

7. CHANGING THE TOOL

⚠ CAUTION

Do not tighten the collet chuck without inserting a tool or dummy bar, as this will damage the collet chuck, spindle or chuck nut, causing difficulty removing the collet chuck.

RECOMMENDATION

Please set the cutting tools to minimize the overhang amount. 13mm is the maximum amount of overhang to maintain high accuracy and safety.

- ① Set the provided 12mm wrench on the spindle.
- ② Loosen the spindle nut and the chuck nut. Turn the back of the chuck nut counter-clockwise to loosen the collet chuck and remove the tool. (The first turn will loosen the chuck nut, but the tool will not release until the spindle nut is fully loosened.)
- ③ Clean the collet chuck and chuck nut, then insert the tool or dummy bar into the collet chuck by turning clockwise. Do not overtighten.

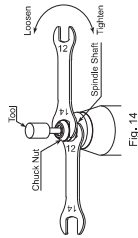


Fig. 14

8. REPLACING THE COLLET CHUCK

⚠ CAUTION

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

- ① Remove the tool according to the section 7. Then, remove the spindle nut and the chuck nut above and remove chuck nut assembly.
- ② The collet chuck and chuck nut are secured by a groove in the collet chuck and a flange in the chuck nut. To remove the collet chuck hold the chuck nut in one hand and turn the collet chuck counter-clockwise. The collet chuck should be released (Fig. 16).
- ③ To install the collet chuck, hold the collet chuck at a slight angle, hold the collet chuck nut (Fig. 17). The chuck nut by positioning the collet chuck in the chuck nut and pressing down on flat surface. (Fig. 16).

Be sure to fully engage the latch inside the chuck nut into the groove on the collet chuck's outer circumference area (Fig. 16).

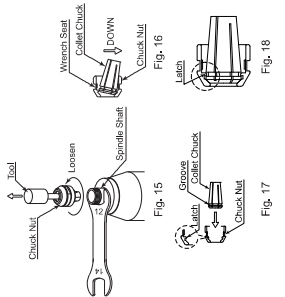


Fig. 15

Fig. 16

Fig. 17

Fig. 18

9. INSTALLATION INTO THE MACHINE

⚠ DANGER

Do not rotate the machining center's main spindle of the HES Brushless Motor Spindle. Rotating the HES Brushless Motor Spindle with the HES Brushless Motor Spindle installed can cause the motor cord to become tangled and pull the control unit off it is mounting. This may cause lead to a big accident.

⚠ WARNING

Whenever installing a Brushless Motor Spindle to a machine, be sure to connect the main spindle to ground in order to avoid risk of an electric shock.

- ① Insert and Clamp the HES Brushless Motor Spindle to the main spindle of the machining center.
- ② Remove the Electric Connector Cap from the HES Brushless Motor Spindles by turning counterclockwise (Fig. 19).
- ③ Remove the Air Cap from the HES Brushless Motor Spindle's Air Joint (Fig. 19).
- ④ Install the 6-4mm air hose on the HES Brushless Motor Spindle's Air Joint (Fig. 20).
- ⑤ Detach the plug cap for motor cord and install the motor cord to the HES Brushless Motor Spindle's plug. Please connect the motor cord to the motor cord connector clockwise to tighten (Fig. 20, 21).
- ⑥ Future the Emergency Connector in the machine. Route the motor cord and air hose and hold them securely with enough slack to allow for quill travel. The Emergency Connector should be positioned so that the air hose can pass freely through the air hose. If the motor cord and air hose are not held properly, the emergency connectors may not separate properly in an emergency (Fig. 22).

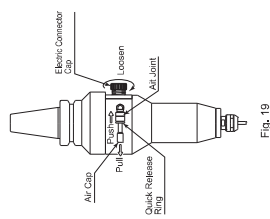


Fig. 19

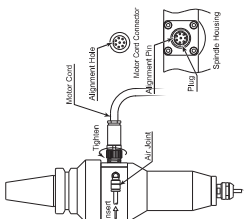


Fig. 20

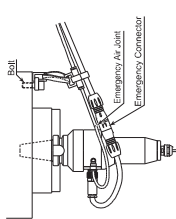


Fig. 22

⚠ CAUTION

When not using the HES Brushless Motor Spindle, please replace the Electric Connector Cap and air cap to protect the connectors from contaminants and prevent the motor cord from being damaged. Also, reset the plug cap for motor cord to motor cord.

- Check that the Motor Cord Connector, Air Hose and Emergency Connector have been tightened properly before operation.
- DO NOT separate the emergency connector.
- It is necessary to quickly disconnect connector.
- System: If the machine's main spindle is rotated by mistake, the Emergency Connector on the Emergency Connector is too loose the Emergency Connector can slip out of position during high speed rotation and cause the Emergency System to malfunction.
- Please check the integrity of the Emergency Connector and suspension prior to use.

12. BREAK-IN PROCEDURE

During transportation, storage or installation, the grease inside the bearings will settle. If the spindle is suddenly rotated, the bearings will be damaged. Please follow the break-in procedure after installation, repair, initial operation, or long periods of non operation, please follow the break-in procedure detailed in Table 2.

Steps	1	2	3	4	5
Rotation Speed (min⁻¹) (rpm)	12,000	24,000	32,000	40,000	50,000
Rotation Time (min)	15	10	10	10	10
Items to Check	No Abnormal Noises. The spindle housing temperature during the break-in process should not exceed 20 degrees C (36 degrees F) above ambient temperature. If the temperature rises, stop the spindle and wait until it cools down. If the spindle is still hot, repeat the break-in process. 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.				

Table 2.

13. TROUBLESHOOTING

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

< CONTROLLER or Motor >

Trouble	Cause	Inspection / Corrective Action
Motor does not run.	Power is not supplied.	• Make sure to turn ON the Main Power Switch on the front (rear) of the CONTROLLER. • Insert the power cord plug correctly into the CONTROLLER. • Check if a fuse is blown.
Can not set the increase or decrease of the Motor Rotation Speed.	Motor Cord Plug is not connected to the Motor CONTROLLER. Manual mode but trying to start with an External Command Signal through Input / Output Connector A.	Connect the Motor Cord plug correctly to the Motor CONTROLLER. Start with the Start / Stop Button (START/STOP) on the Control Panel to Auto mode.
Can not set the required speed value is set in the parameter.	Emergency Stop Signal on External Input / Output Connector B is OFF (Open).	Start with an External Command Signal or set the Control Button on the Control Panel to Manual mode.
Can not set the required speed value is set in the parameter.	An Error has occurred. (Error LED is lit).	Check the setting of parameter [P3]. Adjust to the air pressure 0.25 ~ 0.3MPa.
Can not set the required speed value is set in the parameter.	Motor Fixed Speed is set in [P3].	Check the setting of parameter [P3].
Can not set the required speed value is set in the parameter.	Either the required speed value is set in the parameter or the speed of the motor or the upper limit of the rotational speed has been set in parameter [P3].	Set the Maximum Rotation Speed to a value less than the Motor Rotation Speed set in parameter [P3].
A blinking dot appears on Digital Speed Indicator. Cannot set the motor rotation speed.	Motor Input Monitoring Override is set in the [P3] parameter ON and the motor's maximum speed has been limited to 30,000 min⁻¹ (rpm). Gear Ratio is set to a value other than "1.0".	Check the setting of parameter [P3]. Check the setting of Gear Ratio.

Refer to the E3000 CONTROLLER Operation Manual.

Trouble	Cause	Inspection / Corrective Action
Spindle does not rotate or rotate smoothly.	The spindles 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 noise during rotation.	The tool Shank is bent. Cutting debris has contaminated the ball bearings.	Replace the tool. (Return to NAKANISHI dealer service.)
Tool slippage.	The spindles ball bearings have been damaged. Collet chuck or chuck nut are not correctly installed. The collet chuck and the chuck nut are bent.	Check and clean the collet chuck and chuck nut. Replace the collet chuck and chuck nut. Change the tool.
High run-out.	Chuck nut is not correctly installed. The collet chuck and the chuck nut are worn. Inside of the spindle is worn. Contaminants inside the collet chuck and the chuck nut or the spindle. The spindle ball bearings has been damaged.	Secure the collet chuck and the chuck nut correctly. Replace the collet chuck and the chuck nut. Replace the spindle shaft. (Return to NAKANISHI dealer service.) Clean the collet chuck, chuck nut and the inside of the taper and spindle. Replace the ball bearings. (Return to NAKANISHI dealer service.)

14. DISPOSAL OF THE BRUSHLESS MOTOR SPINDLE

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

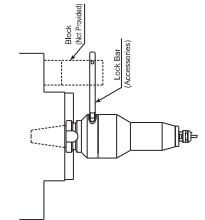


Fig. 23

⚠ CAUTION

The lock bar is not intended to stop the main spindle from rotating; it is only intended to be used as a precautionary measure. If it is not needed, it does not need to be installed.

10. CONNECTING TO THE CONTROLLER

- ① Connect the Motor Cord and Air Hose as shown in Fig. 24.
- ② An Air Line Kit such as NAKANISHI'S (AL-C1204) must be used. The CONTROLLER and the HES Brushless Motor Spindle must be supplied with clean, dry air regulated to between 0.25MPa ~ 0.3MPa. Connect the output of the air line to the Air Inlet of the CONTROLLER. The air line must be connected to the CONTROLLER and the HES Brushless Motor Spindle.
Water contamination in the air will cause damage to the Brushless motor and spindle.
* For details of the operation and connections of the CONTROLLER and Air Line Kit please refer to their respective Operation Manuals.
- ③ Do not attempt to start the HES Brushless Motor Spindle until you have completed and double-checked all the connections. Please refer to the HES Brushless Motor Spindle Operation Manual. Absolutely DO NOT ROTATE the MACHINE'S MAIN SPINDLE after installing the HES Brushless Motor Spindle.

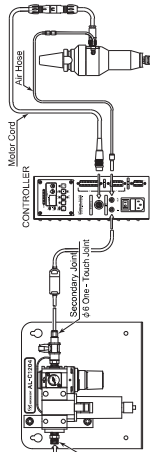


Fig. 24

11. THE HES BRUSHLESS MOTOR SPINDLE CENTERING ALIGNMENT

⚠ CAUTION

It is important to align the HES centerline to the machining center's centerline prior to using the HES Brushless Motor Spindle. The HES Brushless Motor Spindle and taper housing are precision machined to the exacting tolerances of the applicable standard for each taper. However, since no manufacturing tolerances exist, it is necessary to manually achieve perfect centering alignment just by hand loading the spindle. Please follow the steps below to ensure proper centerline alignment.

- ① To find the main spindle's center, mount the Main Spindle on the machine's main spindle and machine the pattern described below and measure the center. Or use a 1/4" collet chuck (Option) and mount an edgefinder in the collet chuck to determine the true centerline of the HES Brushless Motor Spindle.

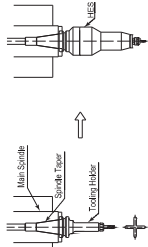


Fig. 25

Mill an X-Y cross pattern in the spindle in the quill and mill the same cross pattern with a smaller diameter tool inside the previously milled cross pattern. The difference in the X-Y intersections.

Fig. 26

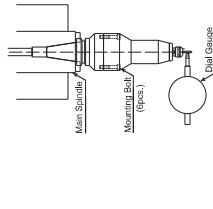


Fig. 27

- ② To adjust the HES centerline, mount the HES Brushless Motor Spindle in the machining center's quill and use a dial gauge on a test pin. Loosen the six bolts that hold the taper housing together. Slightly and tap out the X-Y eccentricity. Tighten the six bolts. The difference between the Main Spindle and the Main Spindle vary considerably. (Fig. 27)