MOTION & CONTROL™

NSK

Megatorque Motor™

-UL Standard/CE Marking Compliant PS/PN Series
-PN Series With Brake
-Environment-Resistant Z Series (Dustproof, Watertight)
-High Acceleration/Deceleration PX Series

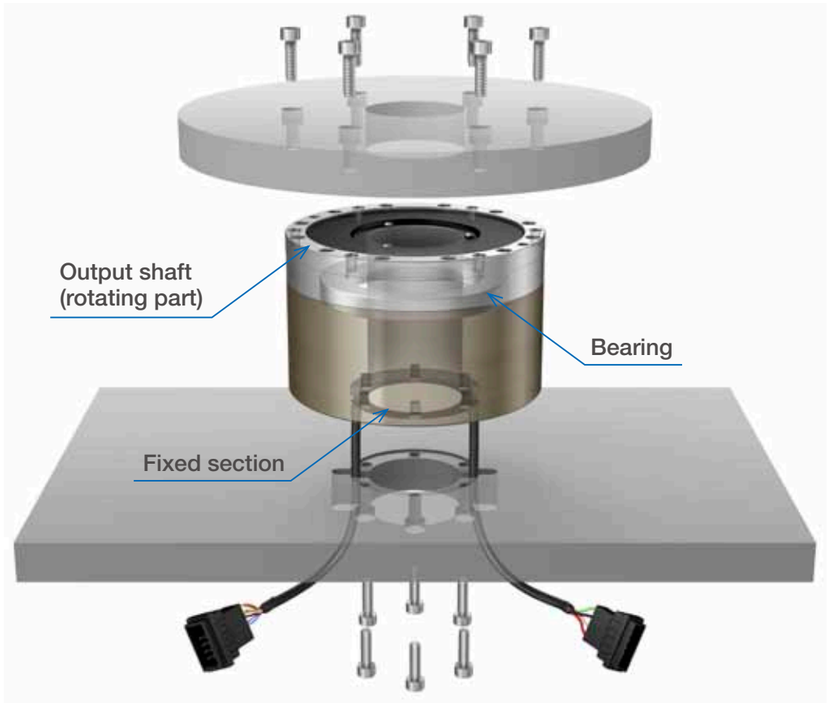
Agile motion, smart control: the ultimate Bearing. ™

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 Motors provide quick, responsive motion combined with smooth, accurate control.

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

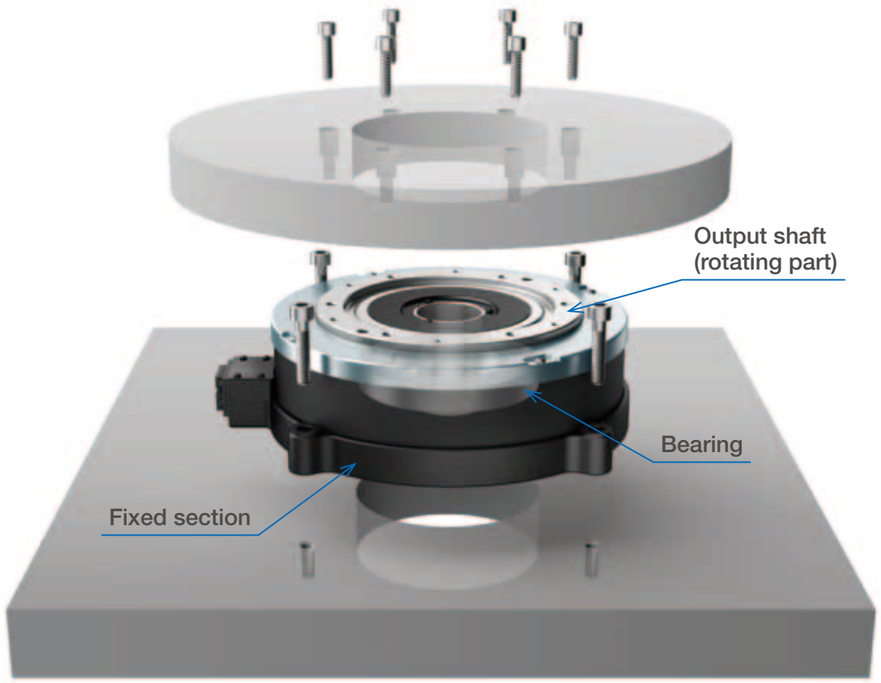
PS Series Features

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



PN/Z Series Features

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



Fast, accurate, and reliable motors for today's needs: Megatorque Motors

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

High reliability, safety-focused

We build Megatorque Motors to last without compromising on safety. The PS/PN Series 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 Series)

Compact

Through advanced design technology, we offer two unique motor series: the low-profile PN Series (PN2 height: 35 mm) and the small-sized PS Series (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

The EDD Driver Unit 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 Series with brake and the Environment-Resistant Z Series (dustproof, watertight).

With brake

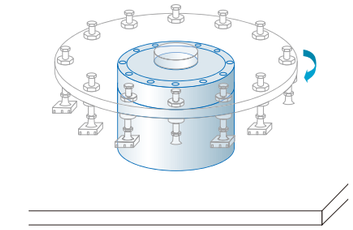
IP66M compliant

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

PS Series Maximum rotational speed **10** s^{-1} (varies by motor model)

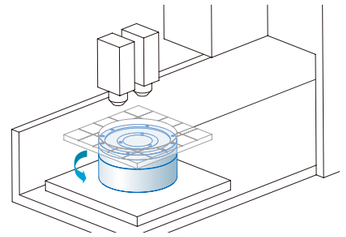
Megatorque Motors excel in a variety of applications and installations.

Application 1: **High Acceleration/ Deceleration PX Series**
Inspection equipment for electronic parts



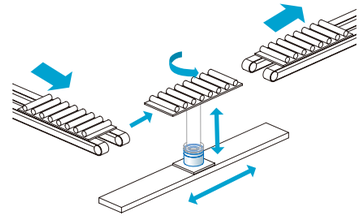
- High speed and high accuracy
- Compact
- Clean
- Hollow structure (convenient for wiring/tubing)

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



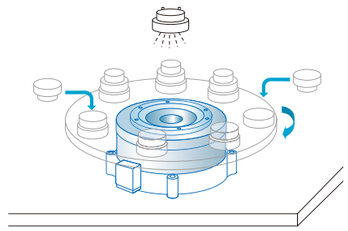
- High speed and high accuracy
- Clean
- Maintenance-free
- Hollow structure (convenient for wiring/tubing)

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



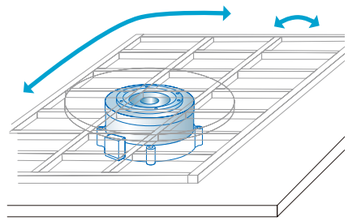
- Clean
- Maintenance-free
- Continuous operation

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



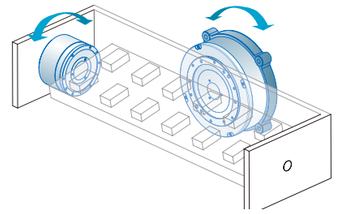
- High speed and high accuracy
- Compact
- Advanced functions (unequal partitioned positioning and shortcut positioning)

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



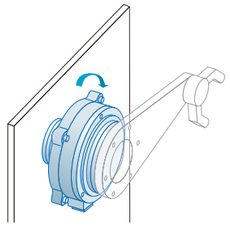
- Compact
- Maintenance-free
- Advanced functions (fine positioning)
- High torque

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



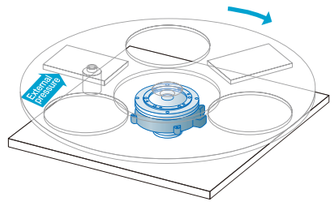
- Smooth rotational operation
- Compact

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



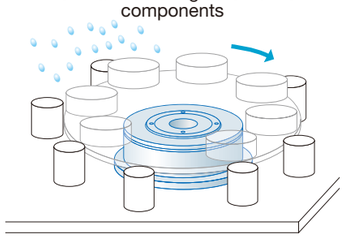
- Prevents unwanted rotation

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



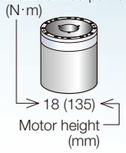
- Holds position

Application 9: **Environment-Resistant Z Series**
For manufacturing automotive components



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

1 Comparison of Megatorque Motor Products



PS Series (Detailed specifications: P7)			PN Series (Detailed specifications: P11)					Environment-Resistant Z Series (Detailed specifications: P15)		High Acceleration/ Deceleration PX Series (Detailed specifications: P17)
PS1 Motor	PS3 Motor		PN2 Motor	PN3 Motor	PN3 Motor (with brake)	PN4 Motor	PN4 Motor (with brake)	PNZ3 Motor	PNZ4 Motor	PX3 Motor
						180 (112)			175 (137)	
						135 (95)	135 (111) ∗Excluding brake		130 (120)	
		90 (170)								
		60 (136)		45 (85)	45 (97) ∗Excluding brake					50 (130)
	30 (102)							40 (100)		
12 (110)	18 (135)	15 (85)	12 (35)							
	6 (85)									
3 (63)										
Output shaft diameter (mm)	ϕ100	ϕ150	ϕ130	ϕ155	ϕ155	ϕ205	ϕ205	ϕ135	ϕ170	ϕ105
Motor outer diameter (mm)	ϕ100	ϕ150	ϕ170	ϕ210	ϕ210	ϕ280	ϕ280	ϕ220	ϕ286	ϕ160
Hollow diameter (mm)	ϕ35	ϕ56	ϕ36	ϕ56	ϕ32	ϕ50	ϕ32	ϕ44	ϕ37	ϕ35
Driver Unit (Dimensions W×D×H (mm)) Detailed specifications: P19	70×140×160	90×140×160	70×140×160	90×140×160						

Ingress Protection (IP) Test

Environment-Resistant Z Series Megatorque Motors comply with IP66M under IEC standards certified by TUV Rheinland, Japan Ltd.


IP6X: Dust-tight Dustproof test

IPX6M: Powerful jet test

The Z Series 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.

Complies with UL and CE

2.1 PS Series (PS1 Motor)

2.1.1 Designation

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

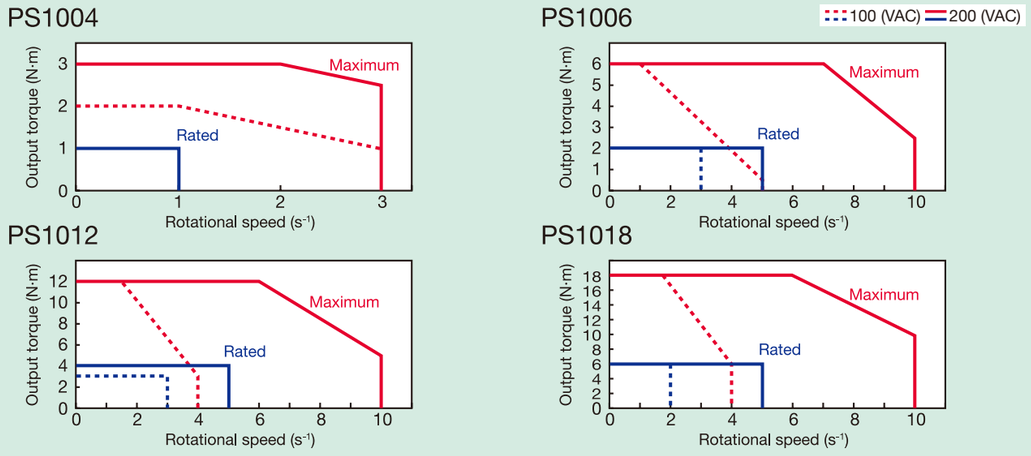
- M-PS: Megatorque Motor PS Series
- 1: Motor size code
- 006: Maximum output torque (N·m)
- KN: Standard
- 002: Design serial number 002: Standard

2.1.2 Specifications

Item \ Designation	M-PS1004KN510	M-PS1006KN002	M-PS1012KN002	M-PS1018KN002
Motor outer diameter (mm)	ϕ100			
Maximum output torque (N·m)*5	3/2	6/6	12/12	18/18
Rated output torque (N·m)*5	1/1	2/2	4/3	6/6
Axial runout accuracy (A in the figure) (μm)	3	50		
Radial runout accuracy (B in the figure) (μm)	50	50		
Motor height (mm)	63	85	110	135
Motor hollow diameter (mm)	ϕ35			
Maximum rotational speed (s^{-1})*5	3/3	10/5	10/4	10/4
Rated rotational speed (s^{-1})*5	1/1	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)	20	28		
Rotor inertia (kg·m²)	0.0023	0.0024	0.0031	0.0038
Allowable range of inertia (kg·m²)	0.15 to 0.23	0.015 to 0.24	0.03 to 0.31	0.03 to 0.38
Mass (kg)	2.2	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.

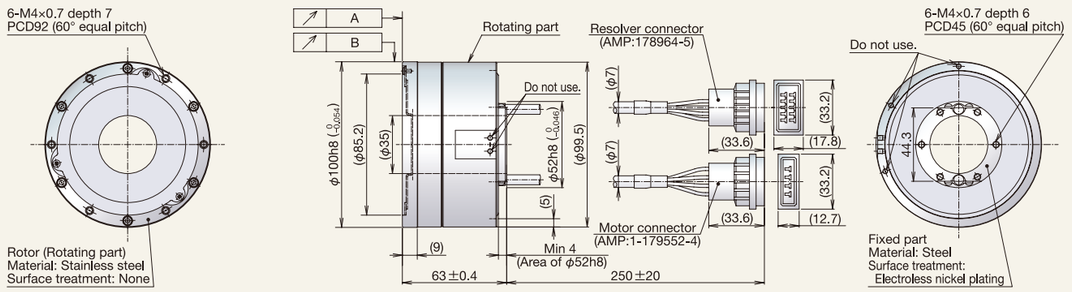
2.1.3 Rotational Speed and Output Torque Characteristics



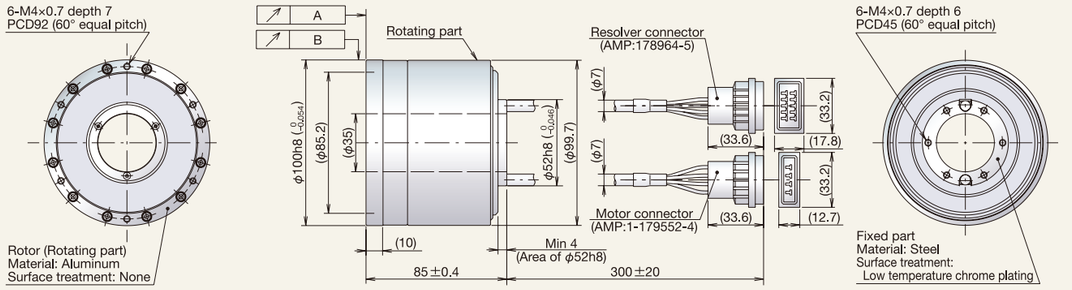
These represent typical values.

2.1.4 Dimensions

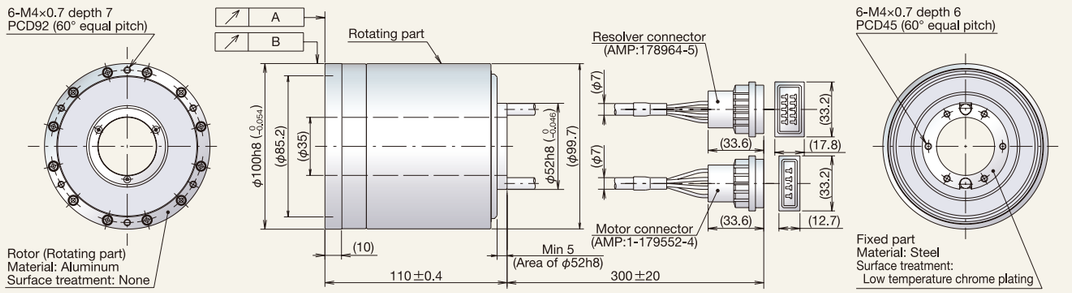
M-PS1004KN510



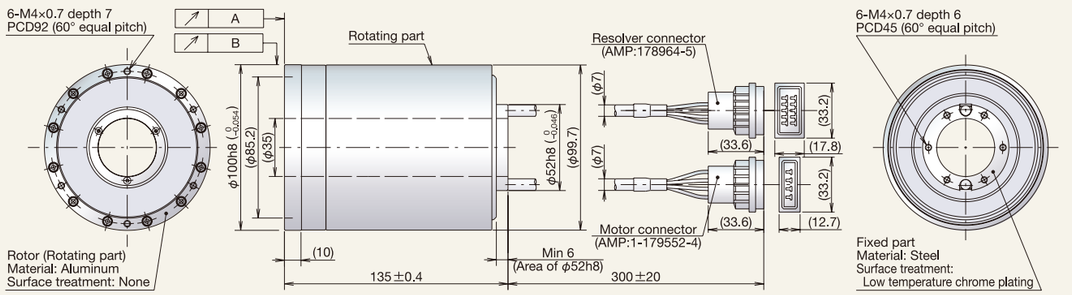
M-PS1006KN002



M-PS1012KN002



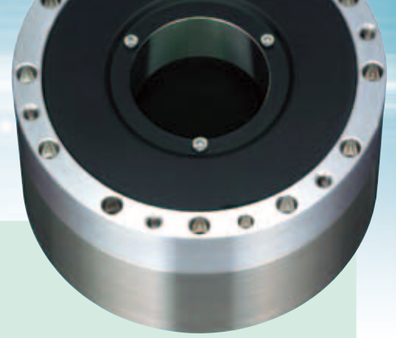
M-PS1018KN002



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 Series (PS3 Motor)



2.2.1 Designation

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

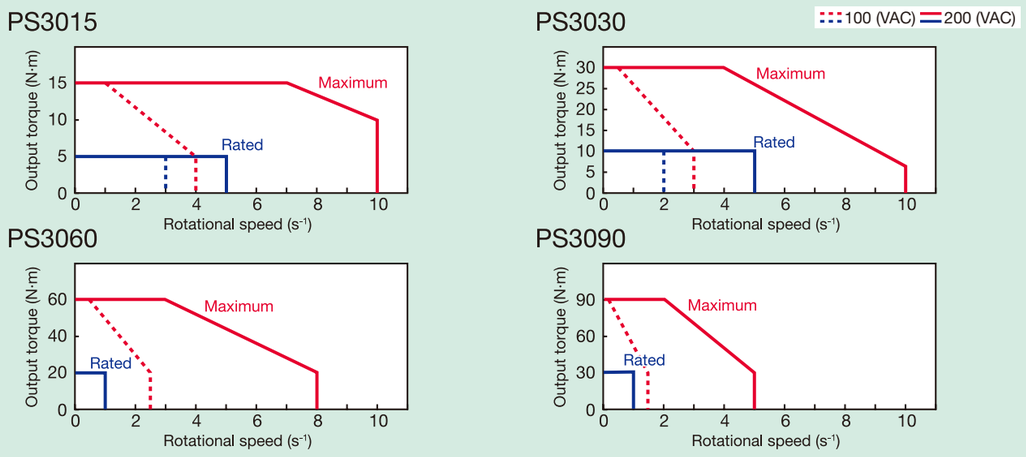
- M-PS: Megatorque Motor PS Series
- 3: Motor size code
- 015: Maximum output torque (N·m)
- KN: Standard
- 002: Design serial number 002: Standard

2.2.2 Specifications

Item \ Designation	M-PS3015KN002	M-PS3030KN002	M-PS3060KN002	M-PS3090KN002
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	50 (10,5,2)	50 (10,5,3)	50 (10,5)	50 (10)
Radial runout accuracy (B in the figure) (μm) *1	50 (10,5,3)	50 (10,5,3)	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.

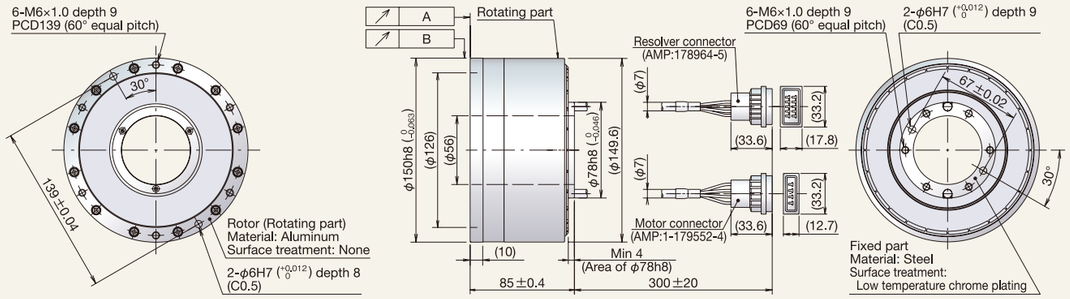
2.2.3 Rotational Speed and Output Torque Characteristics



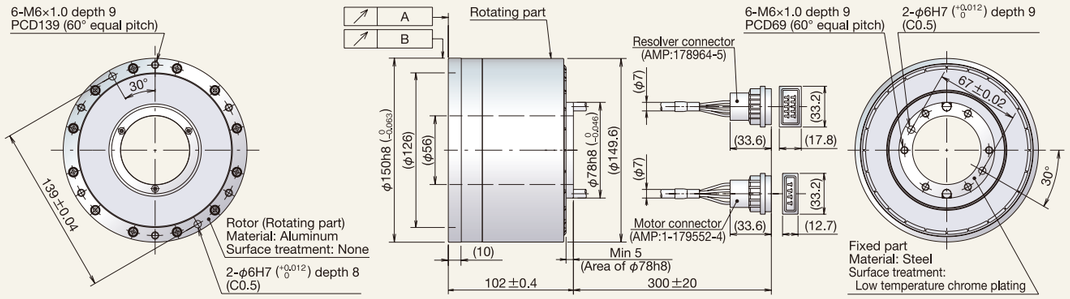
These represent typical values.

2.2.4 Dimensions

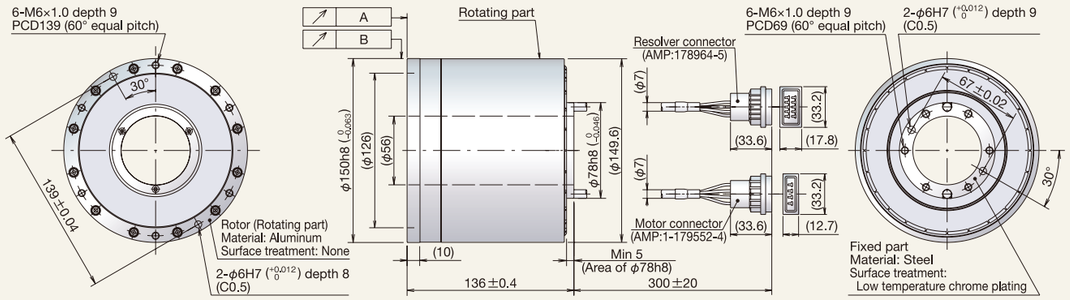
M-PS3015KN002



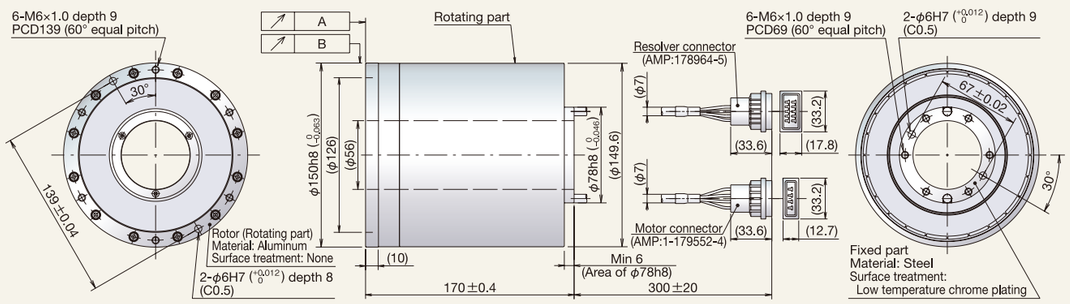
M-PS3030KN002



M-PS3060KN002



M-PS3090KN002



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 Series

2.3.1 Designation

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

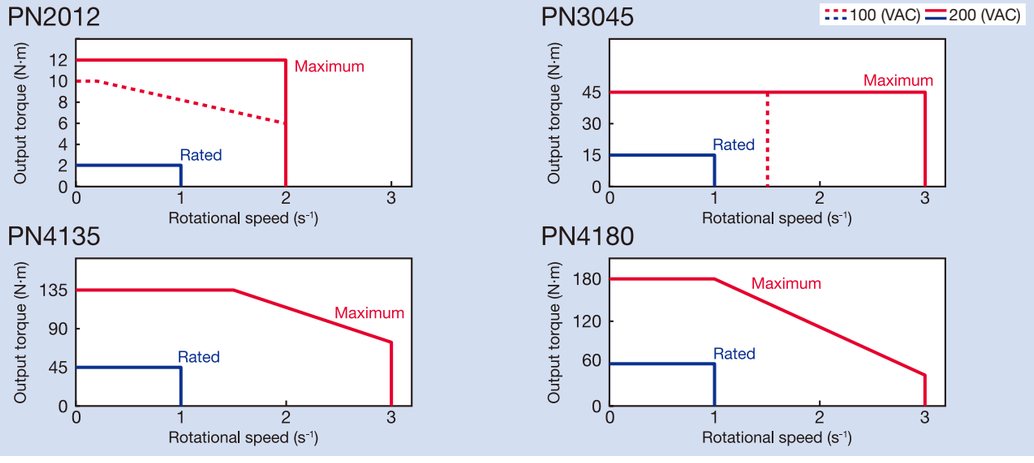
- M-PN: Megatorque Motor PN Series
- 3: Motor size code
- 045: Maximum output torque (N·m)
- KN: Standard
- 001: Design serial number 201: Standard (PN2) 001: Standard (PN3/PN4)

2.3.2 Specifications

Item \ Designation	M-PN2012KN201*1	M-PN3045KN001	M-PN4135KN001	M-PN4180KN001
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	50	30 (10,5)		
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·m^2)	0.0024	0.011	0.057	0.065
Allowable range of inertia (kg·m^2)	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.

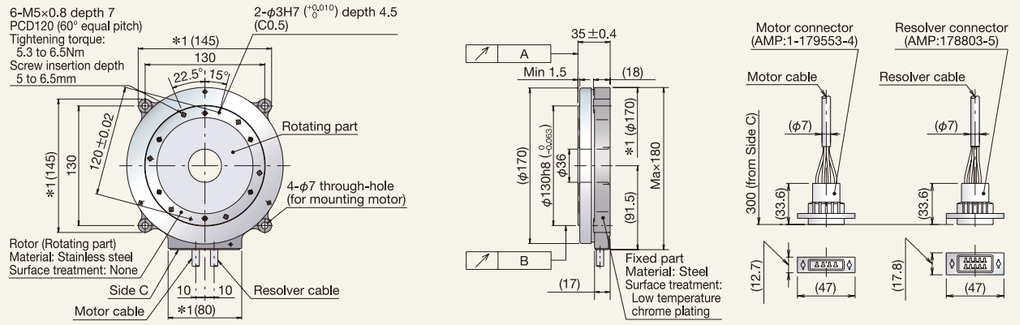
2.3.3 Rotational Speed and Output Torque Characteristics



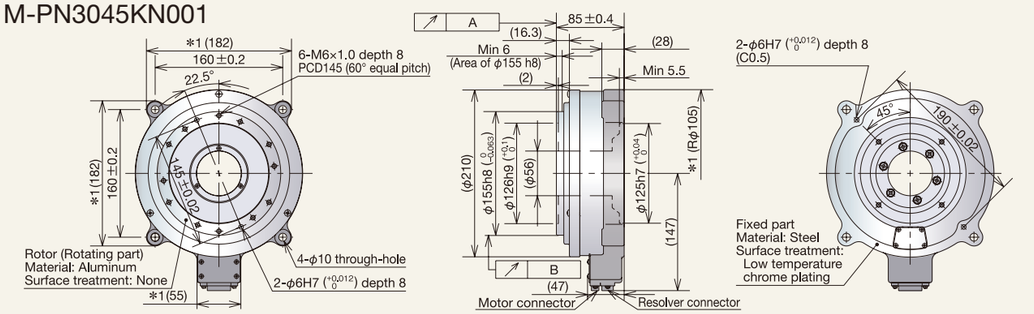
These represent typical values.

2.3.4 Dimensions

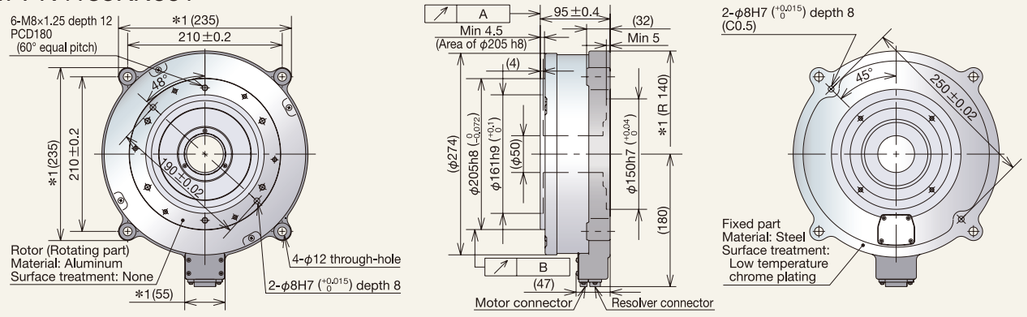
M-PN2012KN201



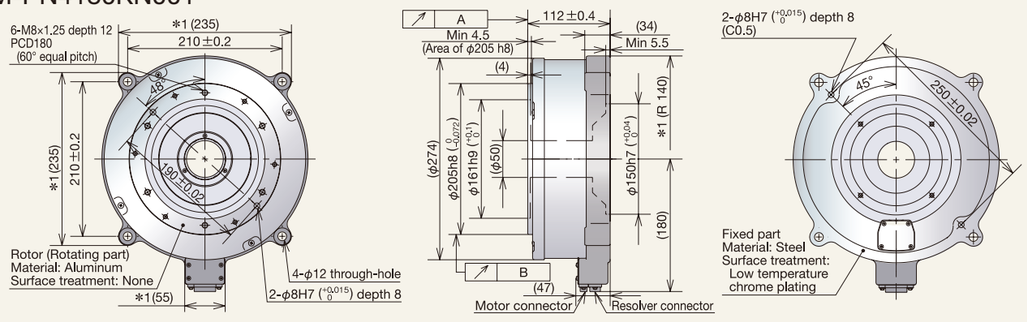
M-PN3045KN001



M-PN4135KN001



M-PN4180KN001



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 Series With Brake

2.4.1 Designation

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

- M-PN: Megatorque Motor PN Series
- 3: Motor size code
- 045: Maximum output torque (N·m)
- KG: With brake
- 001: Design serial number, 001: Standard

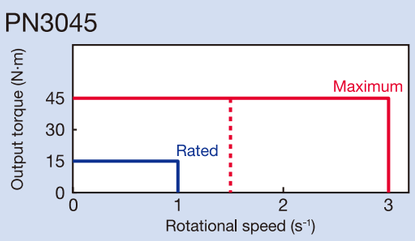
2.4.2 Specifications

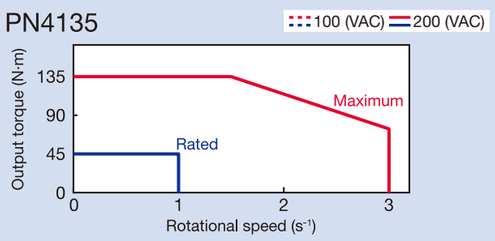
Item \ Designation	M-PN3045KG001	M-PN4135KG001
Motor outer diameter (mm)	ϕ210	ϕ280
Maximum output torque (N·m)*6	45/45	135/—
Rated output torque (N·m)*6	15/15	45/—
Axial runout accuracy (A in the figure) (μm)	50	
Radial runout accuracy (B in the figure) (μm)	50	
Motor height (mm)	97	111
Motor hollow 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 Series Megatorque Motors with Brake
The PN Series 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 Series Megatorque Motors. However, they do not comply with UL Standards or CE Marking when used with the PN Series with brake.

2.4.3 Rotational Speed and Output Torque Characteristics

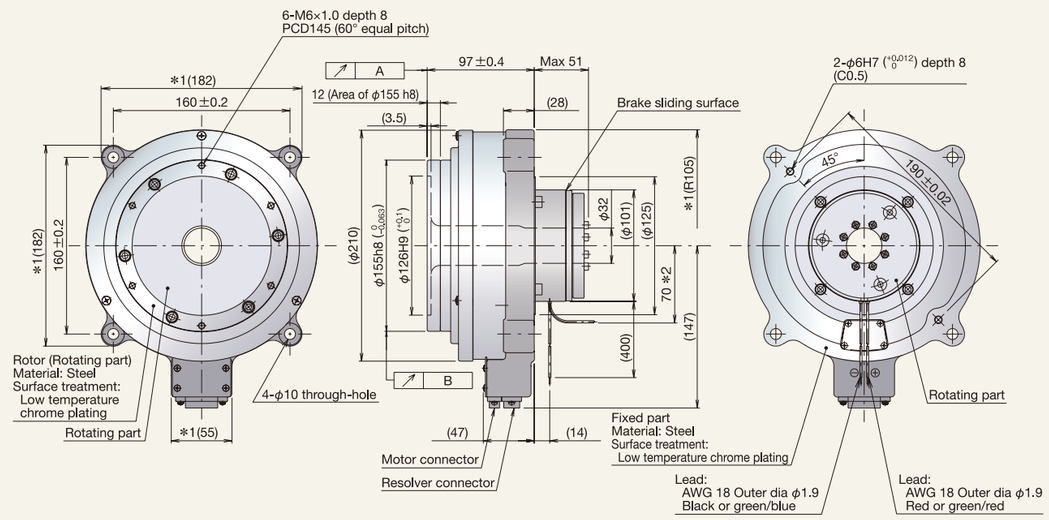




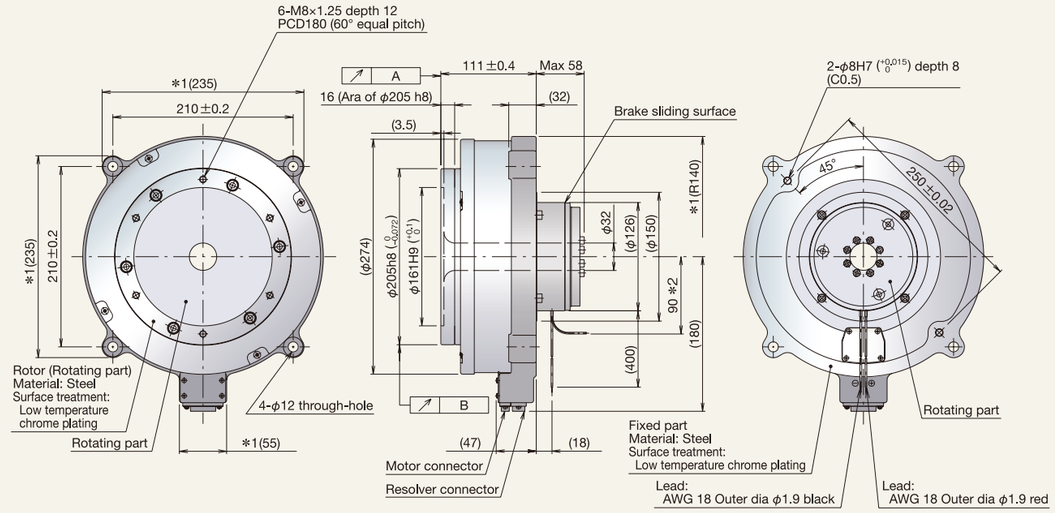
These are typical values.

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 Z Series

2.5.1 Designation

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

- M-PNZ: Megatorque Motor PNZ Series
- 3: Motor size code
- 040: Maximum output torque (N·m)
- KN: Standard
- 001: Design serial number, 001: Standard

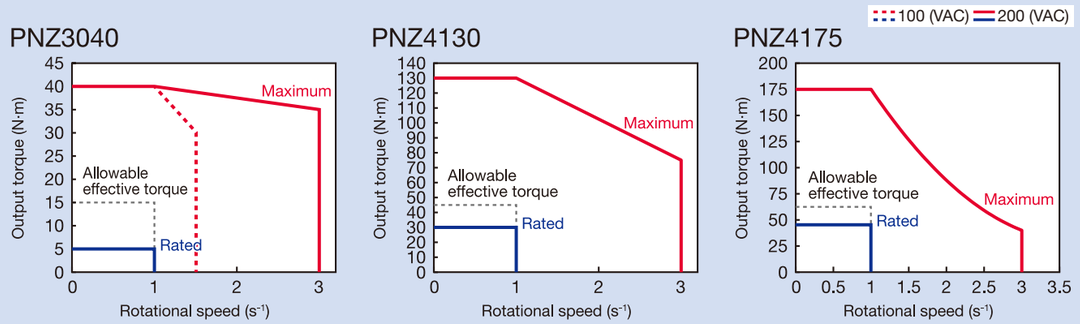
2.5.2 Specifications

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·m^2)	0.028	0.12	0.13
Allowable range of inertia (kg·m^2)	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 >
· Megatorque Motor Z Series with High Environmental Resistance
Megatorque Motor Z Series with High Environmental Resistance 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 Series Megatorque Motor. However, they do not comply with UL Standards or CE Mark when used with a Megatorque Motor Z Series with High Environmental Resistance.

2.5.3 Rotational Speed and Output Torque Characteristics

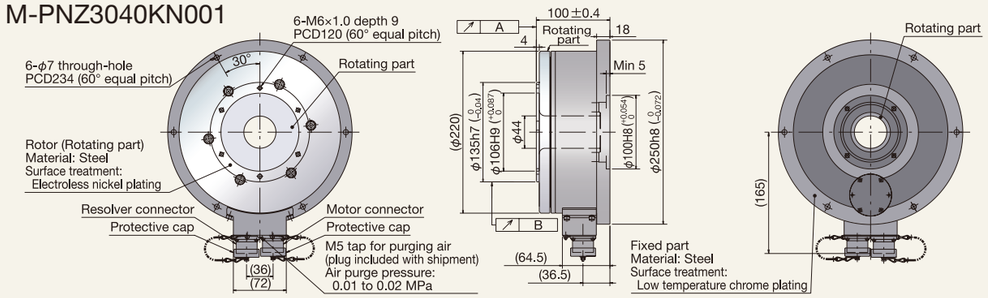


Please contact NSK for calculation of allowable effective torque.

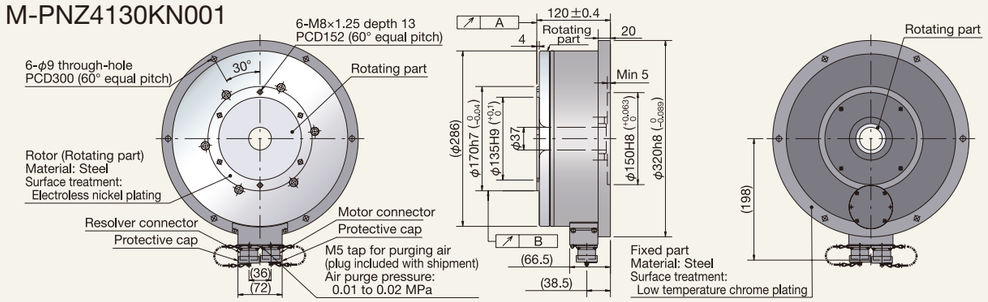
These are typical values at 200 VAC.

2.5.4 Dimensions

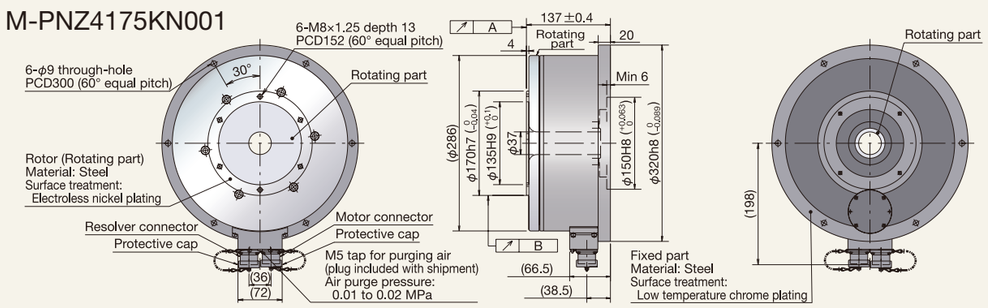
M-PNZ3040KN001



M-PNZ4130KN001

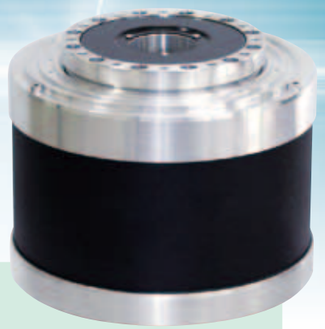


M-PNZ4175KN001



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.

2.6 High-Acceleration /Deceleration PX Series



2.6.1 Designation

Example Designation: **M-PX** **3** **050** **KN** **502**

- Megatorque Motor PX Series
- Motor size code
- Maximum output torque (N·m)
- KN: Standard
- Design serial number

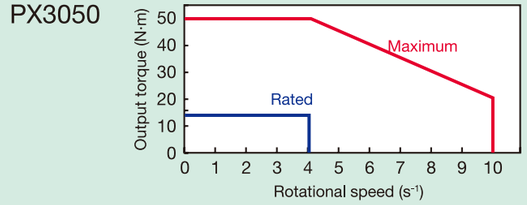
2.6.2 Specifications

Item \ Designation	M-PX3050KN502
Motor outer diameter (mm)	ϕ160
Maximum output torque (N·m)*5	50/—
Rated output torque (N·m)*5	14/—
Axial runout accuracy (A in the figure) (μm)	30
Radial runout accuracy (B in the figure) (μm)	50
Motor height (mm)	130
Motor hollow diameter (mm)	ϕ35
Maximum rotational speed (s^{-1})*5	10/—
Rated rotational speed (s^{-1})*5	4/—
Resolution of position sensor (count/revolution)	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 ($kg·m^2$)	0.0028
Allowable range of inertia ($kg·m^2$)	0.0028 to 0.28
Mass (kg)	9.5
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 Ambient temperature of 25±5 °C
*2 APX3050 cable length up to 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.

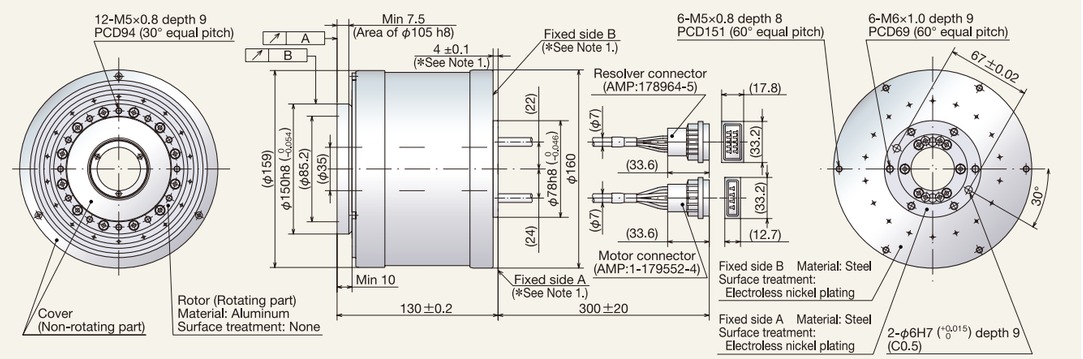
<Note on compliance with UL Standards and CE Marking>
· High Acceleration/Deceleration PX Series
The High Acceleration/Deceleration PX Series does not comply with UL Standards or CE Marking.
· Driver Unit Model EDD
Driver Unit Model EDDs comply with UL Standards and CE Marking when used with PS and PN Series Megatorque Motors. However, they do not comply with UL Standards or CE Marking when used with the High Acceleration/Deceleration PX Series.

2.6.3 Rotational Speed and Output Torque Characteristics



These are typical values at 200 VAC.

2.6.4 Dimensions



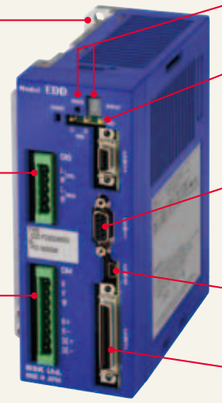
1. Fixed surface A or B should be the installation surface for the motor. When fixed surface A is used, ϕ78h8 slip fit depth should be 3.5 mm or less.
2. The bend radius of the motor cable lead (ϕ7) and the resolver cable lead (ϕ7) should be R30 mm or more.
3. Do not flex cable leads.
4. Avoid stress (tension, vibration, etc.) where the lead and connector join. Stress can cause loose or broken connections

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.

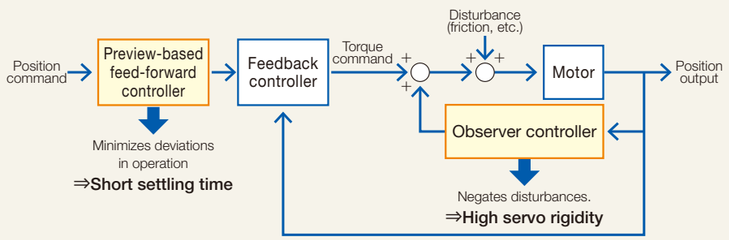
USB port
Provides a PC connection with EDD Megaterm software (free download from NSK's website).

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.

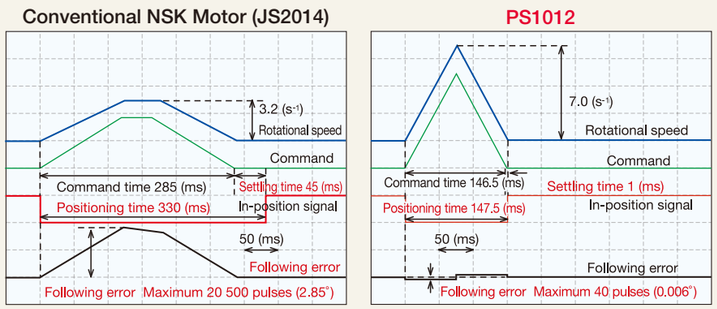
3.3 Control Technology

Control Technology and Example High-Speed Positioning

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



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



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**

- M-EDD: Driver Unit Model EDD
- PS1006: Motor size code
- A: Power voltage A: 100 to 240 (VAC) (single-phase) (PN4, PNZ4 and PX3 models: 200 to 240 (VAC) only)
- B: Position sensor code B: Absolute position sensor code
- 5: Function 5: Standard
- 01: Design serial number 01: Standard
- -03: Connectors, Fixing brackets and startup Guide are included

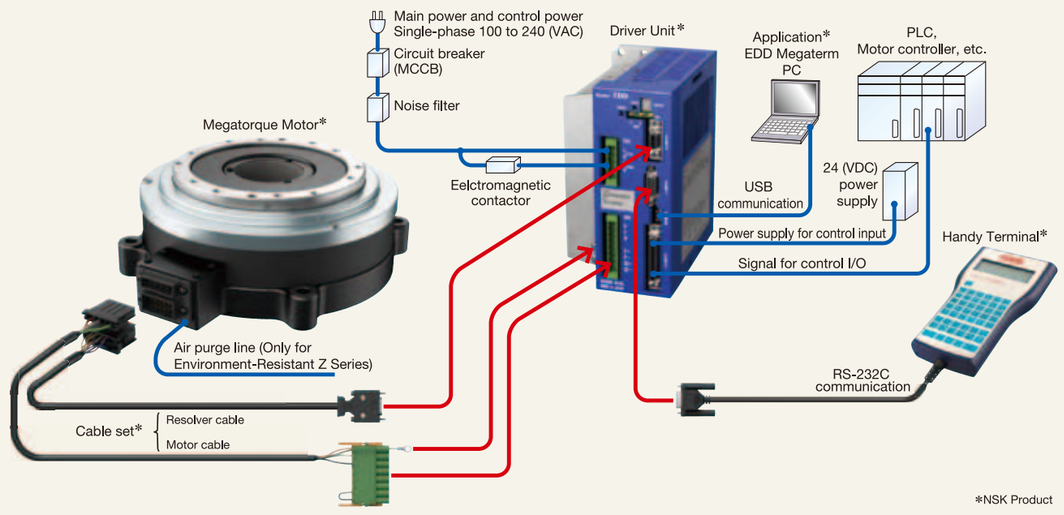
Z Series, PN Series with brake, and PN Series use the same Driver Units. Refer to Section 9 "Motor and Driver Unit Combination" for more details on applicable models.

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/N Series, Environment-Resistant Z Series, and High Acceleration/Deceleration PX Series



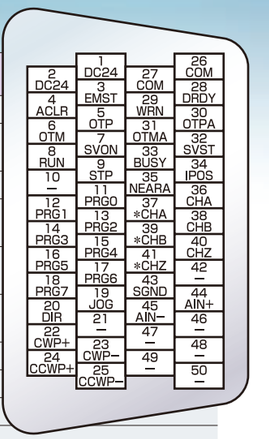
*For PN Series with Brake, refer to 3.9 Example of system configuration of PN Series with Brake.

3.6 General Specifications

Item		Motor model	PS1004	PS1006	PS1012	PS1018	PS3015	PS3030	PS3060	PS3090	PN2012	PN3045	PN4135	PN4180	PX3050
Input power	Rated capacity (kVA)		0.3	0.3	0.4	0.6	0.6	0.9	0.5	0.6	0.2	0.5	0.8	1.0	1.0
	Maximum capacity (AC200V) (kVA)		1.1	1.0	1.4	2.2	2.2	2.7	4.6	4.7	2.3	4.1	4.8	4.8	4.5
	Maximum capacity (AC100V) (kVA)		0.3	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 ϕA/ϕB 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: ϕA/ϕB/ϕZ line driver. Universal resolution setting to ϕA/ϕB is available. Resolution of ϕA/ϕB: 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 ϕA/ϕB Resolution of ϕZ: 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/s^2) 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)

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 ϕA	A pulse signal that reports the number of motor rotations Output format is line driver
	*CHA	37	Positioning feedback signal *ϕA	
	CHB	38	Positioning feedback signal ϕB	
	*CHB	39	Positioning feedback signal *ϕB	
	CHZ	40	Positioning feedback signal ϕZ	
	*CHZ	41	Positioning feedback signal *ϕZ	
	–	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.)	–



Pin-out

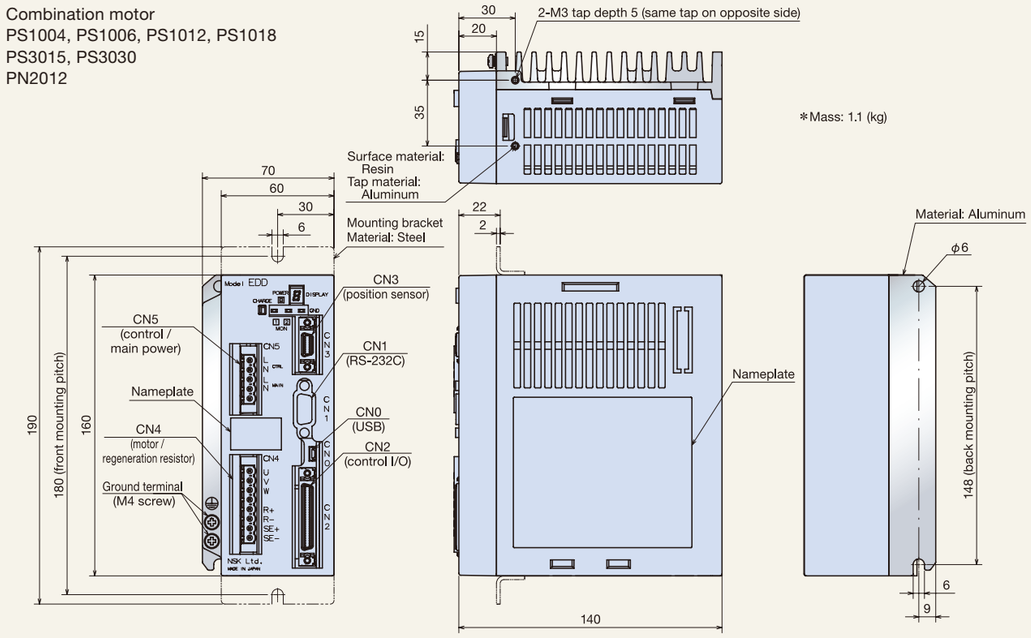
Carefully follow these instructions when wiring to the Control I/O (CN2):
· Use shielded wires and a twisted pair for pulse train input and position feedback output. These wires should be as short as possible (up to 2 m).
Selection and optional settings to control Input/Output signal functions
· You 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.

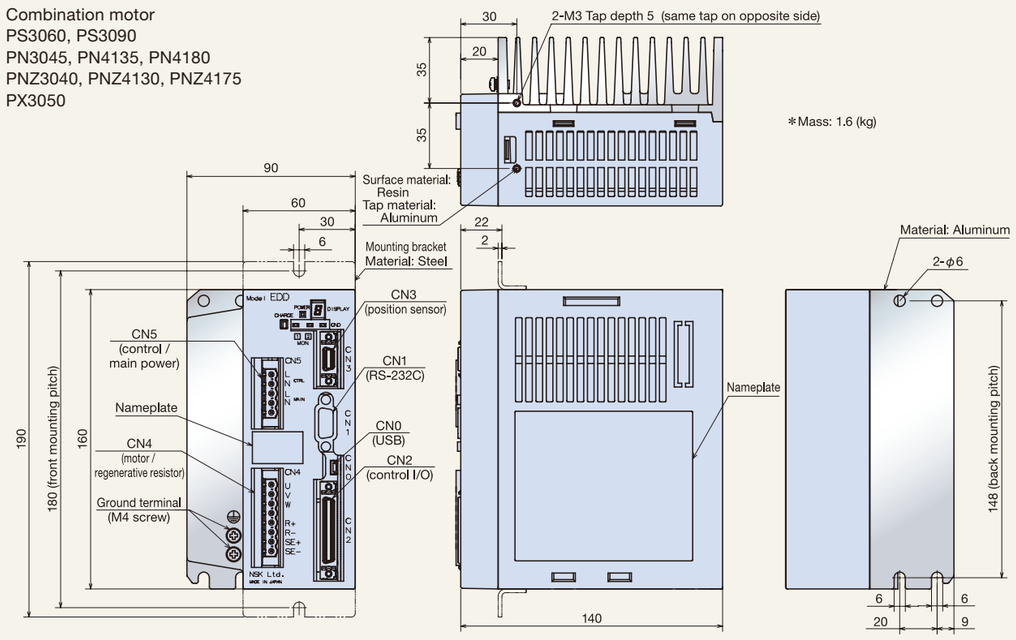
*2 Output signal: Select up to 7 output signals out of the 23 output signals listed above and then assign them to Pins 29 to 35. In addition to the Output signals listed above, you may select: Target proximity B, Zone A/B/C, Over travel limit (± direction), Normal, Position error (under/over), Velocity (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
PS1004, PS1006, PS1012, PS1018
PS3015, PS3030
PN2012

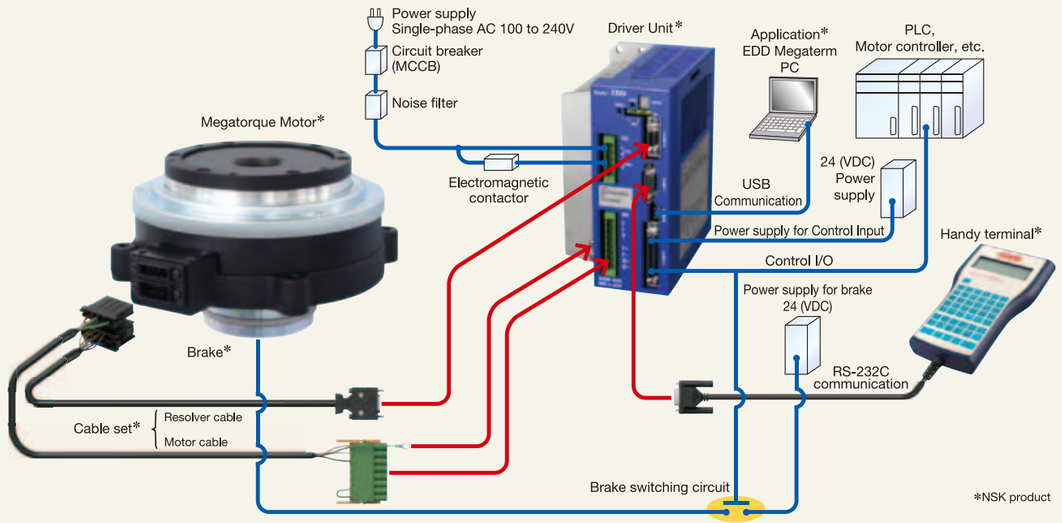


Combination motor
PS3060, PS3090
PN3045, PN4135, PN4180
PNZ3040, PNZ4130, PNZ4175
PX3050

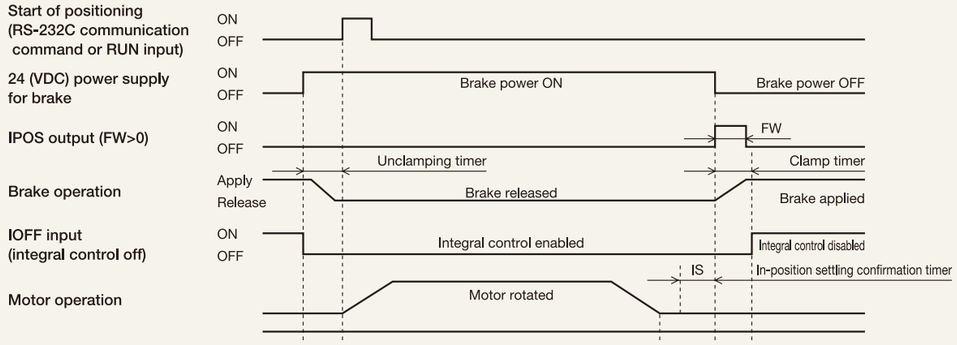


3.9 Example System Configuration

System Configuration of PN Series with Brake



Example Break Sequence



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

4 Cable Set

4.1 Designation

Cable Set Designation for PS/PN Series, PN Series with Brake and High-Acceleration/Deceleration PX Series

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

- M-C: Cable set
- 004: Cable length L: (m) (Example) 004: 4 (m)
- SDP: For PS/PN Series, PN Series with Brake and PX Series with High Acceleration/Deceleration Charasteristics
- 03: Stationary cable
  13: Flexible cable

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 and PX 3050.

Cable Set Designation for Environment-Resistant Z Series

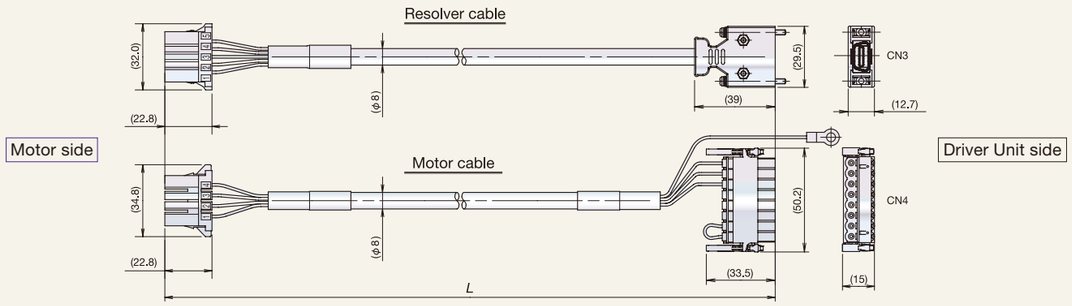
Example Designation: **M-C** **004** **WDP** **13**

- M-C: Cable set
- 004: Cable length L: (m) (Example) 004: 4 (m)
- WDP: For Z Series with High Environmental Resistance
- 13: Flexible cable, straight connector
  14: Flexible cable, angle connector

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

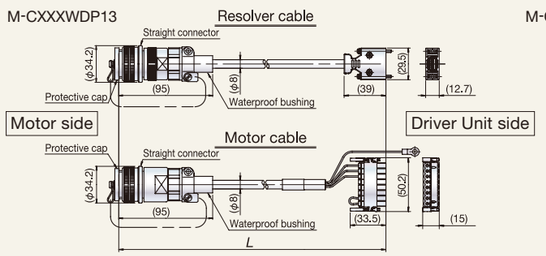
4.2 Dimensions

Cable Set Dimensions for PS/PN Series, PN Series With Brake and High Acceleration/Deceleration PX Series

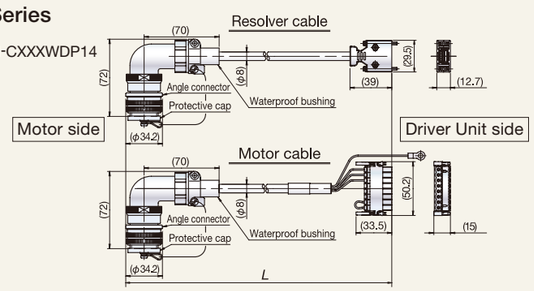


Cable Set Dimensions for Environment-Resistant Z Series

M-CXXXWDP13



M-CXXXWDP14



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**

- M-FHT: Handy Terminal
- 31: 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.

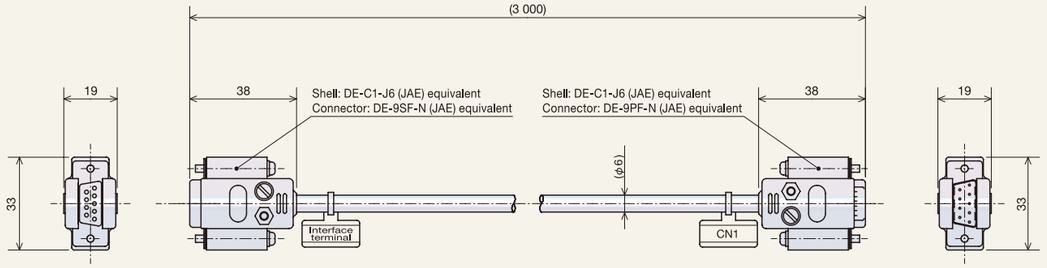
- 20 characters × 4 line LCD Screen, no external power source required, cable length: 3 m

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

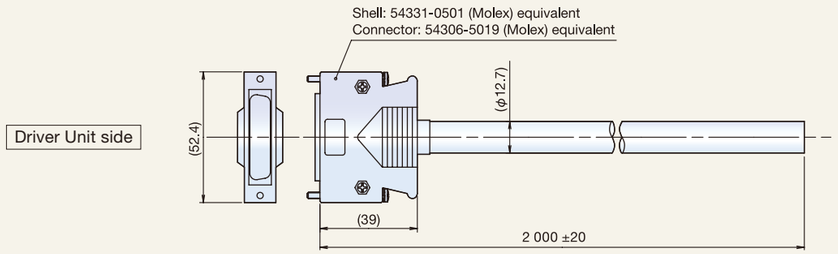
No.	Signal Code
3	TXD
2	RXD
7	RTS
8	CTS
6	DSR
4	DTR
5	SG

CN1

No.	Signal Code
1	TXD
3	RXD
7	RTS
2	CTS
4	DSR
5	DTR
6	SG
8	+5V
9	FG

5.3 Cable With CN2 Connector

Designation: M-E011DCCN1-003



Wiring table

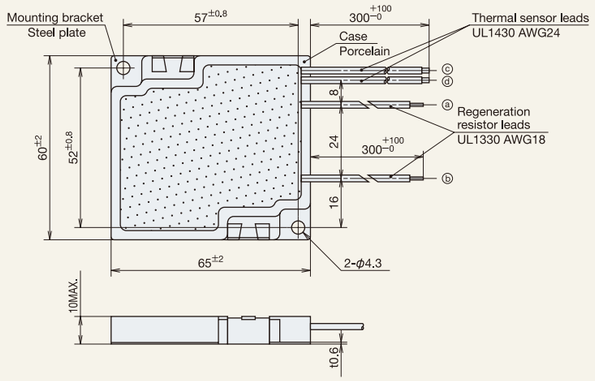
Signal Code (Default setting)	Pin No.	Wire Color	Dot Mark	Dot Color
DC24	1	Yellow	■	Black
		Yellow	■	Red
DC24	2	Bright green	■	Black
		Bright green	■	Red
EMST	3	Bright green	■■■	Black
		Bright green	■■■	Red
ACLR	4	White	■	Black
OTP	5	White	■	Red
OTM	6	Light brown	■■	Black
SVON	7	Light brown	■■	Red
RUN	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

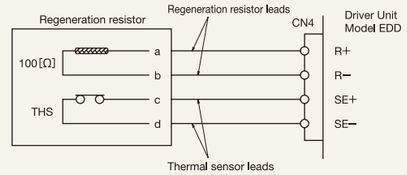
5.4 Regenerative Resistor

Item \ Designation	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		

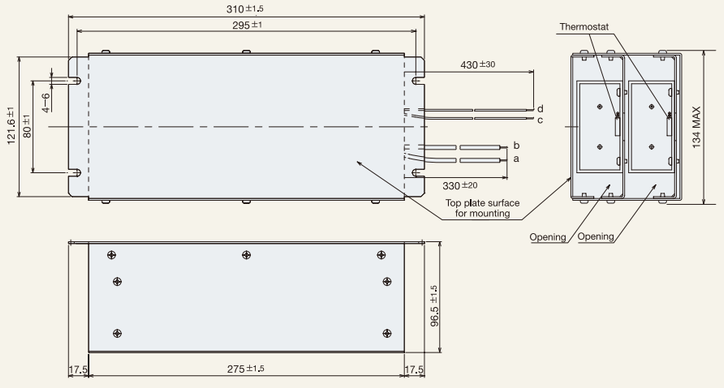
M-E014DCKR1-100



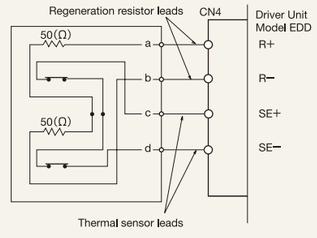
Connection to Driver Unit Model EDD



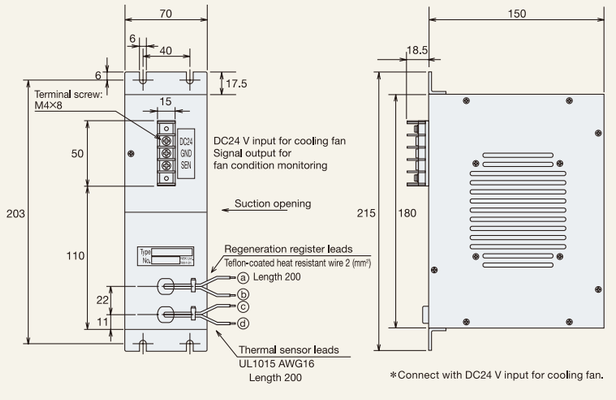
M-E014DCKR1-102



Connection to Driver Unit Model EDD

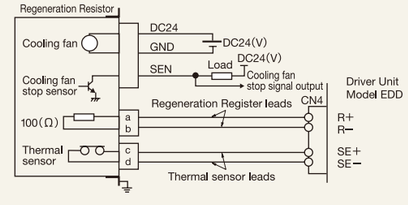


M-E014DCKR1-101



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



6 Selection of Megatorque Motors

To select appropriate Megatorque Motors, 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

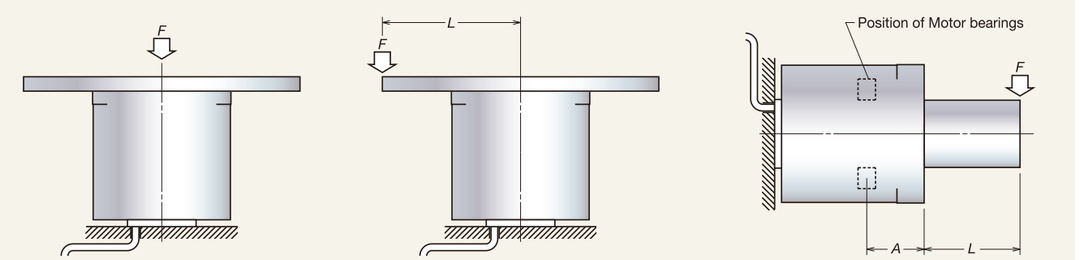
(1) Load moment of inertia; (2) Axial load, radial load, and moment load; (3) Holding torque

(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.)



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

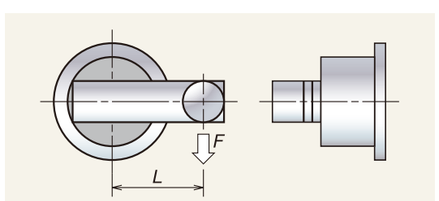
②When F is an external force:
●Axial load: $F_a = F$ + total weight of jigs and work
●Moment load: $M = F \times L$

③When 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	PS1004	PS1	PS3	PN2	PN3	PN4	PN3 with brake	PN4 with brake	PNZ3	PNZ4	PX3
Dimension A (mm)	28.6	30.2	32.9	16.7	33.8	54.2	45.8	70.2	48.8	79.2	30.4

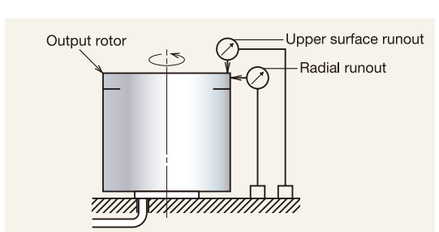
(3) Holding torque

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.

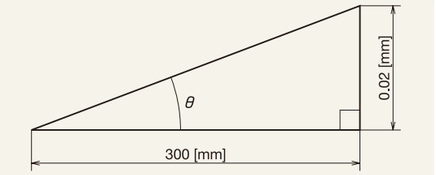


3 Positioning Accuracy

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 Series assuming a required repeatability of ±0.02 mm at a distance 300 mm from the center.

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



Therefore, ±14 > ±2
Both PS1 and PS3 Motors 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:

Rotational energy = $1/2 \times J \times \omega^2$ [J]
$= 1/2 \times J \times (2\pi N)^2$ [J]
$J = J_r + J_m$

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.

7 Positioning Time Diagrams

The positioning time for Megatorque Motors 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.

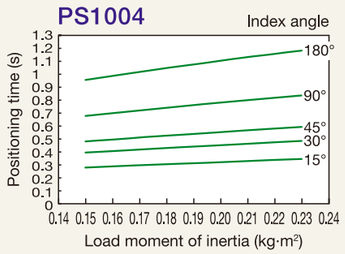
Example: Motor: PN4180

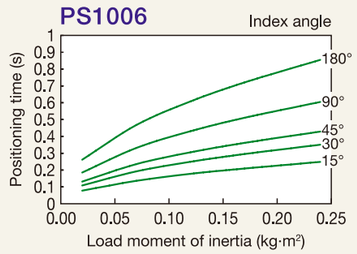
Moment of inertia: 3.0 (kg·m²)

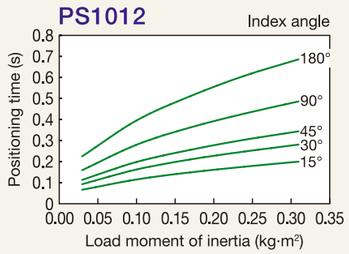
Index angle: 45°

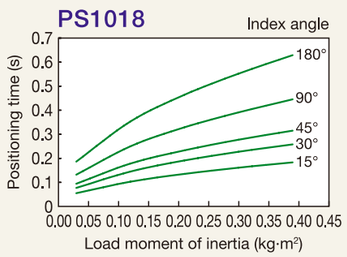
The minimum positioning time of 0.3 s is determined per the appropriate line in the following:

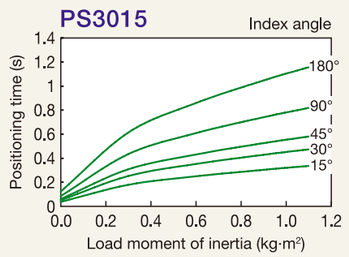
Required repeatability (arc-sec)	Settling time (s)
±2 – ±10	0.1
±10 – ±100	0.04
±100 –	0.001

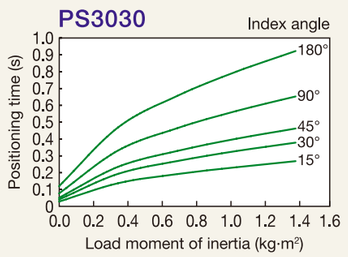


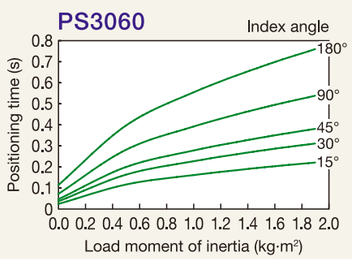


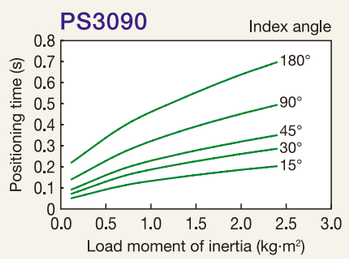




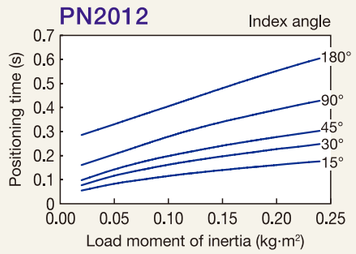


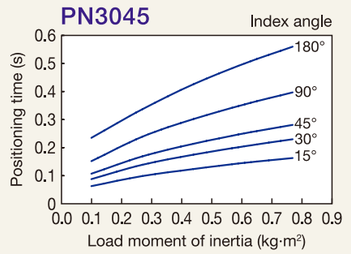


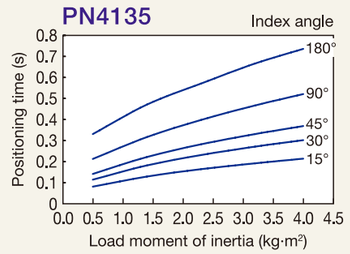


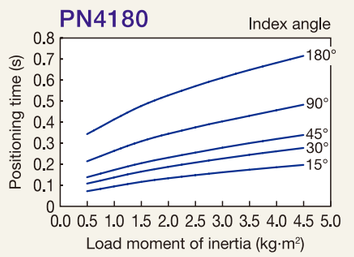


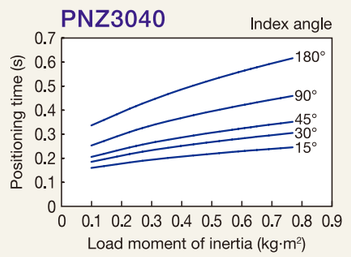
These diagrams apply at a power voltage of 200 VAC.

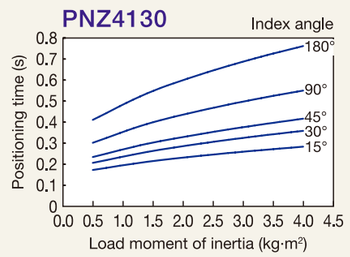


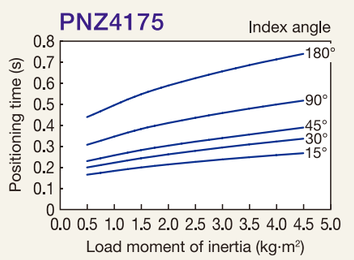


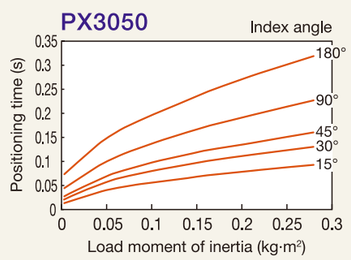










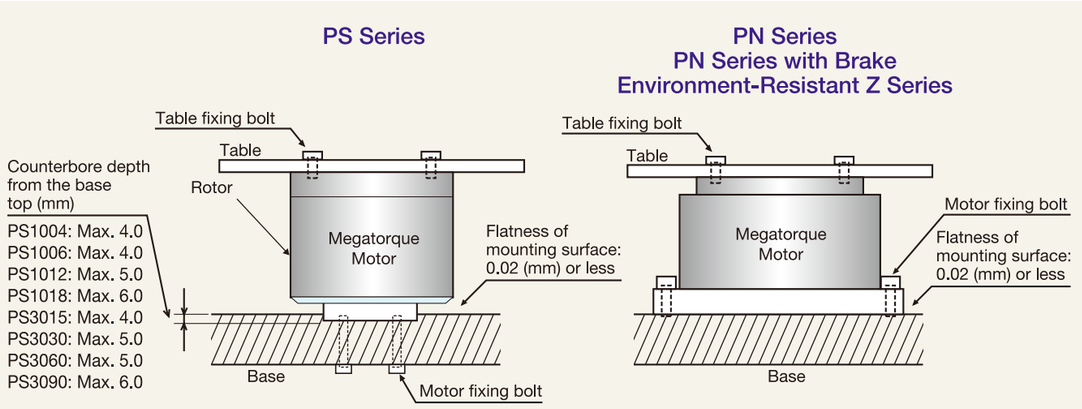


These diagrams apply at a power voltage of 200 VAC.

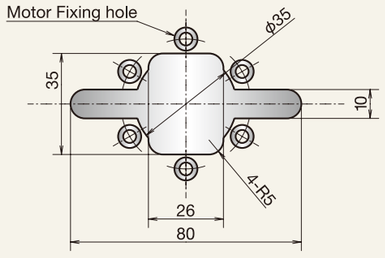
8 Installation of Megatorque Motor

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 Z Series upside-down.
- Take care not to raise the underside cover when attaching the motor (PS Series)
- Please see the figure below for counterbore depth from base top. (PS Series)
- 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.



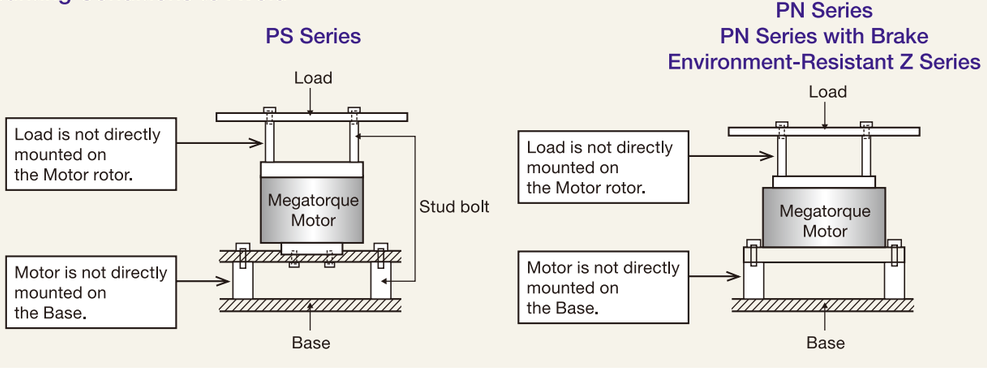
Example Hole for Lead- PS Series



If inserting the PS Series 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.

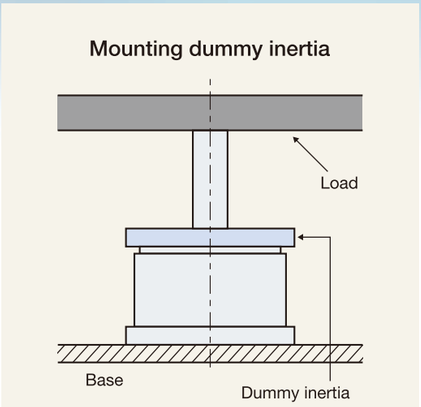
Mounting Conditions to Avoid



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.



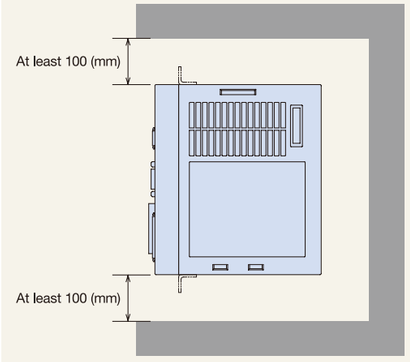
· Inertia of a dummy load shall be approximately 20% of the load inertia. When a speed reducer mechanism is used, it shall be

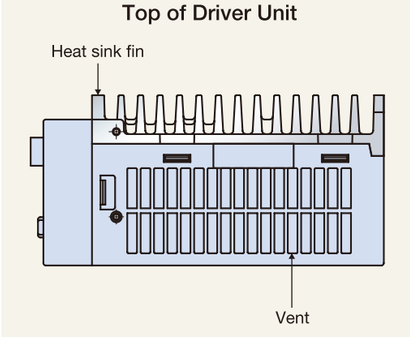
$GD^2_1 / (r^2 \times GD^2_d) \leq 5$

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

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.





9 Motor and Driver Unit Combinations

9.1 PS Series 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	Main Specifications
ϕ100	M-PS1004KN510	M-EDD-PS1004AB501-**	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)	Pulse train input 256 program channels
	M-PS1006KN002	M-EDD-PS1006AB501-**	100 – 240		
	M-PS1012KN002	M-EDD-PS1012AB501-**	100 – 240		
	M-PS1018KN002	M-EDD-PS1018AB501-**	100 – 240		
ϕ150	M-PS3015KN002	M-EDD-PS3015AB501-**	100 – 240		
	M-PS3030KN002	M-EDD-PS3030AB501-**	100 – 240		
	M-PS3060KN002	M-EDD-PS3060AB501-**	100 – 240		
	M-PS3090KN002	M-EDD-PS3090AB501-**	100 – 240		
ϕ100	M-PS1004KN510	M-EDC-PS1004ABC02-**	200 – 230	M-C***SCP03 (Stationary cable) M-C***SCP13 (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)	CC-Link function 256 program channels
		M-EDC-PS1004CBC02-**	100 – 115		
	M-PS1006KN002	M-EDC-PS1006ABC02-**	200 – 230		
		M-EDC-PS1006CBC02-**	100 – 115		
	M-PS1012KN002	M-EDC-PS1012ABC02-**	200 – 230		
		M-EDC-PS1012CBC02-**	100 – 115		
	M-PS1018KN002	M-EDC-PS1018ABC02-**	200 – 230		
		M-EDC-PS1018CBC02-**	100 – 115		
ϕ150	M-PS3015KN002	M-EDC-PS3015ABC02-**	200 – 230		
		M-EDC-PS3015CBC02-**	100 – 115		
	M-PS3030KN002	M-EDC-PS3030ABC02-**	200 – 230		
		M-EDC-PS3030CBC02-**	100 – 115		
	M-PS3060KN002	M-EDC-PS3060ABC02-**	200 – 230		
		M-EDC-PS3060CBC02-**	100 – 115		
	M-PS3090KN002	M-EDC-PS3090ABC02-**	200 – 230		
		M-EDC-PS3090CBC02-**	100 – 115		

9.2 PN Series 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	Main Specifications
ϕ170	M-PN2012KN201	M-EDD-PN2012AB501-**	100 – 240	M-C***SDP03 (Stationary cable) M-C***SDP13 (Flexible cable) *** indicates cable length.	Pulse train input 256 program channels
ϕ210	M-PN3045KN001	M-EDD-PN3045AB501-**	100 – 240		
ϕ280	M-PN4135KN001	M-EDD-PN4135AB501-**	200 – 240		
	M-PN4180KN001	M-EDD-PN4180AB501-**	200 – 240		
ϕ170	M-PN2012KN201	M-EDC-PN2012ABC02-**	200 – 230	M-C***SCP03 (Stationary cable) M-C***SCP13 (Flexible cable) *** indicates cable length.	CC-Link Function 256 program channels
		M-EDC-PN2012CBC02-**	100 – 115		
ϕ210	M-PN3045KN001	M-EDC-PN3045ABC02-**	200 – 230		
		M-EDC-PN3045CBC02-**	100 – 115		
ϕ280	M-PN4135KN001	M-EDC-PN4135ABC02-**	200 – 230		
	M-PN4180KN001	M-EDC-PN4180ABC02-**	200 – 230		

Refer to 9.1 for cable length.

9.3 PN Series With Brake and Driver Unit Combinations

Motor Outer Diameter (mm)	Motor Designation	Driver Unit Designation (**indicates accessory specifications)	Power Voltage (VAC)	Cable Set Designation	Main Specifications
ϕ210	M-PN3045KG001	M-EDD-PN3045AB501-**	100 – 240	M-C***SDP03 (Stationary cable) M-C***SDP13 (Flexible cable) *** indicates cable length.	Pulse train input 256 program channels
ϕ280	M-PN4135KG001	M-EDD-PN4135AB501-**	200 – 240		
ϕ210	M-PN3045KG001	M-EDC-PN3045ABC02-**	200 – 230	M-C***SCP03 (Stationary cable) M-C***SCP13 (Flexible cable) *** indicates cable length.	CC-Link Function 256 program channels
		M-EDC-PN3045CBC02-**	100 – 115		
ϕ280	M-PN4135KG001	M-EDC-PN4135ABC02-**	200 – 230		

Refer to 9.1 for cable length.

9.4 Environment-Resistant Z Series and Driver Unit Combinations

Motor Outer Diameter (mm)	Motor Designation	Driver Unit Designation (**indicates accessory specifications)	Power Voltage (VAC)	Cable Set Designation	Main Specifications
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)	Pulse train input 256 program channels
ϕ286	M-PNZ4130KN001	M-EDD-PN4135AB501-**	200 – 240		
	M-PNZ4175KN001	M-EDD-PN4180AB501-**	200 – 240		
ϕ220	M-PNZ3040KN001	M-EDC-PN3045ABC02-**	200 – 230	M-C***WCP13 (Flexible cable, Straight connector) M-C***WCP14 (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)	CC-Link Function 256 program channels
		M-EDC-PN3045CBC02-**	100 – 115		
ϕ286	M-PNZ4130KN001	M-EDC-PN4135ABC02-**	200 – 230		
	M-PNZ4175KN001	M-EDC-PN4180ABC02-**	200 – 230		

9.5 High Acceleration/Deceleration PX Series and Driver Unit Combinations

Motor Outer Diameter (mm)	Motor Designation	Driver Unit Designation (**indicates accessory specifications)	Power Voltage (VAC)	Cable Set Designation	Main Specifications
ϕ160	M-PX3050KN502	M-EDD-PX3050AB501-**	200 – 240	M-C***SDP03 (Stationary cable) M-C***SDP13 (Flexible cable) *** indicates cable length. Maximum cable length is 8 m.	Pulse train input 256 program channels
		M-EDC-PX3050ABCF1-**	200 – 230	M-C***SCP03 (Stationary cable) M-C***SCP13 (Flexible cable) *** indicates cable length. Maximum cable length is 8 m.	CC-Link Function 256 program channels

Refer to 9.1 for cable length.

9.6 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 EDD Megaterm Application Software

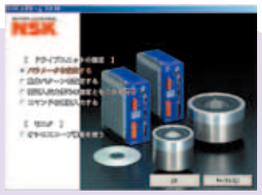
Once installed on your computer, EDD Megaterm software enables the editing, preparation, and control of Driver Unit Model EDD programs and parameters. It also facilitates the allocation and monitoring of control input/output and features oscilloscope and FFT functions for easy confirmation of Motor operation.

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

- EDD Megaterm supports USB communication only.
- If RS-232C communication is selected, the oscilloscope function will disabled.
- Using EDD Megaterm via USB should only be performed when setting up parameters. Do not use during normal operation.

Functions

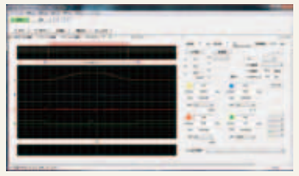
1. Oscilloscope function
2. FFT function
3. Allocation and monitoring of control input/output
4. Parameter editing
5. Channel editing
6. Others:
   - Upload / download parameter and channel data
   - Terminal



Main Functions

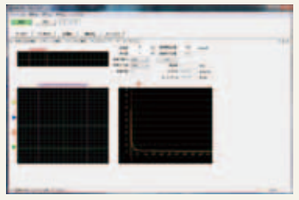
1. Oscilloscope function

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



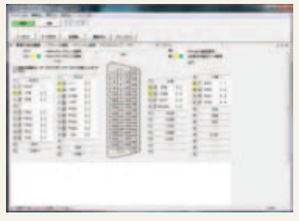
2. FFT function

· FFT can be used for data measured with the oscilloscope function.



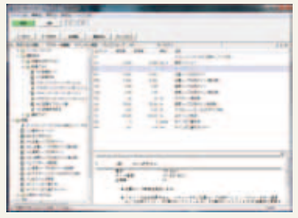
3. Allocation and monitoring of control input/output

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



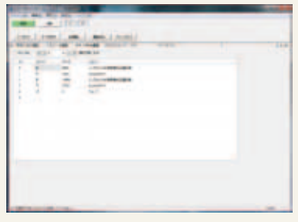
4. Parameter edit

· 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



11 Megatorque Motor Selection Tool

Our website (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.

12 International Safety Standards and Warranty Information

CE Marking (PS/PN Series only)

● Low voltage command (applicable standard: EN61800-5-1)

The Megatorque Motor PS/PN Series is incorporated into machinery as a component. NSK set low voltage standards to ensure the Megatorque Motor PS Series fully complies with the EC Directive. The standards have been certified by TÜV, a third-party testing and certification organization.

● EMC command (applicable standards: EN61800-3)

NSK defined and tested installation models (conditions) for the Megatorque Motor PS/PN Series, including installation space and wiring between Driver Units and Motors, and set EMC command standards certified by TÜV.

When the Megatorque Motor PS/PN Series 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 Series Motors.

Compliance with UL Standards (PS/PN Series 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 Form for Requesting Megatorque Motor Selection

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

To

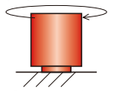
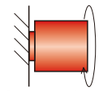
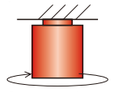
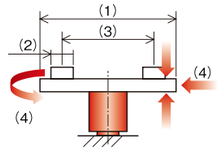
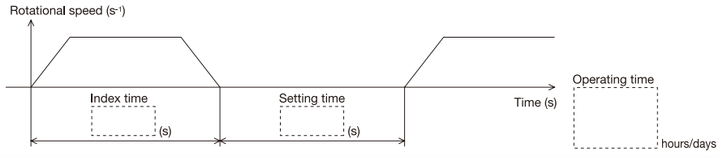
Date (DD/MMM/YYYY): / /

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 ☐CC-Link ☐MECHATROLINK-III
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.	
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	

Example completed form

Date (DD/MM/YYYY): / /

To XXX XXX , in charge of NSK Mechatronics products

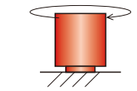
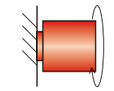
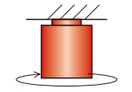
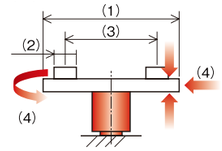
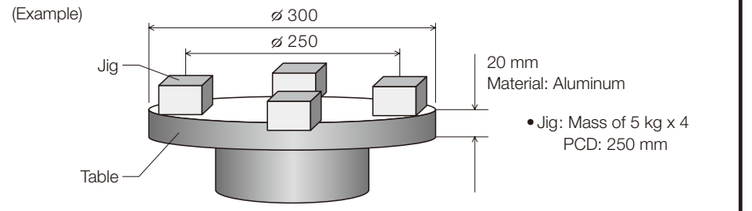
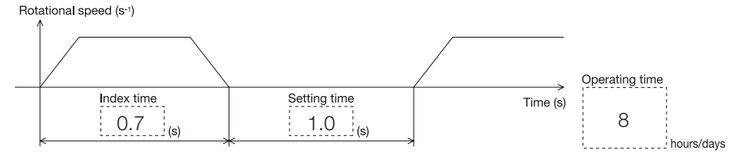
Date (DD/MM/YYYY): 12 / 01 / 20XX

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)  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 ☐CC-Link ☐MECHATROLINK-III
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.	
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)

MOTION & CONTROL™

NSK

Worldwide Sales Offices

P: Phone ☆: Head Office

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HANOI P: +84-24-3955-0159
NSK REPRESENTATIVE OFFICE
HO CHI MINH CITY P: +84-28-3822-7907

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North and South America

United Sates of America:
NSK AMERICAS, INC. (AMERICAN HEADQUARTERS)
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For more information about NSK products, please contact:

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