

# Brushless Motor

## EM-4020 · EM-4020A

## EM-4040 · EM-4040A

### OPERATION MANUAL

OM-K0644E

Thank you for purchasing the EM-4020 · EM-4020A · EM-4040 · EM-4040A Brushless Motor. The <E4000 CONTROLLER>, <E4000 Series Spindle>, and <Air Line Kit > are required to drive this brushless motor. Read these Operation Manual carefully before use. Also read <E4000 CONTROLLER>, <E4000 Series Spindle>, and <Air Line Kit> Operation Manuals. Always keep this Operation Manual in a place where a user can referred to for reference at any time.

#### 1. CAUTIONS FOR HANDLING AND OPERATION

- Read these warnings and cautions carefully and only use in the manner intended.
- These warnings and cautions are intended to avoid potential hazards that could result in personal injury to the operator or damage to the device. These are classified as follows in accordance with the seriousness of the risk.

Class	Degree of Risk
<b>⚠ WARNING</b>	A safety hazard could result in bodily injury or damage to the device if the safety instructions are not properly followed.
<b>⚠ CAUTION</b>	A hazard that could result in light or moderate bodily injury or damage to the device if the safety instructions are not followed

#### ⚠ WARNING

- This brushless motor is not a hand tool. It is designed to be used on CNC machines or special purpose machines.
- Do not touch the cutting tool while it is running. It is very dangerous.
- Wear safety glasses, dust mask and use a protective cover around the spindle whenever the spindle is rotating.
- Never connect, disconnect or touch the Connector and Motor Cord Plug with wet hands. This may cause an electric shock.
- Never operate or handle the brushless motor until you have thoroughly read the Operation Manuals and safe operation has been confirmed.
  - To prevent injuries / damages, check the spindle and cutting tool for proper installation, before operating the brushless motor.
  - Before disconnecting the brushless motor, always turn the control power off and turn the compressed air supply to the CONTROLLER off. Then it is safe to remove the brushless motor.
- When installing a brushless motor to a fixed base, make sure the fixed base is grounded in order to avoid the risk of an electric shock.

#### ⚠ CAUTION

- Do not drop or hit this brushless motor, as shock can damage to the internal components.
- Select suitable products or tools for all applications. Do not exceed the capabilities of the spindle or tools.
- Carefully direct coolant spray to the tool. Do not spray directly on the brushless motor body.
- Stop working immediately when abnormal rotation or unusual vibration are observed. Afterwards, please check the content of section 7 "TROUBLESHOOTING".
- After installation, repair, initial operation, or long periods of non operation, please carry out break -in as follow. Start rotating slowly and over a short period of time, increase speed gradually until allowable maximum speed.
- Do not disassemble, modify or attempt to repair this brushless motor. Additional damage will occur to the internal components. Service must be performed by NSK NAKANISHI or an authorized service center.
- When using this brushless motor for mass production, please purchase the another brushless motor as a spare in case of an emergency.

#### 2. FEATURES

- The Brushless Motor housing is made from precision ground, hardened, stainless steel (SUS) with an outside diameter of  $\phi 40$  mm.
- Excellent durability and high reliability are obtained by using a high-speed brushless motor, which eliminates the need for brush replacement and frequent maintenance.
- The maximum output is 1200W.
- A quick disconnect cord is available for easy brushless motor removal.
- Air-cooling system with a small volume of air ( $100 \ell / \text{min}$ ) is used to prevent heat buildup and allows long continuous operation.

#### 3. SPECIFICATIONS AND DIMENSIONS

##### 3 - 1 Specifications

Model	EM-4020	EM-4020A	EM-4040	EM-4040A
Maximum Rotation Speed	20,000min <sup>-1</sup>		40,000min <sup>-1</sup>	
Max. Output	1,200W			
Weight	1,300g	1,800g	1,300g	1,800g

Standard Accessories	
• Wrench (36mm) • • 1pc.	• Operation Manual • • 1set.

<Option>

Motor Cord	EMCD-4000- □ M (Power Line)	EMCD-4000S- □ M (Signal Line)
*Note1	Cord Length : 2m, 4m, 6m, 8m (The Air Hose ( $\phi 6$ mm) of the same length is attached.)	Cord Length : 2m, 4m, 6m, 8m (The Air Hose ( $\phi 6$ mm) of the same length is attached.)

\*Note1 : Motor Cord is sold separately. Please select the suitable motor cord length for your application.

#### ⚠ CAUTION

These Motor Cords <EMCD-4000-8M and EMCD-4000S-8M> are never to be used for Angle Type Brushless Motors <EM-4020A and EM-4040A>. 8 Meter Cords cannot be used on "A" Type (90-Degree) Motors.

##### 3 - 2 Outside View

① EM-4020 · EM-4040

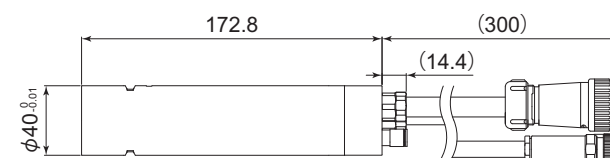


Fig. 1

② EM-4020A · EM-4040A

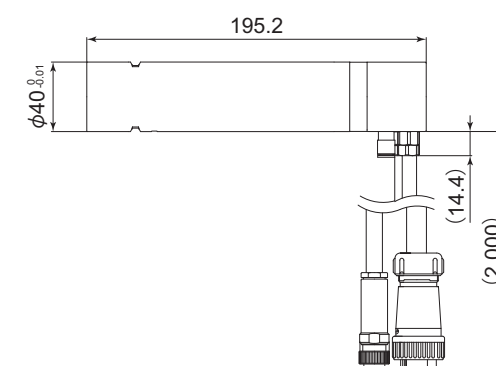


Fig. 2

##### 3 - 3 Torque Characteristics

① EM-4020 · EM-4020A

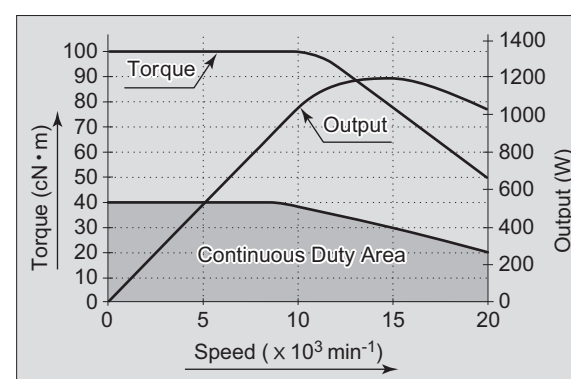


Fig. 3

② EM-4040 · EM-4040A

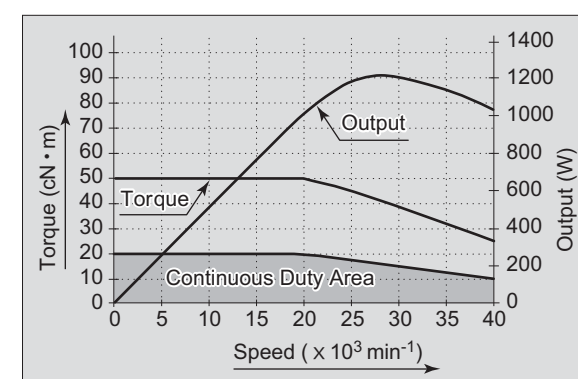


Fig. 4

#### 4. POSITION ADJUSTMENT OF THE MOTOR CORD EXIT HOUSING (BLUE AREA) ON THE EM-4020A and EM-4040A

The Motor Cord Exit Housing (Blue Area) of the EM-4020A and EM-4040A can be adjusted by rotating to a desired position.

##### CAUTION

**Motor Cord Exit Housing (Blue Area) cannot be rotated more than 360 degrees. If forcibly rotated, the mechanical stop inside the Exit Housing will break and cause the base of the cord to kink, leading to internal damage of the cord.**

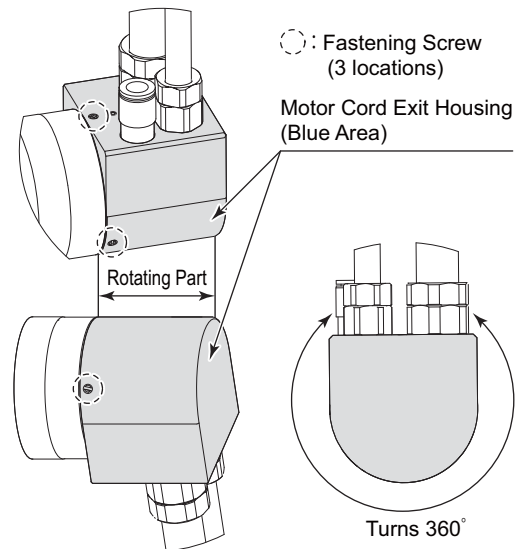


Fig. 5

- Loosen the Fastening Screw (3 locations) of the Motor Cord Exit Housing.
- Adjust the Motor Cord Exit Housing to the desired position.
- Re-tighten the Fastening Screws (3 locations) of the Motor Cord Exit Housing.

#### 5. CONNECTION OF MOTOR CORD

##### CAUTION

- Before connecting to the Motor Cord to the Motor and CONTROLLER, verify the Main Power Switch in the CONTROLLER is turned OFF. If the Main Power Switch on the CONTROLLER is ON while connecting the Motor Cord, damage to the CONTROLLER is possible.
- Install the protective cover (Protective Cover etc.) to prevent damage or contamination to the Motor Cord Plug when not in use.

- Remove the Protective Cover of the Motor Cord (Motor Power Line and Motor Signal Line).

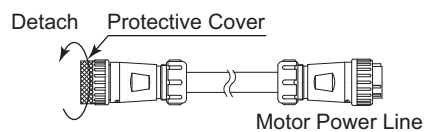


Fig. 6

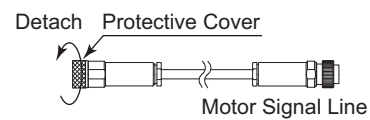


Fig. 7

- Carefully insert the Alignment Pin into the Alignment Hole and push straight into the Connector of the Motor Cord.

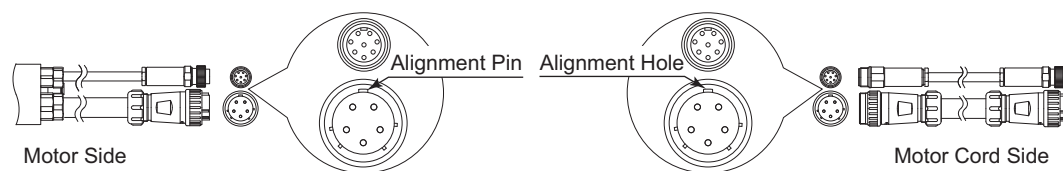


Fig. 8

- Tighten the Coupling Nut with clockwise.

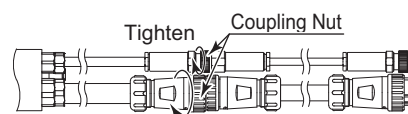


Fig. 9

- Insert the air hose of the Motor Cord Side to the air joint of the Motor Side.

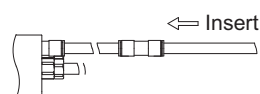


Fig. 10

#### 6. CONNECTION TO THE SPINDLE

##### CAUTION

**Make sure your hands and all interlocking parts of the spindle and motor are clean before connecting the motor to the spindle. This is critical in preventing contaminants from entering the motor or spindle.**

Align the threads on the front end of the motor and the rear end of the spindle, then rotate the spindle clockwise. If the drive shaft of the motor does not engage the drive dog on the spindle, it will not be possible for the spindle to rotate. DO NOT FORCE THIS CONNECTION. Turn the spindle back a few threads, rotate the collet cap or spindle shaft slightly by hand until the drive shaft and the drive dog are fully engaged. This may take several attempts. Use the 36mm wrench that have been provided for the final tightening of the spindle to the motor.

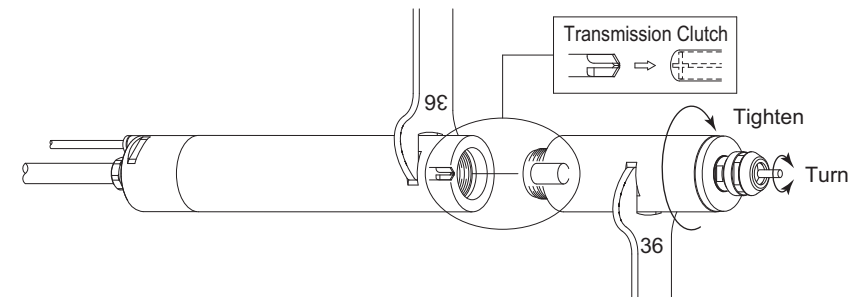


Fig. 11

#### 7. TROUBLESHOOTING

If a problem or concern occurs, please check the following prior to consulting your dealer.

Trouble	Cause	inspection / Corrective Action
Motor does not run.	Power is not supplied.	<ul style="list-style-type: none"> <li>Make sure to turn ON the Main Power Switch on the rear of the CONTROLLER.</li> <li>Connect the power cord correctly to the AC Power Input Terminal Block of the CONTROLLER.</li> </ul>
	Motor Cord Plug is not connected to the Motor and CONTROLLER.	Connect the Motor Cord plug correctly to the Motor and CONTROLLER.
	Control Button (CTRL) is set to Manual mode but trying to start with an External Command Signal through Input / Output Connector A.	Start with the Start / Stop Button (START / STOP), or set the Control Button (CTRL) on the Control Panel to Auto mode.
	Control Button (CTRL) is set to Auto mode but trying to manually start with the Start Button (START / STOP) on the Control Panel.	Start with an External Command Signal or set the Control Button on the Control Panel to Manual mode. (When Start with an External Command Signal, refer to "13 - 1 (1) Details of External Input / Output Connector A Signal Table 2 Pin No. 14" section of the E4000 CONTROLLER Operation Manual.)
	When using the E4000 Safety Relay Box, Emergency Stop Signal is OFF (Open).	Emergency Stop Signal is ON (Closed).
	An Error has occurred. (Error LED is lit.)	Check the "Resetting System after Error Codes" of the E4000 CONTROLLER Operation Manual. Error will not be released until cause of the error has been removed.
Low air pressure.	Adjust to the air pressure 0.2 – 0.35MPa.	
Can not increase or decrease the speed of the motor.	Motor Fixed Speed is set in P3 parameter. Turn this Parameter OFF to allow rotational speed changes	Release parameter P3. (Refer to "15 - 4 ③ P3 Setting Fixed Motor Speed" section of the E4000 CONTROLLER Operation Manual.)
Can not set the motor speed to its maximum	Either the required speed value is higher than the maximum rotation speed of the motor, or the upper limit of the rotational speed has been set in parameter P4.	Set the Maximum Rotation Speed to a value less than the Motor Rotation Speed set in Parameter P4.
Abnormal vibration or noise during rotation.	Cutting debris has contaminated the ball bearing.	Replace the ball bearings. (Return to NAKANISHI dealer service.)
	Low air pressure.	Adjust to the air pressure 0.2 – 0.35MPa.

Refer to the E4000 CONTROLLER Operation Manual.