

EsPERT 500

OPERATION MANUAL

OM-K0331E 002

Thank you for purchasing EsPERT 500. This is a high-precision, extremely high speed micromotor rotary hand tool system. This system is designed for high-precision, small diameter deburring, grinding and a wide variety of other applications. Keep this Operation Manual near EsPERT 500 system for any operators to refer to whenever operating this system. Please read this Operation Manual carefully prior to use.

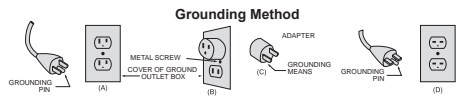
1. Cautions for handling and operation

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

| Class | Degree of Risk |
|----------------|--|
| WARNING | A hazard that could result in bodily injury or damage to the device if the safety instructions are not 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. |
| NOTICE | General information needed to operate the device safely. |

A. GROUNDING INSTRUCTIONS

- In the event of a malfunction or breakdown, grounding provides a path of least resistance for electric current to reduce the risk of electric shock. This tool is equipped with an electric cord having an equipment-grounding conductor and a grounding plug. The plug must be plugged into a matching outlet that is properly installed and grounded in accordance with all local codes and ordinances.
- Do not modify the plug provided - if it will not fit the outlet, have the proper outlet installed by a qualified electrician.
- Improper connection of the equipment-grounding conductor can result in a risk of electric shock. The conductor with insulation having an outer surface that is green with or without yellow stripes is the equipment-grounding conductor. If repair or replacement of the electric cord or plug is necessary, do not connect the equipment-grounding conductor to a live terminal.
- Check with a qualified electrician or service personnel if the grounding instructions are not completely understood, or if in doubt as to whether the tool is properly grounded.
- Use only 3-wire extension cords that have 3-prong grounding plugs and 3-pole receptacles that accept the tool's plug.
- (120V) This tool is intended for use on a circuit that has an outlet that looks like the one illustrated in Sketch A in Figure (below). The tool has a grounding plug that looks like the plug illustrated in Sketch A in Figure (below). A temporary adapter, which looks like the adapter illustrated in Sketches B and C, may be used to connect this plug to a 2-pole receptacle as shown in Sketch B if a properly grounded outlet is not available. The temporary adapter should be used only until a properly grounded outlet can be installed by a qualified electrician.



| Ampere Rating | | Volts | | Total length of cord | | | |
|---------------|---------------|-------|------|----------------------|-----------------|--------------|--------------|
| More Than | Not More Than | 120V | 240V | 7.5m (25ft.) | 15m (50ft.) | 30m (100ft.) | 45m (150ft.) |
| 0 | 6 | 18 | 16 | 16 | 14 | 14 | 12 |
| 6 | 10 | 18 | 16 | 16 | 14 | 12 | 12 |
| 10 | 12 | 16 | 16 | 16 | 14 | 12 | 12 |
| 12 | 16 | 14 | 12 | 12 | Not Recommended | | |

Only the applicable parts of the Table need to be included. For instance, a 120V product need include the 240-volt heading.

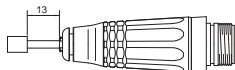
B. OTHER WARNING INSTRUCTIONS

- Do not exceed the "Maximum Allowable Motor Rotation Speed" (Refer to * 15. Specifications).
- When sensing that the attachment and motor are overheated during operation, reduce the working force or the motor rotation speed, or stop the operation until the attachment cools down before restarting.
- Always wear cap, gloves, long sleeve shirt, safety glasses and hearing protection against this device is in use.
- Do not touch the attachment or motor when the system is operating.
- This is a high torque system and bars can grab on the workpiece. Always wear gloves to prevent injury anytime you are using this system. Grinding and deburring produces lots of chips and other dust, keep work are clean and put away items that can be damaged by chips, sand or other contaminants.
- Check that the collet has been securely tightened prior to each use. Bars can fly loose from the chuck and injure operator or anyone nearby.
- Avoid applying heavy hand pressure during operation; let the tool do the work. Heavy force can bend or break bur shanks which can injure operator or anyone nearby. If the motor slows down noticeably during operation, you are applying too much pressure; this type of operation will shorten motor, attachment and tool life and dramatically reduce productivity.
- Do not use bent, broken, cracked or damaged tools, or tools with excessive runout. When using tools with a very large head to shank diameter ratio sudden speed increases can bend or break shank. When using a new or large tool, rotate it at low speed and increase speed gradually for safety.
- Always operate tools within the tool manufacturer's recommended speed limits. Use of a tool outside of the manufacturer's recommended speed limits could cause damage to the spindle and injury to the operator. A Foot Control can be used to vary speed.
- Do not hit or drop the attachment or motor because the shock can damage internal components. Always set the CONTROLLER on a flat, hard, steady surface.
- If the CONTROLLER, motor or attachment emit smoke, burning plastic odor or any other unusual odor, please immediately turn off the power switch, disconnect the power cord and send to NAKANISHI for service.
- Never attempt to operate this system, touch power cord or switch unit on or off, etc. with wet hands. Failure to adhere to this warning can result in severe electric shock.
- Do not exceed 13mm overhang for mounted grindstones. In case overhang must exceed 13mm reduce the motor speed in accordance with Table 1.

Table 1. Overhang versus Speed

| Overhang (mm) | Maximum Operating Speed (rpm) |
|---------------|-------------------------------|
| 20 | N x 0.5 |
| 25 | N x 0.3 |
| 50 | N x 0.1 |

N : Max. operating speed at 13mm overhang.



C. CAUTION

- This system can operate in temperatures from 0°C to 40°C. If condensation forms on the unit please do not operate the system it can short out and there is danger of electric shock.
- This system is not approved for use in flammable or explosive environments or with flammable or explosive materials.
- Never oil the bearings. This attachment is assembled with permanently greased bearings.
- Please check the motor and handpiece prior to each use for vibration, abnormal noises, heat, and rough or stiff rotation. If any of the above conditions are beyond acceptable limits, please send the system to NAKANISHI for service.
- Never move the Chuck Control Ring to Open while the motor is running, the motor and attachment will be damaged. Only change tool with the motor completely stopped.
- When using large cutting tools, tools with a head diameter larger than 4mm rotate the motor and attachment at slow speed. It is very easy to bend and break large cutting tools at high rotation speeds.
- If the motor protection circuit repeatedly activates and stops the motor, you are using too much force. Please use less hand force and continue the operation. Heavy handed usage will result in dramatically shortened motor, attachment and tool life.
- Please clean the chuck and spindle center shaft weekly as failure to do this can cause contaminants to build up in the chuck and increase runout or reduce the clamping strength of the chuck.
- Do not disassemble, modify or attempt to repair the CONTROLLER, Motor Attachment and Foot Control as it will damage internal components. There are no user serviceable parts available.
- Be careful not to be injured by grinder or cutting tool while working.
- Verify type and use only properly rated fuses. Refer to the "10. Fuse Replacement" section.
- When cleaning an Attachment, stop the motor, Turn OFF the Main Power Switch and remove debris with a soft brush or a cloth. Do not blow air into the Attachment with compressed air as foreign particles or cutting debris may get into the ball bearing.

D. NOTICE

- Do not tighten the collet without mounting a cutting tool or dummy bur as this will result in damage to the collet and spindle.
- Don't use pencils, pens or other sharp objects on the Front Panel buttons.
- User is solely responsible for maintaining control of operation, maintenance and periodic inspection of the system.
- Only use grounded power sources. Using a non-specified Power Cord, the risk of fire by over-heat of the cord is possible. In case of damage to the CONTROLLER, return to NAKANISHI dealer service.
- Service and repair must be performed by NSK NAKANISHI or an authorized service center. Return to NSK NAKANISHI or an authorized service center.

2. Parts Names

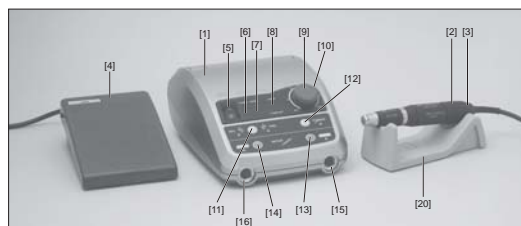


Fig.1

- | | | |
|-----------------------------------|--------------------------------------|-------------------------------|
| [1] CONTROLLER | [8] Speed Display | [15] Motor A Connector |
| [2] Motor/Attachment | [9] Speed Control Knob | [16] Motor B Connector |
| [3] NAKANISHI Smart Switch | [10] Speed Limit Release Button | [17] Foot Control Connector |
| [4] Optional Foot Control (FC-40) | [11] Forward/Reverse Selector Switch | [18] Power Cord |
| [5] Power Switch | [12] FIXpeed Switch | [19] power Connector Assembly |
| [6] Power Lamp | [13] Motor A Switch | [20] Handpiece Stand |
| [7] Reset Lamp | [14] Motor B Switch | |

Fig.2

3. Setting Up the CONTROLLER

3-1. Connecting the Motor/Attachment

Insert the motor cord plug into the Motor Plug Connector [15] and align the pin on the plug with the groove on the connector and tighten the motor cord plug nut (Fig. 3).

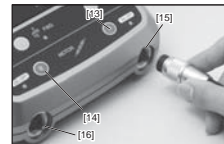


Fig. 3

3-2. Connecting the Optional Foot Control

Insert the Foot Control cord plug into the Foot Control Connector [17] and align the pin on the plug with the groove on the connector (Fig. 4).



Fig. 4

3-3. Connecting the Power Cord

Insert the Power Cord [18] plug into the Power Connector Assembly [19] on the back of the CONTROLLER securely and carefully align the pins (Fig. 5).

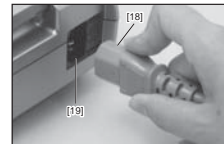


Fig. 5

4. Operating Procedures

- Connect Power Cord [18] to AC plug.
- Make sure the Speed Control Knob [9] is set at the lowest speed position.
- Turn Power Switch [5] ON (Green Power Lamp will light)
- Select the direction of rotation with the Forward/Reverse Selector Switch [11]. Each time this switch is pressed, the direction changes.
- To switch between motor A and motor B press either A [13] or B [14] to select the respective motor. The lamp on the CONTROLLER for the selected motor will light. Either push A [13] or B [14] again to start rotation or push the NAKANISHI Smart Switch on the appropriate motor.

CAUTION

- If the motor lamp is already lit pressing the A [13] or B [14] button will start rotation. Please look carefully at the CONTROLLER's front panel before pushing the motor select button.
- Motor A and B can not be run simultaneously.

Operation 1

Manual Operation

- Set the rotation speed with the Speed Control Knob [9] and check the speed on the Speed Display [8].
- Select the desired motor by pressing either Motor Switch A [13] or B [14].
A [13] = A Motor B [14] = B Motor
- After selecting the motor either press the NAKANISHI Smart Switch [3] or press the Motor Switch again.
- To stop the motor rotation either press Motor Switch A [13] or B [14] or the NAKANISHI Smart Switch again.

Operation 2

Foot Control Operation

- Set the maximum rotation speed with the Speed Control Knob [9] and check the speed on the Speed Display [8].
- Depress Foot Control [4] and the motor will rotate. The rotation speed can be varied up to the preset maximum, depending on the degree of depression of the Foot Control [4].

※ Auto Speed System

To fix the speed within the range set by the Speed Control Knob [9], with the motor running, depress the Foot Control [4] to the desired speed and press Motor Switch A [13] or B [14], depending on which motor is being used. The lamp on the CONTROLLER will flash and the rotation speed will be maintained even if the Foot Control [4] is released. To cancel the Auto Speed System press Motor Switch A [13] or B [14], the NAKANISHI Smart Switch [3] or depress the Foot Control [4] again.

5. Memory Speed Function, FIXpeed

(1) Setting the memory speed function

First with the motor stopped, preset the desired speed on the Speed Control Knob [9]. Next, press the FIXpeed Switch [12] for more than 1 second. A 'beep' will sound and the FIXpeed lamp will light. The motor is now set to run at the FIXpeed setting.

To Change FIXpeed Memory
Repeat the above procedure.

NOTICE

FIXpeed memory cannot be set in excess of 30,000 min⁻¹(rpm).

(2) Using Memory Speed Function

Select the desired motor by pressing either Motor Switch A [13] or B [14].
A [13] = A Motor B [14] = B Motor
After selecting the motor either press the NAKANISHI Smart Switch [3] or press the Motor Switch again. The FIXpeed lamp will flash when the motor is running. During Foot Control [4] operation the FIXpeed set in memory will act as the upper limit and the Foot Control [4] will still vary speed.

(3) Clearing the FIXpeed Memory

Push and hold the FIXpeed Switch [12], a 'beep' will sound and the FIXpeed lamp will shut off. The FIXpeed memory is cleared.

(4) To Undo the Clear

Press the FIXpeed Switch [12], the FIXpeed lamp will light. The FIXpeed memory has been restored.

※ When the EsPERT 500 system is shipped from the factory, the FIXpeed is preset for both motor A and B to 20,000min⁻¹ (rpm).

6. Speed Limit

When using small diameter burs the EsPERT 500 system can be operated at more than 40,000min⁻¹(rpm). Press the Speed Limit Release Button [10] and turn the Speed Control Knob [9] to the desired speed.

CAUTION

Use of more than 40,000 min⁻¹(rpm) is only allowable when the bur manufacturer specifies the maximum acceptable speed in excess of 40,000 min⁻¹(rpm). NEVER use any tools beyond the tool manufacturer's recommended maximum speed.

7. Motor Protection Circuit

When the motor is operated with a load exceeding its limits or the handpiece is locked, the Motor Protection Circuit operates and interrupts the power supply to the motor. When the Motor Protection Circuit has been triggered the Reset Lamp [7] lights and an Error Code appears on the Speed Display [8].

Resetting the Motor Protection Circuit

During manual operation the circuit can be reset by pressing Motor Switch A [13] or B [14] again. During Foot Control operation, release the Foot Control [4] completely and the circuit will be reset.

8. Power Up Memory Function

When the Power Switch [5] is turned On, the rotation direction and Hand/Foot selections being used when the unit was shut down are restored. Please pay careful attention to the rotation direction.

9. Error Codes

When the Motor Protection Circuit stops the motor due to some system failure, such as overload, wire breakage, misuse or circuit problems, the Speed Display [8] will display an Error Code.

| Error Code | Description | Cause |
|------------|-----------------------|---|
| E0 | Self-Check Error | Internal Memory Malfunction |
| E1 | Over current detected | Long time use at high loads (over current) |
| | | Power Cord Shorted |
| E2 | Over voltage detected | Motor Winding Shorted |
| | | Motor Cord Power Line cut |
| E3 | Motor Sensor Error | Faulty Sensor (Hall IC) in motor |
| | | Motor Cord Disconnected |
| E4 | CONTROLLER Overheat | Motor Cord Sensor Line cut |
| | | CONTROLLER thermal shut down due to extended use at high loads or unit placed in high temperature environment |
| E5 | Brake Circuit Error | Abnormal voltage generated in motor start/stop circuit |
| | | Faulty start/stop circuit |
| E6 | Rotor Lock Error | Chuck Open |
| | | Bad Handpiece |
| | | Bad Motor |

For solutions to the error codes please see the Troubleshooting Section of this manual.

10. Fuse Replacement

Fuses are located in the Power Connector Assembly [19]. Depress the spring tabs located on the top and bottom of the Power Connector Assembly and remove it to change the fuses. (AC120V : T3.15AL 250V) (AC230V : T1.25AH 250V) (Fig. 6).

NOTICE

Please make sure to replace fuses with same rated 'Slow Blow' or 'Time Delay' type fuses. Failure to replace with the proper type fuse will result in continuous fuse failures or damage to the unit and motor.

CAUTION

Fuses blow only when a short circuit or voltage spike on the AC line occurs. If you are uncertain of the cause for a fuse failing, send the unit to an authorized NAKANISHI service shop for repair.



Fig. 6

11. Maintenance Mode

This system incorporates a maintenance mode to check the function of the switches, display, Foot Control, motor, etc. To activate the Maintenance Mode press and hold the FixSpeed Switch [12] and Motor Switch A [13] simultaneously and turn the Power Switch [5] on. Hold the buttons until the unit 'beeps' (about 2 seconds). With maintenance mode activated the Speed Control Knob will switch between function checks and the function will be displayed in the Speed Display. The check will be displayed in the following order from lowest speed setting "oP", "dP", "HL", "Pd" and "in" To release Maintenance Mode, turn the unit off and on again.

Function Checks are as follows

1) [oP] : Switch operation check.

Press the switch on the panel you wish to check and the light on the panel will light to indicate proper operation of the switch.

2) [dP] : Display check

Press the Forward/Reverse Selector Switch [11], and the lamps will light one by one to verify their normal operation. To cancel this test press the Forward/Reverse Selector Switch [11] again.

3) [HL] : Motor Signal check (Hall IC check)

Press the Forward/Reverse Selector Switch [11] and the Speed Display [8] will display one or two horizontal lines. Turn the motor slowly by hand and the display will show one line, two lines, one line, two lines...smoothly from top to bottom to top. If any one of these three lines does not light, the sensor (Hall IC) in the motor is bad or the signal line in the motor cord is cut. Please send the unit and motor for repair. To cancel this check, press the Forward/Reverse Selector Switch [11] again.

4) [Pd] : Foot Control check

Press the Forward/Reverse Selector Switch [11], and the Speed Display [8] will display alphanumeric characters (0-9, A-F) according to the degree of depression of the Foot Control [4]. Also depressing the Foot Control slightly lights the Reset Lamp [7] and depressing it fully extinguishes the lamp. If the Speed Display [8] does not change smoothly or the Reset Lamp [7] does not light properly, the Foot Control [4] may be bad. To cancel this check, press the Forward/Reverse Selector Switch [11] again.

5) [in] : Initializing Function

Press the Forward/Reverse Selector Switch [11] until a 'beep' is heard. The settings for rotation direction, Hand/Foot and other settings will be reset to factory defaults.

Rotation Direction: FWD (Forward)

Motor Selector Switch: A

Speed: 20,000min⁻¹ (rpm)

12. Motor and Attachment Operation

12 - 1 Installation and Removal of Burs

Open the chuck by turning the Bur Lock Ring to the open position. The chuck is open and the bur can be removed. Install the new bur and turn the Bur Lock Ring in the Lock direction. Finally turn the Bur Lock Ring all the way to the Lock position until it clicks (Fig. 7).

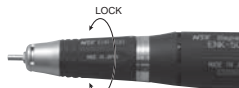


Fig. 7

CAUTION

Never turn the Bur Lock Ring while the motor is rotating. Turning the Bur Lock Ring with the motor rotating can cause injury and damage to motor and attachment.

12 - 2 Cleaning and Replacement of the Chuck

1) Removal of the Chuck

Open the Bur Lock Ring and turn the chuck counterclockwise until you can remove the chuck. Normally, the chuck can be removed and replaced by hand; if it is too tight use the included wrench to remove it as shown in the picture (Fig. 8).

※ Occasionally, when using a large diameter bur at high torque, the chuck may gradually tighten making it difficult to remove. In this case align the spindle's wrench flats in the nose's slits and use the provided L wrench to hold the spindle. Open the Bur Lock Ring and turn the chuck counterclockwise with the provided chuck wrench to remove the chuck (Fig. 9).

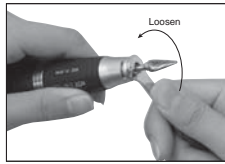


Fig. 8

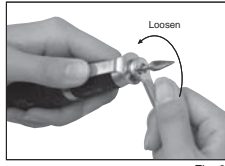


Fig. 9

2) Cleaning the Chuck and Spindle

Remove and thoroughly clean the chuck and ID of the spindle to maintain accuracy. Remove the chuck and clean the chuck and spindle ID at least once a week.

3) Installation of the Chuck

Thinly apply oil before insertion.

Open the ring, insert the dummy bur or the bur in use into the chuck, and turn the chuck clockwise by hand until it stops. Then, lock the ring, and the chuck could hold the bur securely. (Fig. 10)

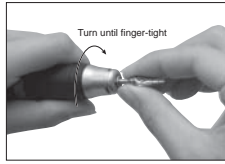


Fig. 10

12 - 3 Disconnecting and Connecting the Motor Cord to the Motor

Removal

Turn the motor cord nut counterclockwise and remove the cord. Hold the motor nut only when disconnecting the motor cord; do not pull on the motor cord.

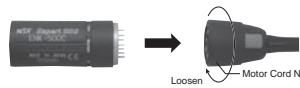


Fig. 11

Connecting

Carefully align the pins on the motor with the holes on the motor cord connector and gently push the motor cord connector onto the motor.

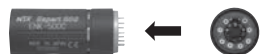


Fig. 12

Tighten the motor cord nut by turning clockwise until it is tight.

CAUTION

Be very careful to push the motor cord connector straight into the motor. The motor pins can be bent easily and cannot be bent back. Don't remove the motor cord unless necessary.

12 - 4 Removing the Handpiece from the Motor.

The Handpiece and Motor are screwed together at the rear of the Handpiece. Hold the motor body and attach the provided pin wrench to the rear of the Handpiece. Turn the pin wrench counterclockwise and unscrew the Handpiece (Fig. 13).

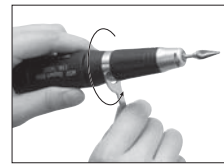


Fig. 13

CAUTION

To connect the Handpiece to the Motor, turn the Handpiece clockwise and tighten firmly. If the drive connections do not align properly, you will not be able to turn the attachment more than two turns. If this happens, DO NOT FORCE. Unscrew the attachment slightly and turn the bur by hand until the drive connections align, and then screw the motor and attachment together (Fig. 14).

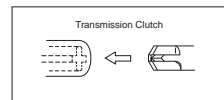


Fig. 14

13. Handpiece Stand

On the bottom of the Handpiece Stand, the tools necessary for attachment maintenance and a spare chuck (optional) can be mounted (Fig. 15).



Fig. 15

14. Handpiece Holder

The Handpiece Holder can be mounted on the right side of the CONTROLLER, giving you an easy place to store the motor and attachment when not in use. Insert the Handpiece Holder into the slot and tighten the screw. You can adjust the Handpiece Holder angle to suit your taste (Fig. 16).



Fig. 16

15. Specifications

CONTROLLER

| | |
|--------------------|---------------------|
| Model Number | NE96 |
| Power Requirements | AC120/230V 50/60Hz |
| Weight | 2.6kg |
| Dimensions | W175 x D230 x H98mm |

Motor

(1) Torque Type

| | |
|----------------------|---------------------------------------|
| Model Number | ENK-500T |
| Motor Rotation Speed | 1,000 - 50,000min ⁻¹ (rpm) |
| Max. Output | 200W |
| Max. Torque | 8.7cN·m |
| Weight | 251g |
| Dimensions | L164mm |
| Cord Length | 1.5m |

Option

(1) Foot Control

| | |
|--------------|-------|
| Model Number | FC-40 |
| Weight | 660g |

Handpiece Stand

| | |
|--------------|----------|
| Model Number | Z095 201 |
| Weight | 120g |

Handpiece Holder

| | |
|--------------|----------|
| Model Number | Z095 104 |
| Weight | 18g |

(2) Compact Type

| | |
|----------------------|--|
| Model Number | ENK-500C |
| Motor Rotation Speed | 1,000 - 50,000 min ⁻¹ (rpm) |
| Max. Output | 140W |
| Max. Torque | 6 cN·m |
| Weight | 209g |
| Dimensions | L148mm |
| Cord Length | 1.5m |

(2) Collet Chuck

| | |
|-----------------------|--------------------------------|
| Collet Chuck (CHH-□□) | e0.3±0.0mm in 0.1mm increments |
| | e2.35mm and e3.175mm |

16. Troubleshooting

When trouble is found, please check the following prior to consulting your dealer.

CONTROLLER and Motor

| Problem | Probable Cause | Solution | |
|--|--|--|--|
| Pilot Lamp does not Light | Power Plug is disconnected. | Insert the power plug correctly. | |
| | Fuse is Blown. | Replace it with the specified fuse. If the reason the fuse has blown is unknown, send for service. | |
| The Motor and Handpiece Do Not Run - Reset Lamp Lights | Power Switch is Bad. | Send for Service. | |
| | Foot Control does not Work | Foot Control Connection is Loose. Check to see if Foot Control operates normally in maintenance mode (4) [Pd] : Foot Control Check. | Connect the Foot Control correctly. If the Foot Control does not operate normally, replaced it or send it for service. |
| | Error Code E0 | Turn Power on again. | If the same Error Code appears, send for service. If system operates normally, the Error Code is due to a temporary overload, which is not a problem. |
| Error Code E1 | If you have spare units, replace the motor and motor cord and check operation. | If system operates normally after replacing the motor and motor cord; the motor and/or motor cord may be shorted. Send the motor and motor cord for service. If the same Error Code still appears after replacing, send the system for repair. | |
| Error Code E2 | Motor cord is disconnected. | Connect the motor cord correctly. | |
| Error Code E3 | If you have spare units, replace the motor and motor cord and check operation. | If system operates normally after replacing the motor and motor cord; the motor and/or motor cord may be cut. Send the motor and motor cord for service. If the same Error Code still appears after replacing, send the system for repair. | |
| Error Code E4 | Motor cord is disconnected. | Connect the motor cord correctly. | |
| Error Code E5 | Check to see if motor operates normally in maintenance mode (3) [HL] : Motor Signal Check. | If any problems are found during the check, the motor cord may be cut or the sensors in the motor may be bad, send for service. | |
| Error Code E6 | Shut down the system and allow to cool for 10 minutes and check operation again. | If the system operates normally, there is no problem. Check the operating environment, storage location, etc for high temperatures. If the same Error Code appears frequently, send for service. | |
| Can't Increase Rotation Speed | Turn Power on again and start and stop motor several times. | If the system operates normally, there is no problem. If the same Error Code appears, send for service. | |
| | Chuck is Open. | Lock the Bur Lock Ring fully. | |
| | Check to see if the bur can be lightly rotated by hand. | If rotation is abnormal, send for service. | |
| | The Speed Control Knob is set low, for Foot Control operation this sets the maximum motor speed. | Set the maximum rotation speed with the Speed Control Knob. | |

Attachment

| Problem | Probable Cause | Solution |
|--|-----------------------------------|--|
| The Attachment does not turn with the chuck closed | Bearings Contaminated or Seized. | Send for Service. |
| Attachment gets hot during use | Bearings Contaminated. | Same as Above. |
| Vibration or Noise during use | Same as Above. | Same as Above. |
| High Runout | Bur is bent or damaged. | Replace the bur. |
| | Contaminants in chuck or spindle. | Clean the chuck and spindle ID. |
| Bur slips out | Chuck is worn. | Replace the chuck. |
| | Bearings worn. | Send for Service. |
| | Chuck is Loose. | Tighten the Chuck. Refer to "12. Motor and Attachment Operation". |

17. DISPOSAL OF THE PRODUCTS

When disposal of a CONTROLLER, Motor or Attachment are necessary, follow the instructions from your local government agency for proper disposal of When disposal of a Reducer is necessary, follow the instructions from your local government agency for proper disposal of industrial components.