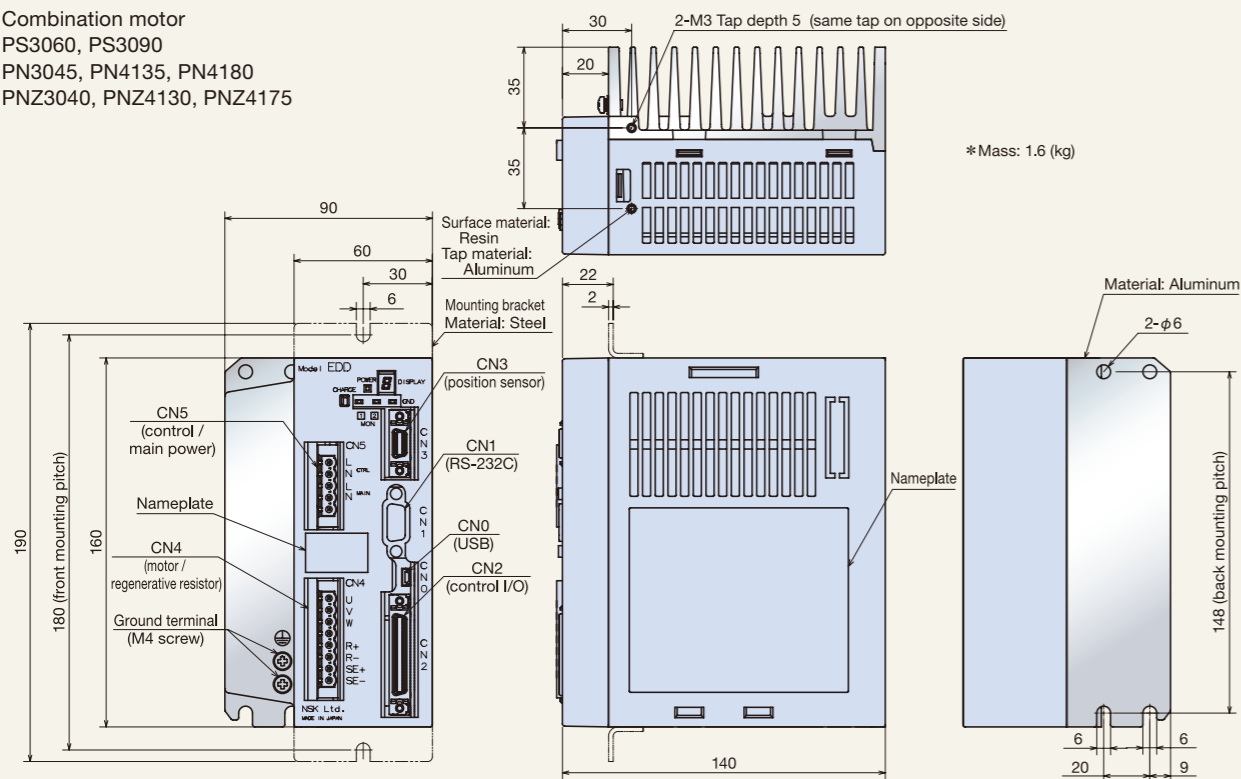| Input/Output | Signal Code | Pin No. | Signal Name | Function |
|---|---|---|---|---|
| Input Signal | DC24 | 1,2 | 24 (VDC) external power supply | External power supply for input signal |
| | EMST | 3 | Emergency stop | Terminates positioning operation and the Motor stops by the dynamic brake[1] |
| | ACLR | 4 | Alarm clear | Clears warning[1] |
| | OTP | 5 | Over travel limit (+ direction) | If OTP goes active, the Motor servo is locked in the CW direction[1] |
| | OTM | 6 | Over travel limit (- direction) | If OTM goes active, the Motor servo is locked in the CCW direction[1] |
| | SVON | 7 | Servo on | If SVON goes active, the servo turns on and the system waits for a command to be entered[1] |
| | RUN | 8 | Start program | Starts program operation specified by the PRG input[1] |
| | STP | 9 | Stop | Stops positioning operation and execution of the program[1] |
| | – | 10 | (Do not connect) | – |
| | PRG0 | 11 | Internal program channel selection 0 | For a program positioning operation: A combination of ON and OFF PRG0 to PRG7 inputs specified channel (0 to 255) to be executed[1] |
| | PRG1 | 12 | Internal program channel selection 1 | |
| | PRG2 | 13 | Internal program channel selection 2 | |
| | PRG3 | 14 | Internal program channel selection 3 | |
| | PRG4 | 15 | Internal program channel selection 4 | |
| | PRG5 | 16 | Internal program channel selection 5 | |
| | PRG6 | 17 | Internal program channel selection 6 | |
| | PRG7 | 18 | Internal program channel selection 7 | |
| | JOG | 19 | Jogging | If JOG goes active, the Motor rotates. If it goes inactive, the Motor decelerates and stops[1] |
| | DIR | 20 | Jogging direction | Specifies the direction of jogging[1] |
| | – | 21 | (Do not connect) | – |
| | CWP+ | 22 | CW pulse train (-) | Pulse train command rotates the Motor in the CW direction (Direction or Phase B) |
| | CWP– | 23 | CW pulse train (-) | |
| | CCWP+ | 24 | CCW pulse train (+) | Pulse train command rotates the Motor in the CCW direction (Pulse or Phase A) |
| | CCWP– | 25 | CCW pulse train (-) | |
| Output signal | COM | 26,27 | Output signal common | Common for output signal |
| | DRDY | 28 | Driver Unit ready | Reports that the Motor is ready to rotate (The port opens when the Motor is not ready, or an alarm occurs) |
| | WRN | 29 | Warning | Warns of abnormality in the System[2] |
| | OTPA | 30 | Over travel limit (+ direction) detected | Reports the output of over travel limit (software and hardware) in the plus direction[2] |
| | OTMA | 31 | Over travel limit (– direction) detected | Reports the output of over travel limit (software and hardware) in the minus direction[2] |
| | SVST | 32 | Servo state | Reports the state of the servo[2] |
| | BUSY | 33 | In-operation | Reports state of positioning operation[2] |
| | IPOS | 34 | In-position | Reports the condition of positioning error and the positioning operation[2] |
| | NEARA | 35 | Target proximity A | Reports that the Motor is approaching destination[2] |
| | CHA | 36 | Positioning feedback signal $\phi$A | A pulse signal that reports the number of motor rotations Output format is line driver |
| | *CHA | 37 | Positioning feedback signal *$\phi$A | |
| | CHB | 38 | Positioning feedback signal $\phi$B | |
| | *CHB | 39 | Positioning feedback signal *$\phi$B | |
| | CHZ | 40 | Positioning feedback signal $\phi$Z | |
| | *CHZ | 41 | Positioning feedback signal *$\phi$Z | |
| | – | 42 | (Do not connect) | – |
| | SGND | 43 | Signal ground | Ground for the position feedback signal |
| Input signal | AIN+ | 44 | Analog signal | ±10 (VDC) Analog input signal |
| | AIN– | 45 | Ground for analog signal | |
| | – | 46-50 | (Do not connect.) | – |
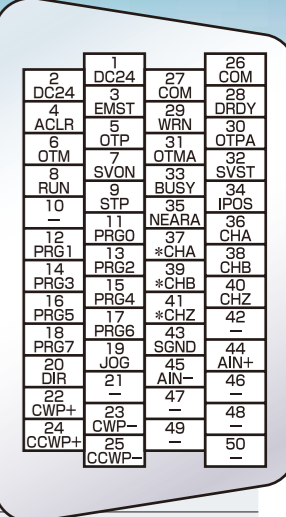
Carefully follow these instructions when wiring to the Control I/O (CN2):
· Use shielded wires and a twisted pair for pulse train input and position feedback output. These wires should be as short as possible (up to 2 m).
Selection and optional settings to control Input/Output signal functions
· You may reassign functions to control Input/Output by setting parameters.
∗1 Input signal: Select up to 16 input signals out of the 22 input signals listed above and then set them to Pins 4 to 9 and 11 to 20. (In addition to the Input signals listed above, you may select: Hold, Velocity override, Integration OFF, Home return start, and/or Home position limit.)
· Pin No. 3 is fixed to the "Emergency stop" signal. The signal polarity is variable.
∗2 Output signal: Select up to 7 output signals out of the 23 output signals listed above and then assign them to Pins 29 to 35. In addition to the Output signals listed above, you may select: Target proximity B, Zone A/B/C, Over travel limit (± direction), Normal, Position error (under/over), Velocity (under/over), Torque command (under/over), Thermal loading (under/over), Home return completed, and/or Home position defined.
· The output "Driver Unit ready" set to Pin 28 can only be replaced with output signal "Normal." (Signal polarity cannot be changed.)

## 3.8 Dimensions (Standard Specifications)

Combination motor
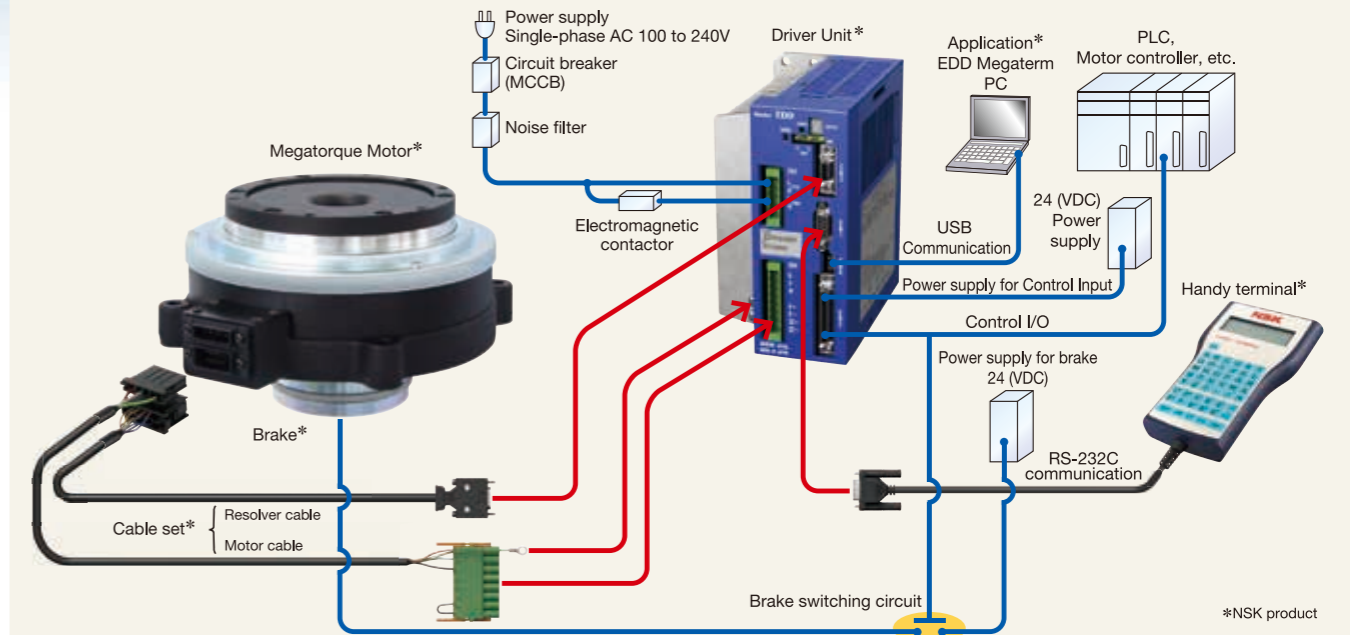PS1006, PS1012, PS1018
PS3015, PS3030
PN2012

30
15
20
35
2-M3 tap depth 5 (same tap on opposite side)

＊Mass: 1.1 (kg)

Surface material:
Resin
Tap material:
Aluminum

Mounting bracket
Material: Steel

70
60
30
6

22
2

Material: Aluminum

φ6

CN3
(position sensor)

CN5
(control /
main power)

CN1
(RS-232C)

Nameplate

CN4
(motor /
regeneration resistor)

CN0
(USB)

CN2
(control I/O)

Ground terminal
(M4 screw)

Model : EDD

190
180 (front mounting pitch)
160

Nameplate

148 (back mounting pitch)

6
9

140

Combination motor
PS3060, PS3090
PN3045, PN4135, PN4180
PNZ3040, PNZ4130, PNZ4175

30
35
20
35
2-M3 Tap depth 5 (same tap on opposite side)

＊Mass: 1.6 (kg)

Surface material:
Resin
Tap material:
Aluminum

Mounting bracket
Material: Steel

90
60
30
6

22
2

Material: Aluminum

2-φ6

CN3
(position sensor)

CN5
(control /
main power)

CN1
(RS-232C)

Nameplate

CN4
(motor /
regenerative resistor)

CN0
(USB)

CN2
(control I/O)

Ground terminal
(M4 screw)

Model : EDD

190
180 (front mounting pitch)
160

Nameplate

148 (back mounting pitch)

6
20
6
9

140

## 3.9 Example System Configuration

### System Configuration of PN Model With Brake

Power supply
Single-phase AC 100 to 240V

Circuit breaker
(MCCB)

Noise filter

Driver Unit＊

Application＊
EDD Megaterm
PC

PLC,
Motor controller, etc.

Megatorque Motor＊

Electromagnetic
contactor

USB
Communication

24 (VDC)
Power
supply

Power supply for Control Input

Control I/O

Handy terminal＊

Power supply for brake
24 (VDC)

Brake＊

RS-232C
communication

Cable set＊
Resolver cable
Motor cable

Brake switching circuit

＊NSK product

### Example Break Sequence

Start of positioning
(RS-232C communication
command or RUN input)

ON
OFF

24 (VDC) power supply
for brake

ON
OFF

Brake power ON

Brake power OFF

IPOS output (FW>0)

ON
OFF

FW

Unclamping timer

Clamp timer

Brake operation

Apply
Release

Brake released

Brake applied

IOFF input
(integral control off)

ON
OFF

Integral control enabled

Integral control disabled

IS

In-position settling confirmation timer

Motor operation

Motor rotated

For brake sequence details, refer to the User's Manual.

# 4 | Cable Set

## 4.1 Designation

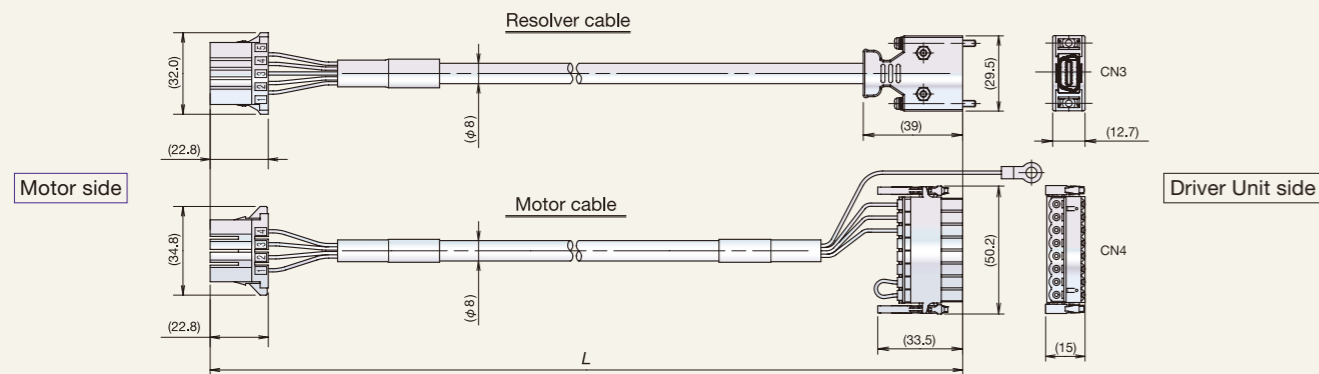### Cable Set Designation for PS/PN Model and PN Model With Brake

Example Designation: **M-C** **004** **SDP** **03**

Cable set

Cable length L: (m)
(Example) 004: 4 (m)

03: Stationary cable
13: Flexible cable

SDP: For PS/PN Model and
PN Model With Brake

Refer to 9 Motor and Driver Unit Combinations for correct length.
Cable length should be less than 8 m for combinations with absolute positioning accuracy of high-precision products, PN 2012.
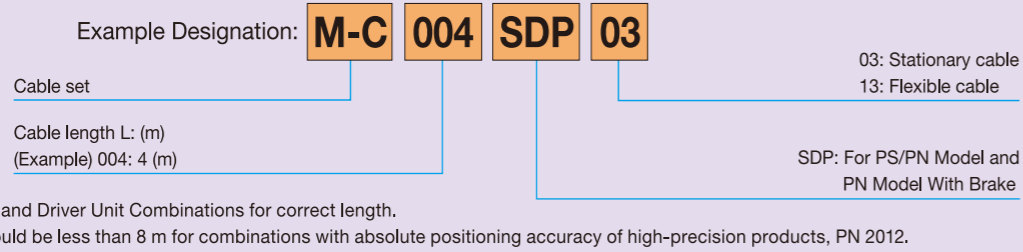
### Cable Set Designation for Environment-Resistant PNZ Model

Example Designation: **M-C** **004** **WDP** **13**

Cable set

Cable length L: (m)
(Example) 004: 4 (m)

13: Flexible cable, straight connector
14: Flexible cable, angle connector

WDP: For Environment-Resistant PNZ Model

Refer to 9 Motor and Driver Unit Combinations for correct length.

## 4.2 Dimensions

### Cable Set Dimensions for PS/PN Model and PN Model With Brake



### Cable Set Dimensions for Environment-Resistant PNZ Model
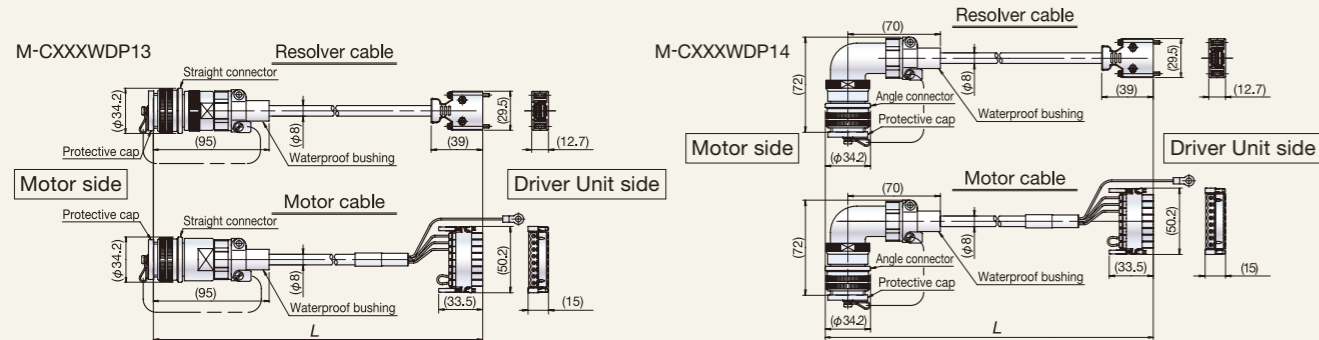


### Cable bend radius (for both motor cable and resolver cable)

|  | Bend radius at fixed side | Bend radius at moving side |
|---|---|---|
| Stationary cable | R43 or more | – |
| Flexible cable | R40 or more | R80 or more |

※UL-compliant cables are used for the cable set.

---

# 5 | Options

## 5.1 Handy Terminal

Example Designation: **M-FHT** **31**

Handy Terminal

Design number
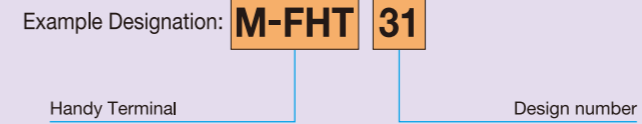


The Handy Terminal (FHT31) is an easy-to-use RS-232C communication terminal for inputting parameters and programs to the Control I/O of the Driver Unit Model EDD.
The Handy Terminal (FHT31) can also read and save (upload) Driver Unit parameters and channel programs and transmit (download) them to other Driver Units.

● 20 characters × 4 line LCD Screen, no external power source required, cable length: 3 m

Conventional models M-FHT11 and M-FHT21 are also supported.

## 5.2 RS-232C Communication Cable
(Communication cable between Driver Unit Model EDD and upper device)

Designation: M-C003RS03



| RS-232C terminal | | | CN1 | |
|---|---|---|---|---|
| No. | Signal Code | | No. | Signal Code |
| 3 | TXD | | 1 | TXD |
| 2 | RXD | | 3 | RXD |
| 7 | RTS | | 7 | RTS |
| 8 | CTS | | 2 | CTS |
| 6 | DSR | | 4 | DSR |
| 4 | DTR | | 5 | DTR |
| 5 | SG | | 6 | SG |
|  |  | | 8 | +5V |
|  |  | | 9 | FG |
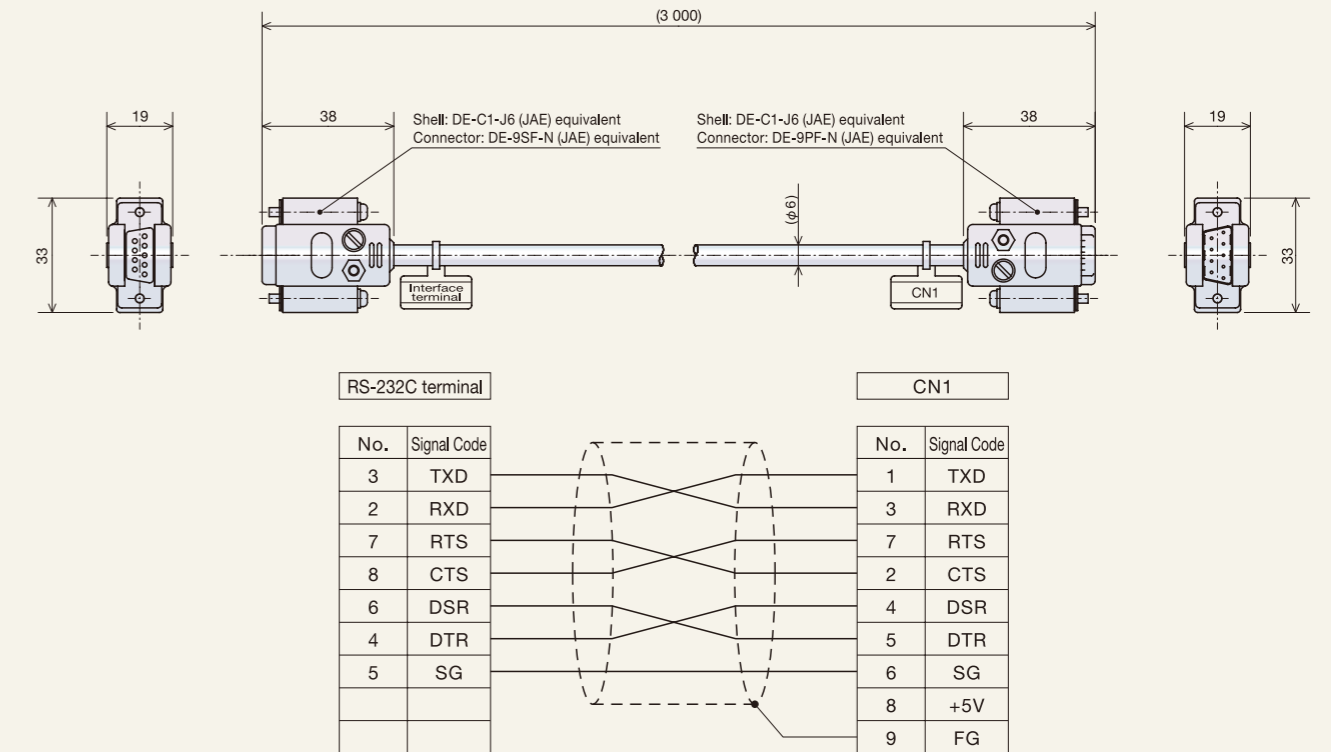
## 5.3 Cable With CN2 Connector

Designation: M-E011DCCN1-003

Shell: 54331-0501 (Molex) equivalent
Connector: 54306-5019 (Molex) equivalent

Driver Unit side

(52,4)
(φ12.7)
(39)
2 000 ±20
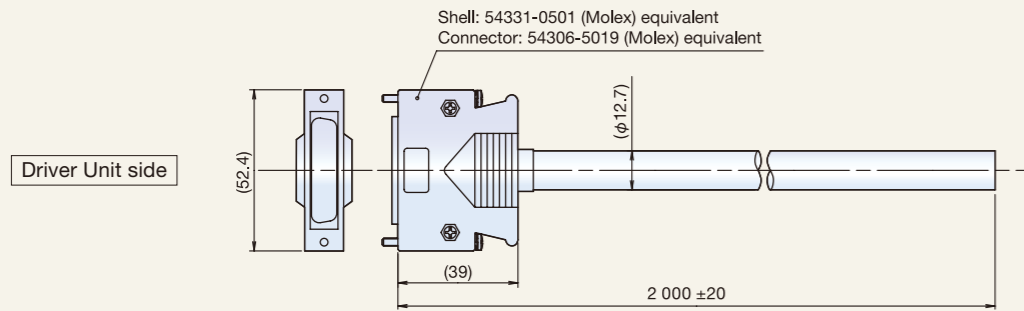
### Wiring table

| Signal Code (Default setting) | Pin No. | Wire Color | Dot Mark | Dot Color |
|---|---|---|---|---|
| DC24 | 1 | Yellow | ■ | Black |
| | | Yellow | ■ | Red |
| DC24 | 2 | Bright green | ■ | Black |
| | | Bright green | ■ | Red |
| EMST | 3 | Bright green | ■■■ | Black |
| | | Bright green | ■■■ | Red |
| ACLR | 4 | White | ■ | Black |
| OTP | 5 | White | ■ | Red |
| OTM | 6 | Light brown | ■■ | Black |
| SVON | 7 | Light brown | ■■ | Red |
| RUN | 8 | Yellow | ■■ | Black |
| STP | 9 | Yellow | ■■ | Red |
| PRG0 | 11 | Bright green | ■■ | Black |
| PRG1 | 12 | Bright green | ■■ | Red |
| PRG2 | 13 | White | ■■ | Black |
| PRG3 | 14 | White | ■■ | Red |
| PRG4 | 15 | Light brown | ■■■ | Black |
| PRG5 | 16 | Light brown | ■■■ | Red |
| PRG6 | 17 | White | ■■■ | Black |
| PRG7 | 18 | White | ■■■ | Red |
| JOG | 19 | Grey | ■■■■ | Black |
| DIR | 20 | Grey | ■■■■ | Red |
| CWP+ | 22 | Yellow | ■■■ | Black |
| CWP- | 23 | Yellow | ■■■ | Red |
| CCWP+ | 24 | Grey | ■■■ | Black |
| CCWP- | 25 | Grey | ■■■ | Red |
| COM | 26 | Grey | ■■■■■■■ (Continuity) | Black |
| COM | 27 | Grey | ■■■■■■■ (Continuity) | Red |
| DRDY | 28 | Bright green | ■■■■■■■ (Continuity) | Black |
| WRN | 29 | Bright green | ■■■■■■■ (Continuity) | Red |
| OTPA | 30 | Yellow | ■■■■ | Black |
| OTMA | 31 | Yellow | ■■■■ | Red |
| SVST | 32 | Bright green | ■■■■ | Black |
| BUSY | 33 | Bright green | ■■■■ | Red |
| IPOS | 34 | White | ■■■■■■ (Continuity) | Black |
| NEARA | 35 | White | ■■■■■■ (Continuity) | Red |
| CHA | 36 | White | ■■■■ | Black |
| *CHA | 37 | White | ■■■■ | Red |
| CHB | 38 | Light brown | ■■■■ | Black |
| *CHB | 39 | Light brown | ■■■■ | Red |
| CHZ | 40 | Yellow | ■■■■■■■ (Continuity) | Black |
| *CHZ | 41 | Yellow | ■■■■■■■ (Continuity) | Red |
| SGND | 43 | Light brown | ■■■■■■■ (Continuity) | Black |
| | | Light brown | ■■■■■■■ (Continuity) | Red |
| Cover | − | | | |

◇◇◇ Twist Pair  ⬚⬚⬚ Shield

AIN+(Pin No 44) and AIN-(Pin No 45) are not connected

## 5.4 Regenerative Resistor

| Designation / Item | M-E014DCKR1-100 | M-E014DCKR1-102 | M-E014DCKR1-101 |
|---|---|---|---|
| Rated wattage (W) | 7 | 70 | 120 |
| Resistance Value (Ω) | 100 | 100 | 100 |
| Thermal Sensor Temperature (°C) | 100 | 100 | 100 |
| Operating Conditions (Environmental Temperature) (°C) | 0 – 40 | | |

### M-E014DCKR1-100

Mounting bracket Steel plate
$57^{\pm0,8}$
$300^{+100}_{-0}$
Case Porcelain
Thermal sensor leads UL1430 AWG24
Regeneration resistor leads UL1330 AWG18
$60^{\pm2}$  $52^{\pm0,8}$  8  24  16
$300^{+100}_{-0}$
$65^{\pm2}$  $2-\phi4.3$
10MAX.  10,6

#### Connection to Driver Unit Model EDD

Regeneration resistor
Regeneration resistor leads  CN4  Driver Unit Model EDD
100[Ω]  a  R+
b  R−
THS  c  SE+
d  SE−
Thermal sensor leads

### M-E014DCKR1-102

$310^{\pm1,5}$
$295^{\pm1}$
Thermostat
$430^{\pm30}$
$121,6^{\pm1}$  $80^{\pm1}$  4−6
134 MAX
d c b a
$330^{\pm20}$
Top plate surface for mounting
Opening  Opening
$96,5^{\pm1,5}$
17.5  $275^{\pm1,5}$  17.5

#### Connection to Driver Unit Model EDD

Regeneration resistor leads  CN4  Driver Unit Model EDD
50(Ω)  a  R+
b  R−
50(Ω)  c  SE+
d  SE−
Thermal sensor leads

### M-E014DCKR1-101

70  40  6  15  17.5
6
Terminal screw: M4×8
DC24  GND  SEN
DC24 V input for cooling fan Signal output for fan condition monitoring
50  Suction opening
203  215  180  150  18.5
110  Regeneration register leads Teflon-coated heat resistant wire 2 (mm²)
22  a Length 200  b  c  d
11  Thermal sensor leads UL1015 AWG16 Length 200
*Connect with DC24 V input for cooling fan.

| Fan Specifications | |
|---|---|
| Rated Voltage | DC24 (V) |
| Rated Current | 0.2 (A) |
| Open collector output with lock sensor | |
| Maximum collector output | +27.6 (V) |
| Maximum collector current | 5 (mA) |

#### Connection to Driver Unit Model EDD

Regeneration Resistor
Cooling fan  DC24
Cooling fan stop sensor  GND  DC24(V)
SEN  Load  DC24(V)
Cooling fan stop signal output
100(Ω)  Regeneration Register leads  CN4
a  R+
b  R−
Thermal sensor  c  SE+
d  SE−
Thermal sensor leads
Driver Unit Model EDD
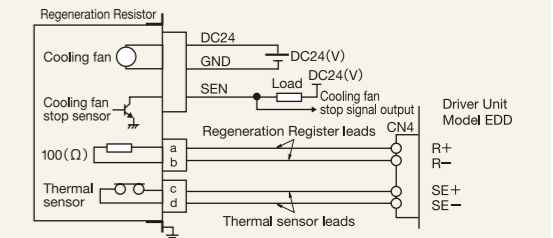
## To select appropriate Megatorque Motor, examine the following.

**1 Loads on the Motor**
  (1) Load moment of inertia; (2) Axial load, radial load, and moment load; (3) Holding torque required

**2 Runout Accuracy**

**3 Positioning Accuracy**

**4 Selection of Regenerative Resistor**

**5 Driving Conditions**

## 1 Loads on the Motor

(1) Load moment of inertia; (2) Axial load, radial load, and moment load; (3) Holding torque
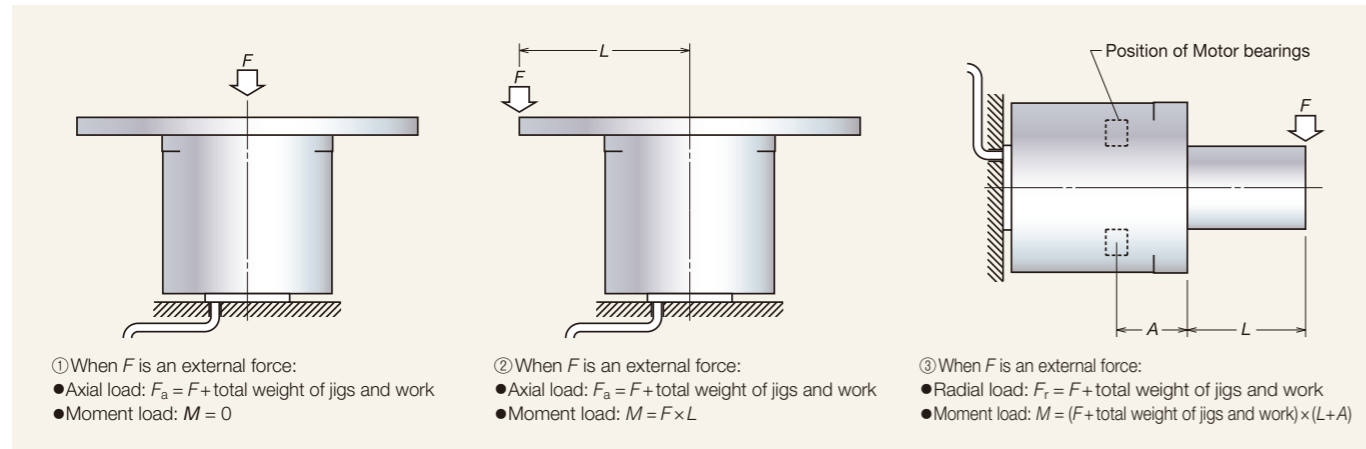
### (1) Load moment of inertia $J$

When a Megatorque Motor is used, the moment of inertia of the load mounted to the Motor rotor significantly affects the acceleration/deceleration characteristics. Thus, calculation of the moment of inertia for load J is required.

### (2) Axial load, radial load, and moment load

Calculate the load on the Motor. The relationship between external force and load is represented in the following three patterns.
Ensure the axial load/radial load and the moment load are set within the allowable limits.
(Refer to 2. "Motor Specifications" for allowable loads.)



① When $F$ is an external force:
● Axial load: $F_a = F +$ total weight of jigs and work
● Moment load: $M = 0$

② When $F$ is an external force:
● Axial load: $F_a = F +$ total weight of jigs and work
● Moment load: $M = F \times L$

③ When $F$ is an external force:
● Radial load: $F_r = F +$ total weight of jigs and work
● Moment load: $M = (F +$ total weight of jigs and work$) \times (L + A)$

| Motor model | PS1 | PS3 | PN2 | PN3 | PN4 | PN3 with brake | PN4 with brake | PNZ3 | PNZ4 |
|---|---|---|---|---|---|---|---|---|---|
| Dimension A (mm) | 30.2 | 32.9 | 16.7 | 33.8 | 54.2 | 45.8 | 70.2 | 48.8 | 79.2 |

### (3) Holding torque

When the arm is stopped at the position shown at right, the torque, equal to F × L, is applied on the Motor as a load torque. Therefore, limit load torque to equal or below rated torque.
When holding brakes, limit load torque to equal or below brake torque. Contact NSK for positioning accuracy for holding brakes.
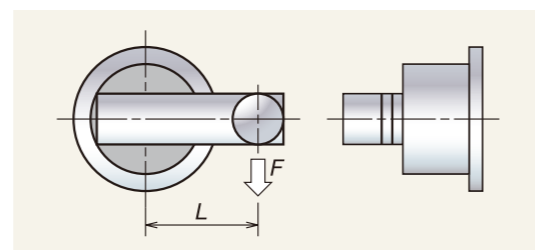


## 2 Runout Accuracy

The measurement method for runout accuracy is shown at right.
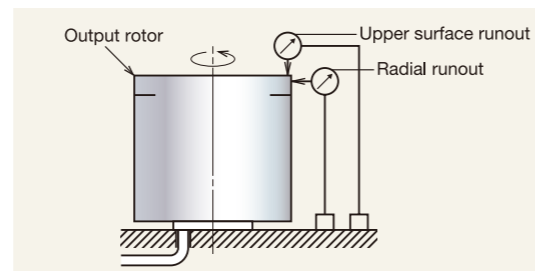


## 3 Positioning Accuracy

The positioning accuracy of the Megatorque Motor System is affected by the following:
(1) Absolute positioning accuracy: 90 (arc-sec) (interchangeable)
(2) Repeatability: ±2 (arc-sec)

[Example 1]
We examine the compatibility of the PS Model assuming a required repeatability of ±0.02 mm at a distance 300 mm from the center.

$$\begin{aligned} \text{From } \tan\theta &= 0.02 \div 300 \\ \theta &= \tan^{-1}(0.02 \div 300) \\ &= 3.8 \times 10^{-3}\ ° \\ &= 14\ (\text{arc-sec}) \end{aligned}$$



Therefore, ±14 > ±2
Both PS1 Model and PS3 Model can be used in terms of positioning accuracy.
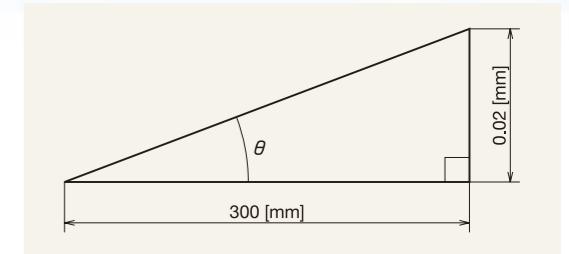
## 4 Selection of Regenerative Resistor

**(1) Obtain the rotational energy of the Megatorque Motor during deceleration**
Calculate the rotational energy using the following equation:

$$\begin{aligned} \text{Rotational energy} &= 1/2 \times J \times \omega^2\ [\text{J}] \\ &= 1/2 \times J \times (2\pi N)^2\ [\text{J}] \\ J &= J_r + J_m \end{aligned}$$

$J_r$ : Rotor inertia (kg·m²)
$J_m$ : Moment of inertia of the load (kg·m²)
$N$ : Rotational speed (s⁻¹)

**(2) Regenerative energy capacity by internal capacitors**
The regeneration energy that can be charged by the internal capacitors is 28 [J].

**(3) Calculate energy consumed by optional regeneration resistor**
Energy consumed by regeneration resistor [J] = Rotational energy [J] – 28 [J] capacitor absorption energy)
When the difference is zero or less, a regenerative resistor is unnecessary.
When the difference is greater than zero, use the following procedure to obtain the required capacity for the optional regenerative resistor.

**(4) Calculate required capacity for optional regeneration resistor**
Required capacity for regeneration resistor [W] = Energy consumed by regeneration resistor [J] / (Operation cycle [s] × 0.25)
0.25: Load ratio of optional regeneration resistor use
If the quotient is 7 or less, we recommend regenerative resistor M-E014DCKR1-100. (optional)
If the quotient is 70 or less, we recommend regenerative resistor M-E014DCKR1-102. (optional)
If the quotient is 120 or less, we recommend regenerative resistor M-E014DCKR1-101. (optional)
Please contact NSK if the quotient exceeds 120.

## 5 Driving Conditions

Use the selection tool described in Section 11 to confirm suitable driving conditions.

# Positioning Time Diagrams

The positioning time for Megatorque Motor can be roughly calculated using the following positioning time diagrams.
(dwell time > accelerating/decelerating time x 10).
These diagrams only apply under the following conditions. Use the selection sheet in all other cases.
(1) The motor is directly connected to the load (without gear reducer, belt, or couplings), and the rigidity of the load is sufficiently high (natural frequency: More than 100 (Hz)).
(2) No load torque is applied to the motor.
(3) The motor dwell time is greater than accelerating/decelerating time.
The following conditions require additional considerations:

**a. When the load's moment of inertia exceeds the allowable moment load and is off the diagram:**
Operation is possible, although much more time may be required than shown in the diagram, since rotational speed and acceleration are limited.

**b. When there is no diagram for the relevant positioning angle:**
An appropriate calculation is required. However, very small angles may not work in the calculation.
A settling time of 0.001 s was used. Add more settling time if higher repeatability is required.
Example: Motor: PN4180
Moment of inertia: 3.0 $(kg \cdot m^2)$
Index angle: 45°
The minimum positioning time of 0.3 s is determined per the appropriate line in the following:
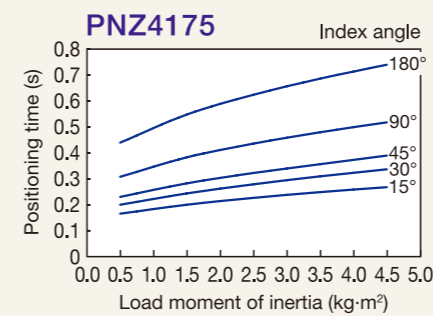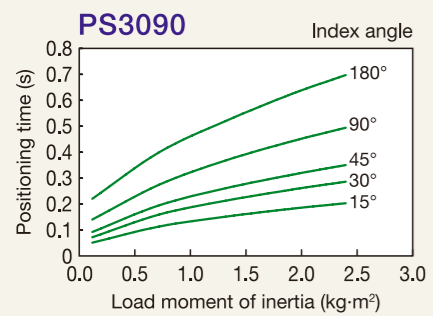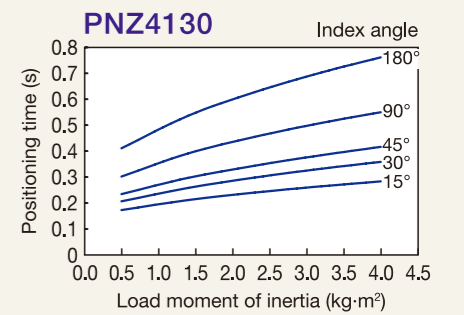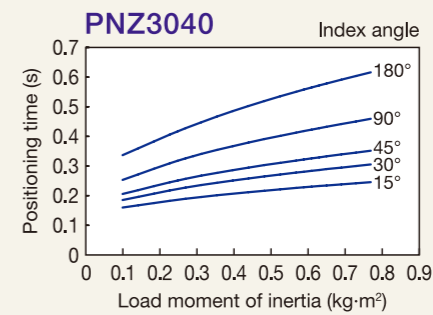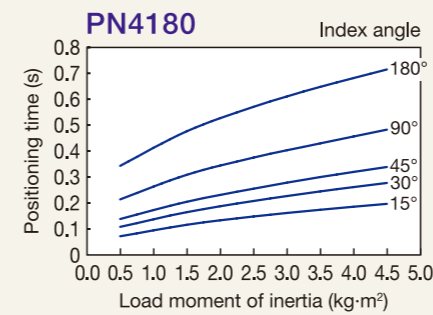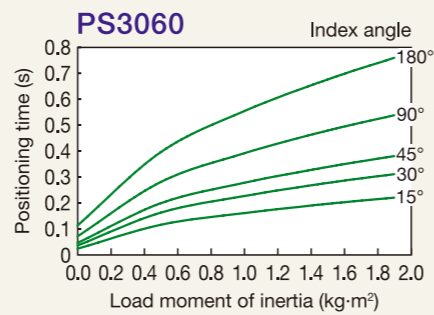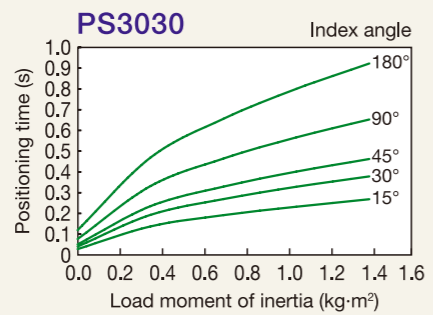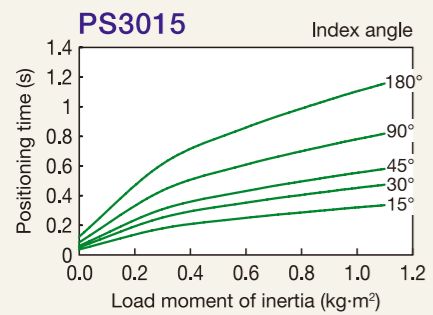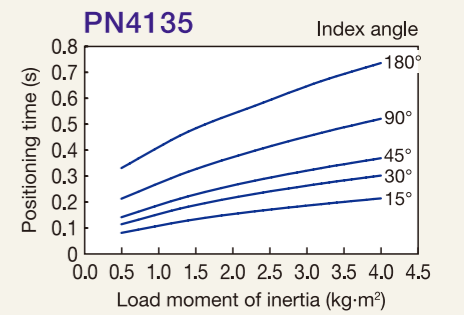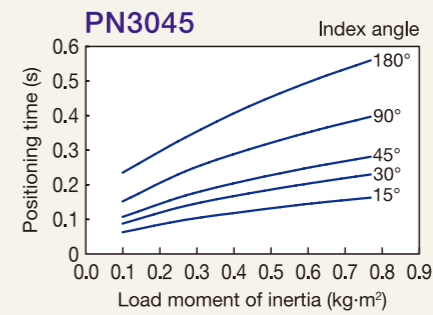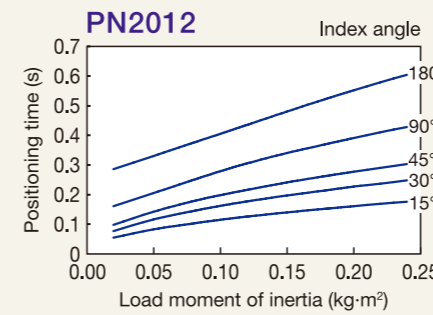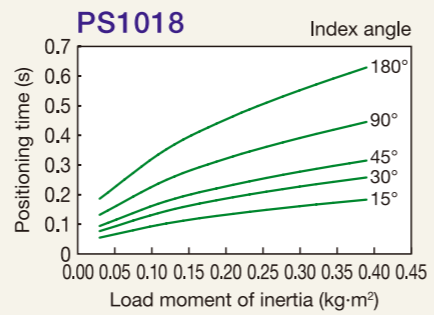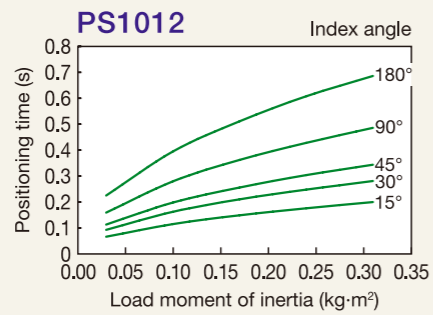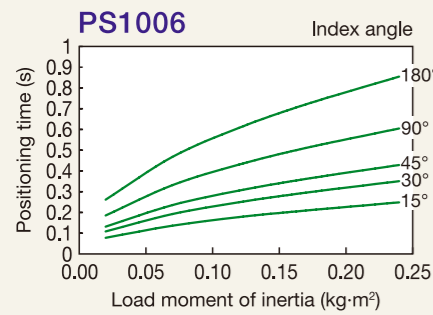
| Required repeatability (arc-sec) | Settling time (s) |
|---|---|
| ±2 – ±10 | 0.1 |
| ±10 – ±100 | 0.04 |
| ±100 – | 0.001 |



PS1006 · PS1012 · PS1018 · PS3015 · PS3030 · PS3060 · PS3090

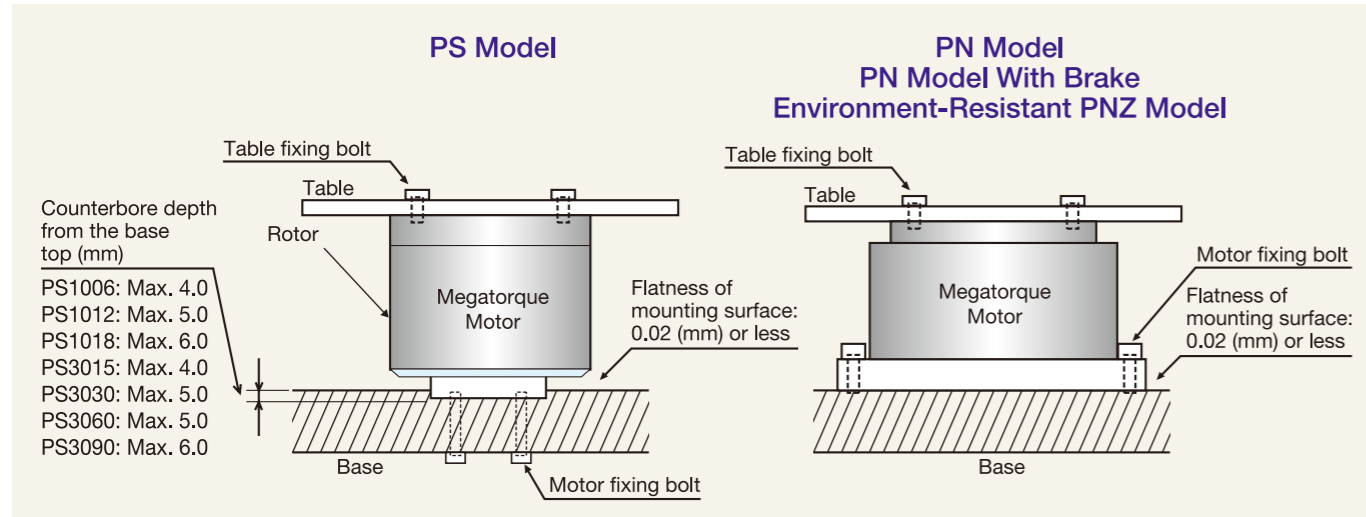These diagrams apply at a power voltage of 200 VAC.



PN2012 · PN3045 · PN4135 · PN4180 · PNZ3040 · PNZ4130 · PNZ4175
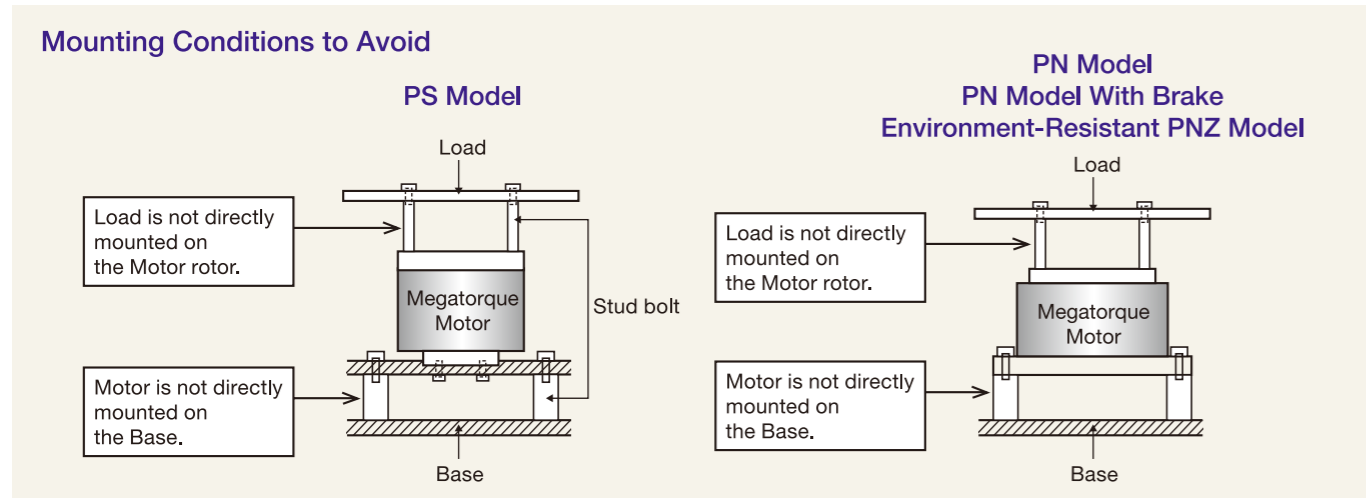
These diagrams apply at a power voltage of 200 VAC.

## 8.1 Installation of Motor

- Install and secure the Motor on a rigid baseto prevent mechanical vibrations.
- Mount the motor using the tapped holes or through-holes.
- The mounting surface flatness should be less than 0.02 mm.
- The Motor can be attached either horizontally or vertically. Do not install the Environment-Resistant PNZ Model upside-down.
- Take care not to raise the underside cover when attaching the motor (PS Model)
- Please see the figure below for counterbore depth from base top. (PS Model)
- Do not use leads that flex.
  The bend radius of the motor cable lead and the resolver cable lead should be R30 mm or more.

### PS Model

Table fixing bolt
Table
Counterbore depth from the base top (mm)
Rotor

PS1006: Max. 4.0
PS1012: Max. 5.0
PS1018: Max. 6.0
PS3015: Max. 4.0
PS3030: Max. 5.0
PS3060: Max. 5.0
PS3090: Max. 6.0

Megatorque Motor

Flatness of mounting surface: 0.02 (mm) or less

Base
Motor fixing bolt

### PN Model
### PN Model With Brake
### Environment-Resistant PNZ Model

Table fixing bolt
Table

Megatorque Motor

Motor fixing bolt

Flatness of mounting surface: 0.02 (mm) or less

Base

### Example Hole for Lead- PS Model

Motor Fixing hole

Ø35
35
10
26
80
4-R5

If inserting the PS Model connector through the bottom of the base, we recommend making a larger hole than that in this figure.

If the motor is installed as shown below, mechanical vibrations will be generated and the proportional gain of the velocity loop (VG) cannot be increased. This results in low holding power for stops and overshoot will occur, preventing the motor from operating smoothly. To prevent this, attach the load directly to the motor rotor and mount the motor directly to the base.

### Mounting Conditions to Avoid

#### PS Model

Load
Load is not directly mounted on the Motor rotor.
Megatorque Motor
Stud bolt
Motor is not directly mounted on the Base.
Base

#### PN Model
#### PN Model With Brake
#### Environment-Resistant PNZ Model

Load
Load is not directly mounted on the Motor rotor.
Megatorque Motor
Motor is not directly mounted on the Base.
Base

## 8.2 Dummy Inertia

To realize the full benefits of the direct drive motor system, the user should maximize the resonance frequency of the whole mechanism by increasing the rigidity of the load and securely fastening the Motor to the mechanism.
Therefore, adding some dummy load directly to the rotor directly may when:

A. A key is used to fix the load to the rotor because the load cannot be directly attached to the rotor.
B. The load is directly fixed to the rotor, but vibration occurs due to torsional deflection on the rotary axis of the load.
C. Inertia of the whole mechanism is very low when a thin shaft such as a ball screw shaft is attached.
D. Play exists because a sprocket chain or a gear train is used.
E. Vibration occurs because the rigidity of the structure is low, such as when the Motor is being used to drive a belt.

· Inertia of a dummy load shall be approximately 20% of the load inertia. When a speed reducer mechanism is used, it shall be

$$GD^2{}_1 / (r^2 \times GD^2{}_d) \leq 5$$

Where $GD^2{}_1$ = inertia of indirectly connected load, $GD^2{}_d$ = inertia of directly attached load, and r = reduction ratio.

### Mounting dummy inertia

Load
Base
Dummy inertia
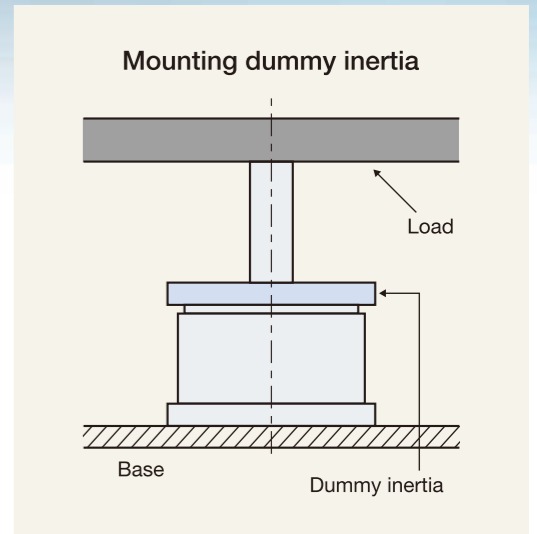
## 8.3 Installation of Driver Unit

- The Driver Unit Model EDD must be fixed so that fins are vertical for natural air-cooling.
- Ambient temperatures should range from 0 to 50 °C. The Driver Unit cannot be used above 50 °C. Provide sufficient space (at least 100 mm) both above and below the Driver Unit in the control cabinet. Operate the Driver Unit only in environments where internally generated heat can dissipate.
  If heat is trapped above the Driver Unit, open the space above it to allow the heat to dissipate (in this case, also take steps to prevent the entry of dust) or provide a forced-air cooling system.
- Use the Driver Unit in a control cabinet with IP54 or higher. Protect the Driver Unit from exposure to oil mist, cutting water, cutting dust, coating gas, etc., to prevent entry into the Driver Unit through ventilation openings, which could cause circuit failure.
- When installing two or more Driver Units for multi-axis combinations, provide 10 mm or more space between adjacent Driver Units.
- The Driver Unit Model EDD can be attached to a panel using front mounting brackets (optional).
- The maximum power loss of the Driver Unit Model EDD is 60 W.

At least 100 (mm)
At least 100 (mm)

### Top of Driver Unit

Heat sink fin
Vent
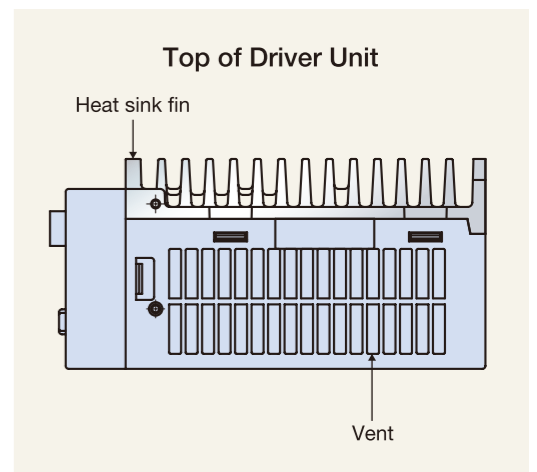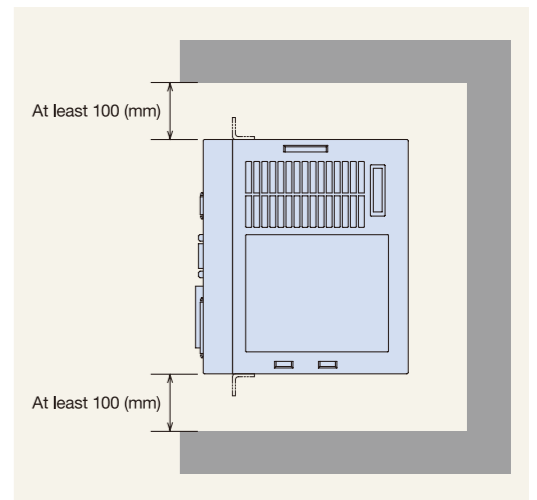
# 9 | Motor and Driver Unit Combinations

## 9.1 PS Model and Driver Unit Combinations

**Complies with UL and CE**

| Motor Outer Diameter (mm) | Motor Designation | Driver Unit Designation (**indicates accessory specifications) | Power Voltage (VAC) | Cable Set Designation |
|---|---|---|---|---|
| φ100 | M-PS1006KN002 | M-EDD-PS1006AB501-** | 100 – 240 | M-C***SDP03 (Stationary cable) M-C***SDP13 (Flexible cable) *** indicates cable length. 001 : 1 (m) 002 : 2 (m) 003 : 3 (m) 004 : 4 (m) 005 : 5 (m) 006 : 6 (m) 008 : 8 (m) 010 : 10 (m) 015 : 15 (m) 020 : 20 (m) 030 : 30 (m) |
| | M-PS1012KN002 | M-EDD-PS1012AB501-** | 100 – 240 | |
| | M-PS1018KN002 | M-EDD-PS1018AB501-** | 100 – 240 | |
| φ150 | M-PS3015KN002 | M-EDD-PS3015AB501-** | 100 – 240 | |
| | M-PS3015KN701 | | | |
| | M-PS3030KN002 | M-EDD-PS3030AB501-** | 100 – 240 | |
| | M-PS3030KN701 | | | |
| | M-PS3060KN002 | M-EDD-PS3060AB501-** | 100 – 240 | |
| | M-PS3060KN701 | | | |
| | M-PS3090KN002 | M-EDD-PS3090AB501-** | 100 – 240 | |
| | M-PS3090KN701 | | | |

## 9.2 PN Model and Driver Unit Combinations

**Complies with UL and CE**

| Motor Outer Diameter (mm) | Motor Designation | Driver Unit Designation (**indicates accessory specifications) | Power Voltage (VAC) | Cable Set Designation |
|---|---|---|---|---|
| φ170 | M-PN2012KN201 | M-EDD-PN2012AB501-** | 100 – 240 | M-C***SDP03 (Stationary cable) M-C***SDP13 (Flexible cable) *** indicates cable length. |
| φ210 | M-PN3045KN001 | M-EDD-PN3045AB501-** | 100 – 240 | |
| | M-PN3045KN701 | | | |
| φ280 | M-PN4135KN001 | M-EDD-PN4135AB501-** | 200 – 240 | |
| | M-PN4135KN701 | | | |
| | M-PN4180KN001 | M-EDD-PN4180AB501-** | 200 – 240 | |
| | M-PN4180KN701 | | | |

## 9.3 PN Model With Brake and Driver Unit Combinations

| Motor Outer Diameter (mm) | Motor Designation | Driver Unit Designation (**indicates accessory specifications) | Power Voltage (VAC) | Cable Set Designation |
|---|---|---|---|---|
| φ210 | M-PN3045KG001 | M-EDD-PN3045AB501-** | 100 – 240 | M-C***SDP03 (Stationary cable) M-C***SDP13 (Flexible cable) *** indicates cable length. |
| φ280 | M-PN4135KG001 | M-EDD-PN4135AB501-** | 200 – 240 | |

## 9.4 Environment-Resistant PNZ Model and Driver Unit Combinations

| Motor Outer Diameter (mm) | Motor Designation | Driver Unit Designation (**indicates accessory specifications) | Power Voltage (VAC) | Cable Set Designation |
|---|---|---|---|---|
| φ220 | M-PNZ3040KN001 | M-EDD-PN3045AB501-** | 100 – 240 | M-C***WDP13 (Flexible cable, Straight connector) M-C***WDP14 (Flexible cable, Angle connector) *** indicates cable length. 002 : 2 (m) 004 : 4 (m) 006 : 6 (m) 008 : 8 (m) 010 : 10 (m) 015 : 15 (m) 020 : 20 (m) 030 : 30 (m) |
| φ286 | M-PNZ4130KN001 | M-EDD-PN4135AB501-** | 200 – 240 | |
| | M-PNZ4175KN001 | M-EDD-PN4180AB501-** | 200 – 240 | |

## 9.5 Options

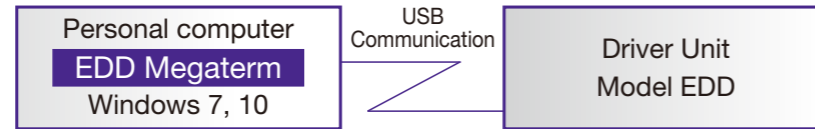| Item | Designation | Contents |
|---|---|---|
| Connector | M-FAE0008 | CN2 connector (user side) for standard function |
| | M-FAE0009 | CN5 connector (user side) |
| Mounting bracket | M-E050DCKA1-001 | Driver Unit mounting brackets |
| Regenerative resistor | M-E014DCKR1-100 | Regenerative resistor (7 (W)) |
| | M-E014DCKR1-102 | Regenerative resistor (70 (W)) |
| | M-E014DCKR1-101 | Regenerative resistor (120 (W)) |
| Accessory set | M-FAE0010 | Set of M-FAE0008, M-FAE0009, and M-E050DCKA1-001 |
| RS-232C Communication cable | M-C003RS03 | Communication cable between Driver unit and Upper device (Cable length: 3 (m)) |
| Cable with CN2 connector | M-E011DCCN1-003 | Cable with CN2 connector for standard function (Cable length: 2 (m)) |
| Handy Terminal | M-FHT31 | RS-232C interface terminal for inputting parameter/program into Driver Unit (Cable length: 3 (m)) |

## 10.1 User's Manual

User's manual can be downloaded for free from NSK's website (https://www.nsk.com).

## 10.2 EDD Megaterm Application Software

Once installed on your computer, EDD Megaterm software enables the editing, preparation, and control of Driver Unit Model EDD programs and parameters. It also facilitates the allocation and monitoring of control input/output and features oscilloscope and FFT functions for easy confirmation of Motor operation.

EDD Megaterm can be downloaded for free from NSK's website (https://www.nsk. com/jp-ja/).

| Personal computer |
| --- |
| EDD Megaterm |
| Windows 7, 10 |

USB Communication

| Driver Unit Model EDD |
| --- |

- EDD Megaterm supports USB communication only.
- Using EDD Megaterm via USB should only be performed when setting up parameters. Do not use during normal operation.

## Functions

1. Oscilloscope function
2. FFT function
3. Allocation and monitoring of control input/output
4. Parameter editing
5. Channel editing
6. Others:
   - Upload / download parameter and channel data
   - Terminal

## Main Functions

### 1. Oscilloscope function

- Analogue 4-channel and Digital 4-channel oscilloscopes
- Monitor scales are adjustable.
- Measured waveforms are output as bitmaps or in CSV format.
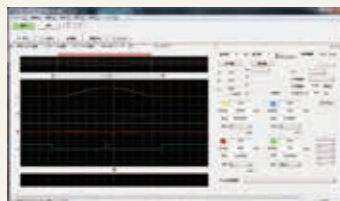
### 2. FFT function

- FFT can be used for data measured with the oscilloscope function.
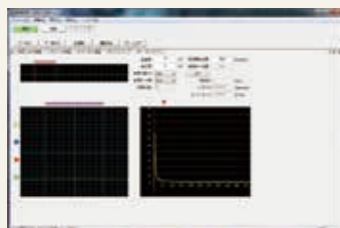
### 3. Allocation and monitoring of control input/output

- Allocation of control input/output by drag-and-drop editing
- Monitoring of input/output signals
- Report of allocation list

### 4. Parameter edit

- Parameter edits take effect in real time (off-line editing is also supported)
- Parameter-by-parameter reset to default
- Help function for parameters
- Report of parameter setting list
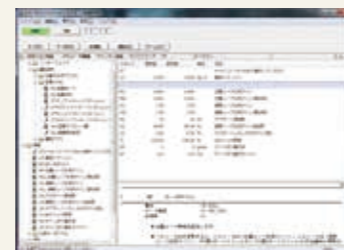
### 5. Channel edits

- Drag-and-drop edits from command window
- Direct input capability also supported (automatic insertion of comments)
- Report of program list
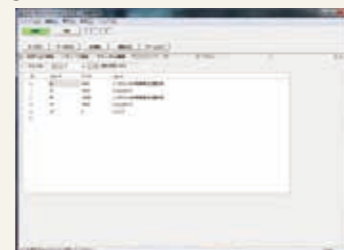
Our website (https://www.nsk.com) features a Megatorque Motor Selection Tool with the following functions:

- A wizard to easily select the ideal Megatorque Motor for your application.
- Automatic calculation of the inertia moment d from the outside load dimensions.
- The desired operational pattern can be automatically calculated and selected from the starting conditions (positioning angle, inertia moment of load, etc. ).
- Supports Japanese, English, Chinese, Taiwanese, and Korean languages.

## Main Functions

### 1. Automatic calculation of inertia moment of the load

- The inertia moment is automatically calculated from the outside dimension.
- Users can select the standard calculation method using an index table or a combined cylinder and column calculation method.

### 2. Motor selection by shortest positioning

- The operational pattern for the shortest positioning is automatically calculated from the positioning angle and inertia moment of the load
- Motor availability and comments are displayed based on calculation results

### 3. Motor selection from the operational pattern

- Displays motor availability and comments from calculation results

### 4. Selection of Options

- Automatically determines the ideal combination based on Driver Unit and cable specifications.

## CE Marking (PS/PN Model only)

● **Low voltage command**

PS/PN Model is incorporated into machinery as a component. NSK set low voltage standards to ensure the PS/PN Model fully complies with the EU Directive.

● **EMC command**

NSK defined and tested installation models (conditions) for the PS/PN Model, including installation space and wiring between Driver Units and Motors.

When the PS/PN Model is incorporated into machinery, real-world installation and/or wiring conditions may differ from those of established models. Therefore, it is necessary to check for EMC command compliance (especially radiation and conduction noise) in machinery incorporating PS/PN Model.

## Compliance with UL Standards (PS/PN Model only)

● **Motor**

Compliant with UL1004-1 (File No.: E216970)

● **Driver Unit Model EDD**

Compliant with UL61800-5-1 (File No.: E216221)

● **Cable set**

UL-compliant cables are used.

## Warranty Period

● The warranty period is either one year from delivery or 2400 hours of operation, whichever comes first.

## Limited Warranty

● The warranty is limited to the products supplied by NSK Ltd.
● Defective products will be repaired free of charge within the applicable warranty period.
● Repairs after the expiration of the applicable warranty period will be subject to payment.

## Immunities

● The product is not warranted in any of the following cases even within the warranty period:

· Failure of the unit due to installation and operation not in accordance with the instruction manual specified by the supplier.
· Failure of the unit due to improper handling and use, modification, or careless handling by the user.
· Failure of the unit due to the causes other than those attributable to the supplier.
· Failure of the unit due to modification or repair that is conducted by a person(s) or party (ies) other than the supplier.
· Other types of failures due to natural disasters or accidents (causes not attributable to the responsibility of the supplier).

● Damages induced by a failure of the supplied unit are not covered.

## Services Fee

● Prices of goods do not include any applicable service charges, such as the dispatching of engineers.
● Startup or maintenance services that require the dispatching of engineers are subject to payment even during the applicable warranty period.

## Discontinuation of Production and Maintenance Service Period

● Any discontinuation of production will be announced one year in advance. The maintenance service period will continue for five (5) years after discontinuation of production. An announcement will be released by the supplier or published on the NSK website.

## Special-Purpose Applications

This product is intended for general industrial use. It is not designed or manufactured for uses that may pose serious risk to people's lives or property. It cannot be adapted for special uses such as nuclear control, explosive/corrosive/poisonous material handling devices, or safety devices or systems related to these uses.

Please contact NSK Ltd. in advance before using this product for aeronautical devices, transport devices, or medical devices.

While this product is manufactured under strict quality controls, NSK recommends that an appropriate safety device be installed when used with equipment that could cause serious accidents or damage in the event of product failure.

## 13.1 Form for Requesting Megatorque Motor Selection

NSK is happy to assist in selecting the best Megatorque Motor for your needs.
Please fill in this form and submit to your local NSK office.

**∗Items marked with represent the important information required for selection. Please provide as much detail as possible.**
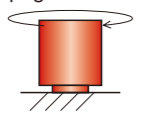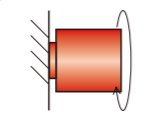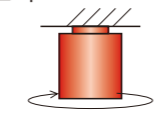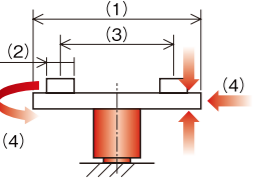
**To be completed by customer**
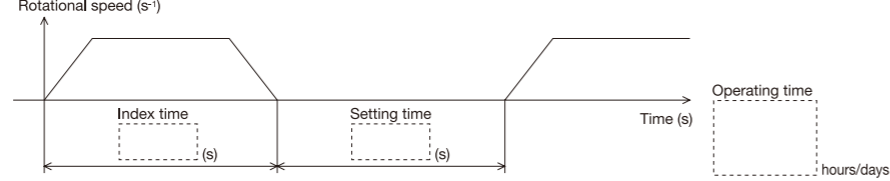
**Example completed form**

Date (DD/MM/YYYY):　　/　　/

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### Form (To be completed by customer)

To

Date (DD/MMM/YYYY):　　/　　/

Company Name:

Section:
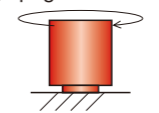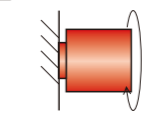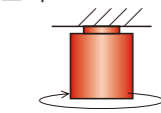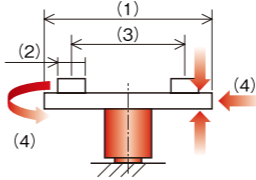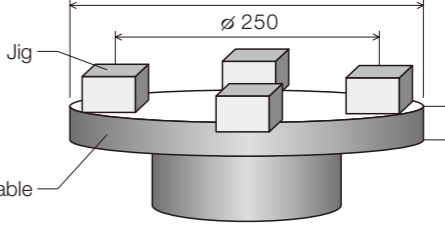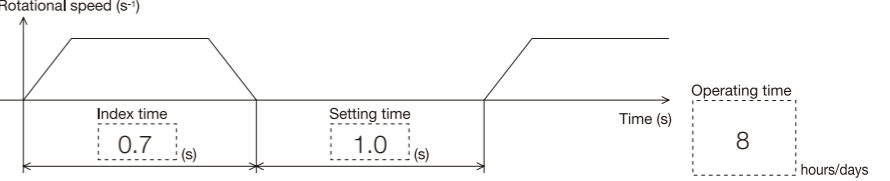
Name:

Contact:
TEL　　　　　FAX

| **Application and equipment** (specify with as much detail as possible) | |
| --- | --- |
| **Motor installation position** (check in ☐) | ☐ Upright — Output shaft in a vertical direction ☐ Horizontal — Output shaft in a horizontal direction ☐ Upside-down — Output shaft in a downward direction ☐ Others |
| **Load conditions** (1) Geometry, dimensions, thickness, material (or mass) of table (2) Dimensions, mass, quantity of loads/jigs (3) PCD (distance between the jigs/loads) (Example) | Schematic drawing (or an attached illustration showing outside dimensions) · Please provide information on outside dimensions, dimensions from the center, material, etc. Attachment: ☐ Yes ☐ No |
| (4) External force (pressure/impact load, sliding friction, etc.) | _____ (N) ☐ None ☐ Always ☐ At settling ☐ During rotating ☐ Some impact ☐ Rotational direction ☐ Sliding friction ∗Specify position, direction, etc. in the schematic drawing. |
| **Motor size requested** | |
| **Positioning command system** | ☐ Internal program system ☐ Pulse train input operation ☐ RS-232C operation |
| **Index angle / Number of points** | Settle at　　°, Number of points: |
| **Repeatability (±)** | ±　　(arc-sec) (±　　mm at　　mm from the motor center) |
| **Cycle pattern** (desired positioning time) *Specify settling time. | Rotational speed (s⁻¹) — Index time (s), Setting time (s), Time (s), Operating time (s) hours/days |
| **Input power voltage** | ☐ 100 (VAC) ☐ 200 (VAC) ☐ Others (　　(VAC)) |
| **Environmental conditions** | Operating environment ☐ General environment (equivalent to IP30) ☐ Oil, water and chemical ☐ Chips and dust ☐ Clean Operating temperature ☐ 0 (°C) to 40 (°C) ☐ Below 0 (°C) ☐ Above 40 (°C) ☐ Other (　　(°C)) Contact NSK for details. |
| **Cable specification and length** | ☐ Stationary cable ☐ Flexible cable　Length:　　(m) Select "flexible" when cable is repeatedly bent anywhere along the wiring route. |
| **Other request items** | |

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### Example completed form

To　XXX XXX , in charge of NSK Mechatronics products

Date (DD/MMM/YYYY):　12 / 01 / 20XX

Company Name:　YYY Corporation

Section:　Engineering Dept., Engineering Section #1

Name:　YYY YYY

Contact:
TEL　03-1234-5678　　　FAX　03-1234-5678

| **Application and equipment** (specify with as much detail as possible) | Semiconductor inspection machine |
| --- | --- |
| **Motor installation position** (check in ☐) | ☑ Upright — Output shaft in a vertical direction ☐ Horizontal — Output shaft in a horizontal direction ☐ Upside-down — Output shaft in a downward direction ☐ Others |
| **Load conditions** (1) Geometry, dimensions, thickness, material (or mass) of table (2) Dimensions, mass, quantity of loads/jigs (3) PCD (distance between the jigs/loads) (Example) | Schematic drawing (or an attached illustration showing outside dimensions) · Please provide information on outside dimensions, dimensions from the center, material, etc. (Example) ⌀ 300, ⌀ 250, Jig, 20 mm Material: Aluminum, • Jig: Mass of 5 kg x 4, PCD: 250 mm, Table Attachment: ☐ Yes ☐ No |
| (4) External force (pressure/impact load, sliding friction, etc.) | 10 (N) ☐ None ☐ Always ☑ At settling ☐ During rotating ☐ Some impact ☐ Rotational direction ☐ Sliding friction Force is applied downward to a single point at 125 mm in radius from the center. ∗Specify position, direction, etc. in the schematic drawing. |
| **Motor size requested** | M-PS3060 |
| **Positioning command system** | ☑ Internal program system ☐ Pulse train input operation ☐ RS-232C operation |
| **Index angle / Number of points** | Settle at　90 °, Number of points:　4 |
| **Repeatability (±)** | ± 20.6 (arc-sec) (± 0.01 mm at 100 mm from the motor center) |
| **Cycle pattern** (desired positioning time) *Specify settling time. | Rotational speed (s⁻¹) — Index time 0.7 (s), Setting time 1.0 (s), Time (s), Operating time 8 hours/days |
| **Input power voltage** | ☐ 100 (VAC) ☑ 200 (VAC) ☐ Others (　　(VAC)) |
| **Environmental conditions** | Operating environment ☑ General environment (equivalent to IP30) ☐ Oil, water and chemical ☐ Chips and dust ☐ Clean Operating temperature ☑ 0 (°C) to 40 (°C) ☐ Below 0 (°C) ☐ Above 40 (°C) ☐ Other (　　(°C)) Contact NSK for details. |
| **Cable specification and length** | ☐ Stationary cable ☑ Flexible cable　Length:　4　(m) Select "flexible" when cable is repeatedly bent anywhere along the wiring route. |
| **Other request items** | Please reply by January 20, 20xx. (example) |

# MEMO

# Worldwide Sales Offices

P: Phone   ☆: Head Office

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<As of August 2024>
For the latest information, please refer to the NSK website.
**www.nsk.com**

**For more information about NSK products, please contact:**