

Brushless Motor

EM - 3060

OPERATION MANUAL

OM-K0482E 004

Thank you for purchasing the Brushless Motor "EM-3060". This Brushless Motor which can be connected with 60,000min⁻¹ (rpm) spindle. The E3000 CONTROLLER, Spindle, Motor Cord and Air Line Kit are required to drive this Brushless Motor. Read this and all the associated component Operation Manuals carefully before use. 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
⚠ WARNING	A safety hazard could result in bodily injury or damage to the device if the safety instructions are not properly followed.
⚠ CAUTION	A hazard that could result in light or moderate bodily injury or damage to the device if the safety instructions are not followed.

⚠ WARNING

- ① This Brushless Motor is not a hand tool. It is designed to be used on CNC machines or special purpose machines.
- ② Do not touch the cutting tool while it is running. It is very dangerous.
- ③ Wear safety glasses, dust mask, and use a protective cover around the Brushless Motor whenever the Brushless Motor is rotating.
- ④ Never connect, disconnect or touch the Power Cord Plug or Motor Cord Plug with wet hands. This may cause an electric shock.
- ⑤ Never operate or handle the Brushless Motor and spindle until you have thoroughly read the Operation Manuals and safe operation has been confirmed.
 - 1) To prevent injuries / damages, check the Brushless Motor, spindle and cutting tool for proper installation, before operating the Brushless Motor and spindle.
 - 2) Before disconnecting the Brushless Motor and spindle, 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 and spindle.
- ⑥ 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

- ① Do not drop or hit this Brushless Motor, as shock can damage to the internal components.
- ② Select suitable products or tools for all applications. Do not exceed the capabilities of the Brushless Motor or tools.
- ③ Do not stop the supply cooling air for Brushless Motor during operation of the machine. Removing the air pressure from the Brushless Motor causes a loss of purging, allowing the Brushless Motor to ingest coolant. This will cause damage to the Brushless Motor.
- ④ Carefully direct coolant spray to the tool. Do not spray directly on the Brushless Motor body. If large amount spray directly on the Brushless Motor, it may cause excess load of the Brushless Motor rotation with loss of durability to the Brushless Motor.
- ⑤ Stop working immediately when abnormal rotation or unusual vibration are observed. Immediately, please check the content of section " 11. TROUBLESHOOTING ".
- ⑥ Always check if the connection hose and supply air hose for damaged before and after operating.
- ⑦ 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 15 - 20 minutes, increase speed gradually until allowable maximum speed.
- ⑧ 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.
- ⑨ When using this Brushless Motor for mass production, please consider the purchase of an additional Brushless Motor to be used as a back-up in case of emergency.
- ⑩ Securely connect the compressor supply connection hose to the Air Line Kit, and connect the air hose to the Air Line Kit, CONTROLLER and the Brushless Motor to avoid accidental disconnection during use.

2. BASIC PACKAGE

When opening the package, check if it includes all items listed in " Table. 1 Packing List Contents ". In the event of any shortage, please contact either NAKANISHI (see the " 4. CONTACT US " section) or your local dealer.

Table. 1 Packing List Contents

EM - 3060 • • 1pc.	Wrench (22 x 27) • • 1pc.	Operation Manual • • 1set

3. WARRANTY

We provide a limited warranty for our products. We will repair or replace the products if the cause of failure is due to the following manufactures defects. Please contact us or your local distributor for details.

- ① Defect in manufacturing.
- ② Any shortage of components in the package.
- ③ Where damaged components are found when initially opening the package.
(This shall not apply if the damage was caused by the negligence of a customer.)

4. CONTACT US

For your safety and convenience when purchasing our products, we welcome your questions. If you have any questions about operation, maintenance and repair of the product, please contact us.

Contact Us

● For U.S. Market

Company Name	: NSK America Corp. Industrial Div.
Business Hours	: 8:00 to 17:00 (CST) (closed Saturday, Sunday and Public Holidays)
U.S. Toll Free No.	: +1 800 585 4675
Telephone No.	: +1 847 843 7664
Fax No.	: +1 847 843 7622
Website	: www.nskamericacorp.com

● For Other Markets

Company Name	: NAKANISHI INC.
Business Hours	: 8:00 to 17:00 (JST) (closed Saturday, Sunday and Public Holidays)
Telephone No.	: +81 289 64 3520
e-mail	: webmaster-ie@nsk-nakanishi.co.jp

5. FEATURES

- ① The Brushless Motor housing is made from precision ground, hardened, stainless steel (SUS) with an outside diameter of $\phi 30$ mm.
- ② Excellent durability and high reliability are obtained by using a high-speed Brushless Motor, which eliminates the need for brush replacement and frequent maintenance.
- ③ The maximum output is 350W.
- ④ Air-cooling system with a small volume of air (30 ℓ / min) is used to prevent heat buildup and allows long continuous operation.

6. SPECIFICATIONS AND DIMENSIONS

6 - 1 Specifications

Model	EM-3060
Motor Rotation Speed	1,000 - 60,000min ⁻¹ (rpm)
Max. Output	350W
Weight	325g (without Motor Cord)
Noise Level at 1m distance	Less than 70dB (A)

	Temperature	Humidity	Atmospheric Pressure
Operation Environment	0 - 40°C	MAX.75% (No condensation)	800 - 1,060hPa
Transportation and Storage Environment	-10 - 50°C	10 - 85%	500 - 1,060hPa

<Option>

Motor Cord : <S Type> Straight	EMCD-3000-4M (4m) / 6M (6m) / 8M (8m) (The Air Hose ($\phi 4$ mm) of the same length is attached.)
: <A Type> Angle	EMCD-3000A-4M (4m) / 6M (6m) / 8M (8m) (The Air Hose ($\phi 4$ mm) of the same length is attached.)

*Note 1 : Motor Cord is sold separately.

Please select the suitable motor cord length for your application.

6 - 2 Outside View

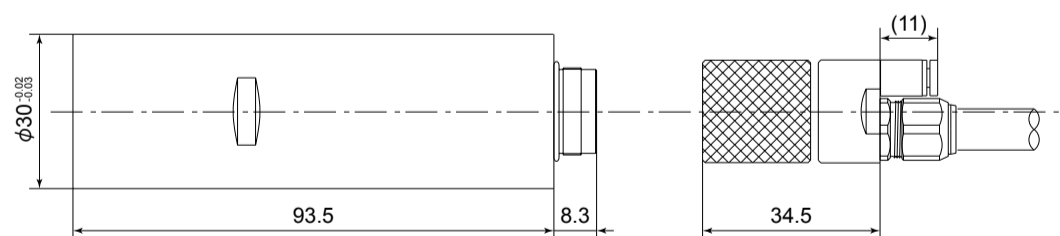


Fig. 1

6 - 3 Torque Characteristics

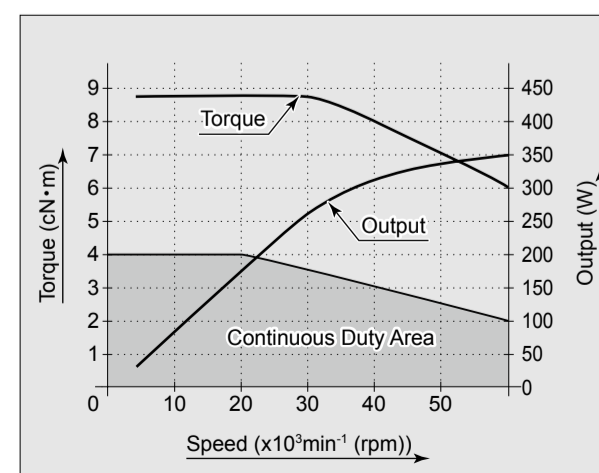


Fig. 2

7. CONNECTION OF MOTOR CORD

⚠ CAUTION

- Before connecting the Motor Cord to the Brushless Motor and CONTROLLER, verify the Main Power Switch on 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 Cap etc. to prevent damage or contamination to the Motor Cord Connector when not in use.

- ① Remove the Protective Cap of the Motor Cord.
- ② Carefully insert the Alignment Pin into the Alignment Hole and push straight into the Connector of the Motor Cord.

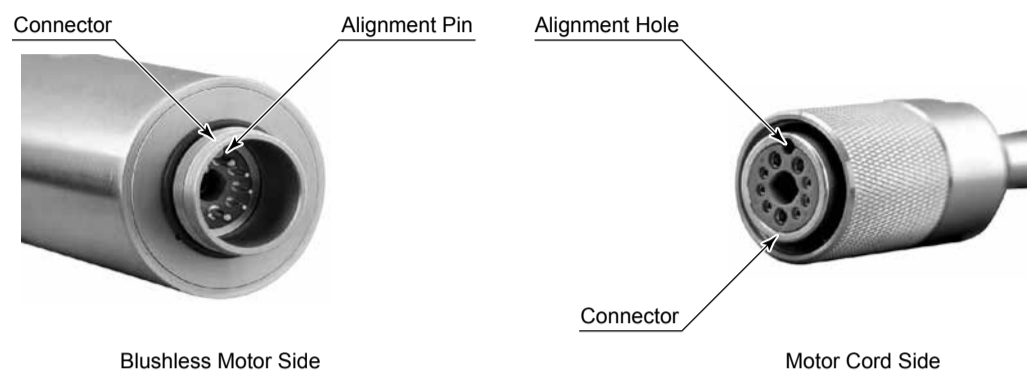


Fig. 3

- ③ Tighten the Connector Nut with clockwise.

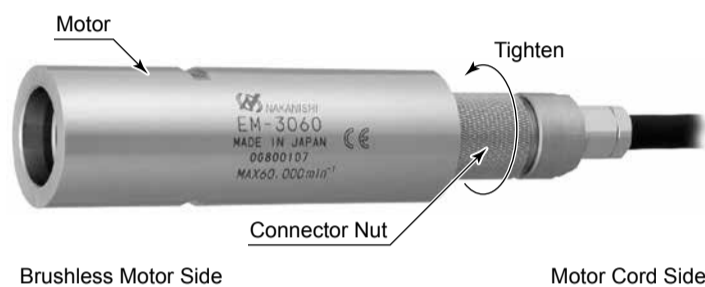


Fig. 4

8. CONNECTION OF MOTOR CORD PLUG

⚠ CAUTION

Before connecting the Motor Cord to the Brushless Motor and CONTROLLER, verify the Main Power Switch on 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.

- ① Ensure the Alignment Pin of the Motor Cord Plug is located (12 o'clock) upward. Carefully insert the Alignment Pin of Motor Cord Plug into the Alignment Hole on the front of the CONTROLLER and push straight.
- ② Tighten the Connector Nut with clockwise.

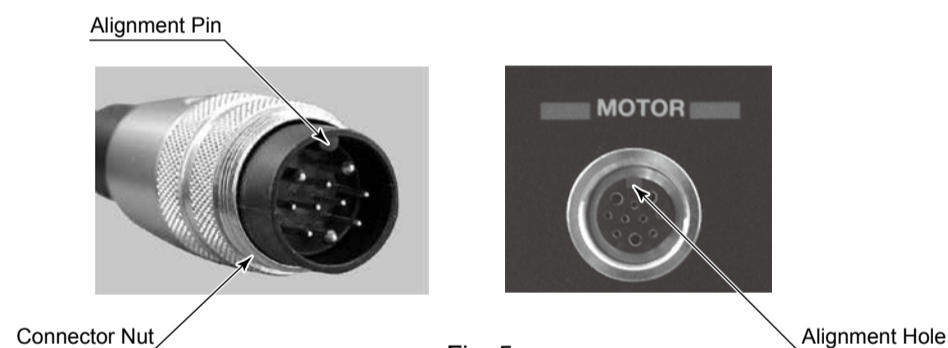


Fig. 5

9. CONNECTION OF AIR HOSE

⚠ CAUTION

When not using the NAKANISHI's Air Line Kit, make sure that the incoming air supply is dry, clean and properly regulated.

- ① Insert the $\phi 6\text{mm}$ Air Hose with Filter (controller accessory) connected to the Air Line Kit (AL-C1204) sold separately into the Air Input Joint on the front of the CONTROLLER.
- ② Connect $\phi 4\text{mm}$ and $\phi 3.2\text{mm}$ Air Hoses using a $\phi 4.0\text{mm} - \phi 3.2\text{mm}$ Joint. Insert the $\phi 3.2\text{mm}$ Air Hose into the Air Joint at the rear of the Brushless Motor.
- ③ Insert the $\phi 4\text{mm}$ Air Hose into the Air Output Joint on the front of the CONTROLLER. At this time, use a Reducer ($\phi 6\text{mm} - \phi 4\text{mm}$ Conversion Adapter: controller accessory).
- ④ Regulate air pressure between 0.25 - 0.3MPa (36.3 - 43.5psi).

■ $\phi 4\text{mm}$ Air Hose (for motor cooling), $\phi 3.2\text{mm}$ Air Hose (for motor cooling) and $\phi 4.0\text{mm} - \phi 3.2\text{mm}$ Joint are accessories for Motor Cord.

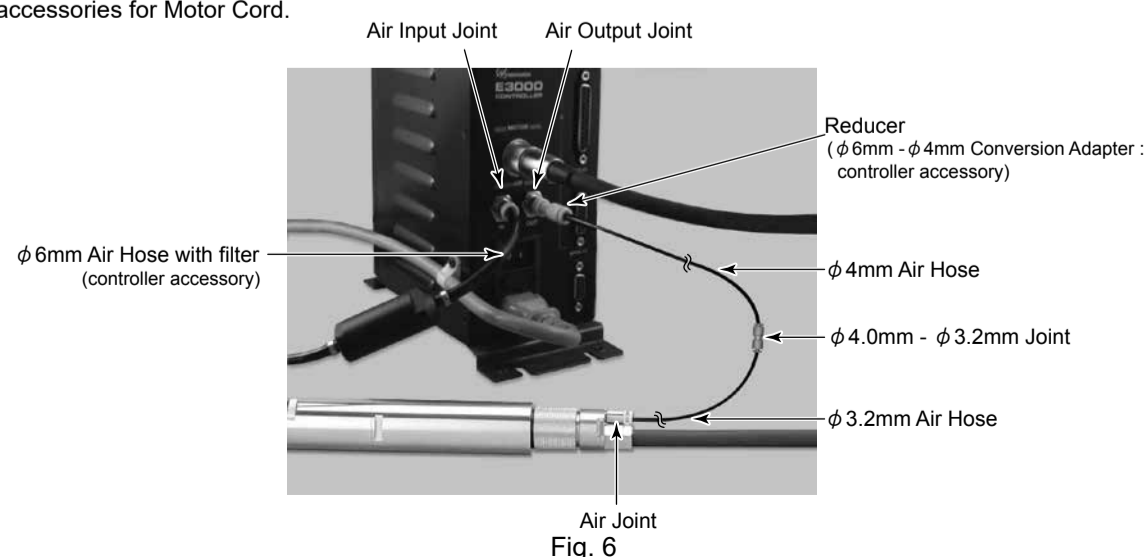


Fig. 6

10. CONNECTION OF THE MOTOR TO THE SPINDLE

⚠ CAUTION

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

Align the thread on the front end of the Brushless Motor and the rear of the spindle, and turn the spindle clockwise. If the drive shaft of the Brushless Motor does not engage properly to the drive dog on the spindle, it may only turn approximately two threads before stopping. DO NOT FORCE THEM TOGETHER. Loosen the spindle from the Brushless Motor, rotate the spindle shaft by hand then re-try. The drive shaft and the drive dog must be fully engaged. When fully engaged, secure the Brushless Motor and spindle using the provided 27mm wrench (Fig. 8).

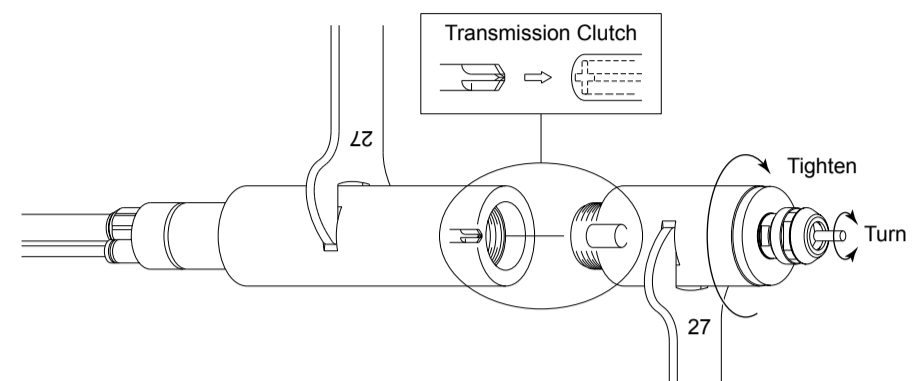


Fig. 7

11. TROUBLESHOOTING

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

Trouble	Cause	Inspection / Corrective Action
Motor does not rotate.	Power is not supplied.	<ul style="list-style-type: none"> • Make sure to turn ON the Main Power Switch on the front of the CONTROLLER. • Insert the power cord plug correctly into the Main Power Inlet with Power Supply Fuses of the CONTROLLER. • Check if a fuse is blown.
	Motor Cord Plug is not connected to the Motor, CONTROLLER or SELECTOR.	Connect the Motor Cord plug correctly to the Motor and CONTROLLER or SELECTOR.
	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 (CTRL) on the Control Panel to Manual mode.
	Emergency Stop Signal on External Input / Output Connector B is OFF (Open).	Set Emergency Stop Signal to be "ON" (close).
	An Error has occurred (Error LED is lit).	Check and correct the source of the Error Code.
	Low air pressure.	Adjust to the air pressure 0.25 - 0.3MPa (36.3 - 43.5psi).
Can not set the increase or decrease of the Motor Rotation Speed.	Motor Fixed Speed is set in $P3$ parameter.	Release parameter $P3$.
Can not set the motor speed to its maximum allowable speed.	Either the required speed value is higher than the maximum rotation speed of the Brushless 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 $P4$.
	Air Input Monitoring Override is set in the $P7$ Parameter to On and the Brushless Motor's maximum speed has been limited to 30,000 min^{-1} (rpm).	Check the setting of parameter $P7$.
A blinking dot appears on Digital Speed Indicator. Cannot set the desired rotation speed.	Gear Ratio is set to a value other than "1.0".	Check the setting of Gear Ratio.
Overheating during rotation.	Cutting debris has contaminated the ball bearings, and the ball bearings are damaged.	Replace the ball bearings. (Return to NAKANISHI dealer service.)
	Low air pressure.	Check air hose connection and air pressure.

Refer to the E3000 CONTROLLER Operation Manual.

12. DISPOSAL OF THE BRUSHLESS MOTOR

When disposal of a Brushless Motor is necessary, follow the instructions from your local government agency for proper disposal of industrial components.

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IL 60192, USA
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Elly-Beinhorn-Strasse 8
65760 Eschborn
Germany

NSK United Kingdom Ltd.
UK Authorised Representative
Office 4, Gateway 1000
Arlington Business Park, Whittle Way
Stevenage, SG1 2FP, UK