

8. REPLACING THE COLLET

⚠ CAUTION

When installing the collet into the collet nut, be sure to fully engage the latch inside the collet nut to the groove on the collet's outer diameter area. In addition, remember that if the collet is attached without being engaged with the latch of the collet nut, the collet cannot be removed and this may cause damage to the collet or the spindle.

- Remove the tool according to the section "7. CHANGING THE TOOL", procedure above and remove collet nut assembly (Fig. 7).
- The collet and collet nut are secured by a groove in the collet and a flange in the collet nut. To remove the collet, turn the collet nut clockwise and pull the collet out of the collet nut. The collet must be released (Fig. 8).
- To install the collet, hold the collet slightly and insert it into the collet nut. Press the collet into the collet nut by positioning the collet in the collet nut and pressing down on flat surface (Fig. 8). Be sure to fully engage the latch inside the collet nut into the groove on the collet's outer circumference area (Fig. 10).

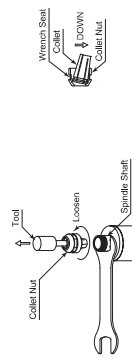


Fig. 7

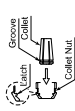


Fig. 8

Fig. 9

9. 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 Cap etc. to prevent damage or contamination to the Motor Cord Plug when not in use.

- Remove the Protective Cover of the Motor Cord Plug and keep it for use when not using the Motor / Spindle to keep the connector pins safe and clean.



Fig. 11

- Ensure the Alignment Pin of the Motor Cord Connector is located (12 o'clock) upward. Carefully, insert the Alignment Pin of Motor Cord Plug into the Alignment Hole on the front(rear) of the CONTROLLER and push straight.



Fig. 12

- Tighten the Connector Nut of the Motor Cord in a clockwise direction.

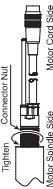


Fig. 13

10. INSTALLATION OF THE MOTOR SPINDLE

⚠ WARNING

When installing a Motor Spindle to a fixed base, make sure the fixed base is grounded in order to avoid the risk of an electric shock.

⚠ CAUTION

- When installing a Motor Spindle, do not hit, drop or cause shock to the Motor Spindle. This may cause damage to internal components and result in malfunctions.
- When mounting the Motor Spindle, be sure to secure within Clamping Area etched on the Motor Spindle O.D. If the Motor Spindle is installed incorrectly, damage to the internal components is possible.
- Caution when tightening the securing bolts on a Split Type Holder. Do not over-tighten the bolt. This will cause damage to Motor Spindle's section. Tighten the bolt until the Motor Spindle body can not be rotated by hand within the fixture. Extreme tightening is not necessary or recommended. Apply working force and check that the Motor Spindle is tight before using.

- When mounting a Motor Spindle, refer to the Clamping Area etched on the Motor Spindle (Fig. 14).

Table 2

Model	D1	D2
EM20 - S6000	18	34
EM25 - S6000	22	30
EM30 - S6000	20	35

Fig. 14

- * When installing a EM30 - S6000, using "Grip Ring GR-30 (sold separately)" (Fig. 15) is recommended. If the Grip Ring GR-30 (sold separately) cannot be used due to the size of the Motor Spindle, install the EM25 - S6000 or EM20 - S6000. Install as shown in ② below.

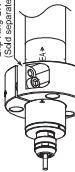


Fig. 15

- When installing a Motor Spindle to the holder, recommended installation method is shown Fig. 16. Refer to "③ How to fabricate the Split Type Holder". If this is not possible, install as shown in Fig. 17.

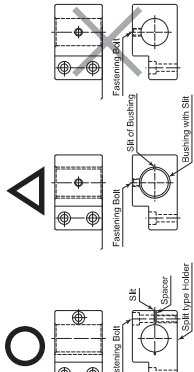


Fig. 16

Fig. 17

⚠ CAUTION

Do not allow set screws to come directly in contact with the Motor Spindle body as shown in Fig. 18, as this will result in damage to the Motor Spindle housing and internal components. When installing, never clamp directly over the bearings, as this will result in bearing damage (Refer to Fig. 19).

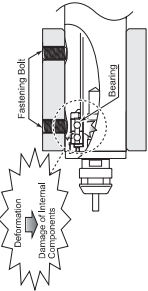


Fig. 19

- How to fabricate the Split Type Holder.
 - Rough bore the inside diameter of the Split Type Holder.
 - Call, (Ex. Split 2mm) wide.
 - Tighten the Set Screw for Removal and Remove the Split Area.
 - Remove the Set Screw for Removal and Remove the Split Area.
 - Loosen the Screw for Removal, and lighten the fastening bolt with its specified torque.
 - Finish the Split Type Holder so that the inside diameter of the Split Type Holder is Motor Spindle's outside diameter (Refer to Table 3). The correct tolerance range for the holder is -0.01mm to -0.015mm and a roundness and cylindricity of less than $5\mu\text{m}$.

Table 3

Model	EM20 - S6000	EM25 - S6000	EM30 - S6000
Motor Spindle's outside diameter	$\phi 20$	$\phi 25$	$\phi 30$

- When inserting the Motor Spindle, loosen the Fastening Bolt, and lighten the Screw for Removal, widening the Split Area.

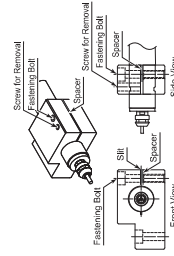


Fig. 20

⚠ CAUTION

- How to confirm the correct tightening or clamping of the Motor Spindle in the holder. Measure the current value of the CONTROLLER's power cord by the clamp meter. When the Motor Spindle is correctly installed, the current value is approximately 20mA at the maximum rotation speed with the Motor Spindle fastened at 20mA (for Type 200V) / 14mA (for Type 200V / 230V) or less, compared to the no-load current value (during rotation at the maximum rotation speed) without fastening the Motor Spindle. Do not over-tighten the Fastening Bolt. It may damage Motor Spindle's precision and shorten the life of the bearings.
- The final responsibility for ensuring holder's safety for use in a given application is left to the designer of the equipment in which NAKANISHI's Motor Spindle is installed. Please refer to the specifications of the equipment and the specifications of the Motor Spindle. Please carefully check the Motor Spindle's specifications against the requirements of your equipment and verify suitability and safety of the Holder prior to initial use.

11. BREAK-IN PROCEDURE

During transportation, storage or installation, the grease inside the bearings will settle. If the Motor Spindle is suddenly run at high-speed, the grease will be ejected from the bearings, causing excessive heat that will cause bearing damage. To repair, initial operation, or long periods of non operation, please follow the break-in procedure detailed in Table 4.

Table 4

Spindle Speed (min./rpm)	1	2	3	4	5
Rotation Time (min)	15	30,000	40,000	50,000	60,000
Items to Check	No Abnormal Noises	10	10	10	10
	The Motor Spindle housing temperature during the break-in process should not exceed 20 degrees C (36 degrees F) above ambient temperature. Should temperature rise above 20 degrees C (36 degrees F) above ambient temperature, stop the break-in process for at least 20 minutes and re-start the break in procedure from the beginning. If the housing temperature rises again and exceeds 20 degrees C (36 degrees F) above ambient temperature, check the spindle and motor for proper installation.				The Motor Spindle housing temperature during the break-in process should not exceed 20 degrees C (36 degrees F) above ambient temperature. Should temperature rise above 20 degrees C (36 degrees F) above ambient temperature, stop the break-in process for at least 20 minutes and re-start the break in procedure from the beginning. If the housing temperature rises again and exceeds 20 degrees C (36 degrees F) above ambient temperature, check the spindle and motor for proper installation.

12. CAUTIONS WHEN USING GRINDSTONES AND TOOLS

⚠ CAUTION

The maximum surface speed or rpm is always specified for a grindstone. Do not exceed the maximum speed with reference to the calculating chart below. Always follow the grindstone manufacturer's recommendations.

$$\text{Surface Speed (m/s)} = \frac{3.14 \times \text{Diameter (mm)} \times \text{Rotation Speed (min}^{-1}\text{) (rpm)}}{1,000 \times 60}$$

- The proper surface speed for general grindstones is 10 - 30m / s.
- Do not exceed 13mm of overhang for mounted grindstones as shown in Fig. 21. If the overhang must exceed 13mm, reduce the motor speed in accordance with Table 5.
- Dress the grinding tool to be used.
- Do not use cutting tools with bent or broken shanks, cracks or excessive run-out.
- For grinding, maximum depth of cut should not exceed 0.01mm radially or axially. Reciprocate the tool along the workpiece and use a light feed.
- Always operate cutting tools within the allowable recommended speed of the cutting tools. Use of a cutting tool outside of the allowable speed of the cutting tools could cause damage to the spindle and injury to the operator.
- Keep the cutting tool sharp and clean. If contaminants are left in the collet or collet nut, excessive run-out will cause damage to the cutting tool and or spindle.
- Please set the cutting tools to minimize the overhang amount. 13mm is the maximum amount of overhang to maintain high accuracy and safety.

Table 5 Overhang and Speed

Overhang (mm)	Max. Speed (min ⁻¹) (rpm)
0	N x 0.5
20	N x 0.3
50	N x 0.1

* N = Max. Operating Speed with 13mm overhang.



Fig. 21

13. TROUBLESHOOTING

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

Trouble	Cause	Inspection / Corrective Action
Motor Spindle does not rotate or rotate smoothly.	The Motor Spindle ball bearings have been damaged. The motor has been damaged.	Replace the ball bearings. (Return to NAKANISHI dealer service.) Replace the motor. (Return to NAKANISHI dealer service.)
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.)
Abnormal vibration or noises during rotation.	The air pressure is too low. Cutting debris has contaminated the ball bearing.	Check air hose connection and air pressure. Replace the tool. (Return to NAKANISHI dealer service.)
Tool slippage.	The Motor Spindle ball bearings have been damaged. Collet or collet nut are not correctly installed and are loose. The collet and the collet nut are worn.	Check and clean the collet and collet nut. Replace the collet and collet nut. Replace the collet and collet nut.
High run-out.	The tool is bent. Collet nut is not correctly installed. The collet and the collet nut are worn.	Change the tool. Secure the collet and the collet nut correctly. Replace the collet and the collet nut.
	Residue of the spindle is worn.	Replace the spindle shaft. (Return to NAKANISHI dealer service.)
	Contaminants inside the collet and the collet nut or the spindle.	Clean the collet, collet nut and the inside of the upper and spindle.
	The Motor Spindle ball bearings have been damaged.	Replace the ball bearings. (Return to NAKANISHI dealer service.)

Refer to the E3000 CONTROLLER Operation Manual.

14. DISPOSAL OF THE MOTOR SPINDLE

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