NAKANISHI

OM-K0572E 007

Emax EVOlution

OPERATION MANUAL



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Thank you for purchasing Emax EVOlution. 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 Emax EVOlution system for any operators to refer to whenever operating this system.
Please read this Operation Manual carefully prior to use.

⚠ Cautions for handling and operation

- **Read these cautions carefully and only use in the manner intended.**
- **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.**

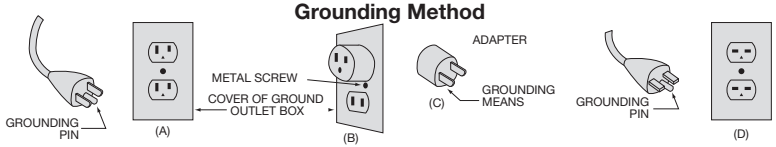
Class	Degree of Risk
⚠ **WARNING**	**A hazard that could result in bodily injury or damage to the device if the safety instructions are not followed.**
⚠ **CAUTION**	**A hazard that could result in light or moderate bodily injury or damage to the device if the safety instructions are not followed.**
⚠ **NOTICE**	**General information needed to operate the device safely.**

A. GROUNDING INSTRUCTIONS

① 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.
② Do not modify the plug provided - if it will not fit the outlet, have the proper outlet installed by a qualified electrician.
③ 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.
④ 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.
⑤ Use only 3-wire extension cords that have 3-prong grounding plugs and 3-pole receptacles that accept the tool's plug.

⑥ (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. The green-colored rigid ear, lug, and the like, extending from the adapter must be connected to a permanent ground such as a properly grounded outlet box. Note : Adopter (Figure B) not for use in Canada.

Grounding Method



⑦ USE PROPER EXTENSION CORD Make sure your extension cord is in good condition. When using an extension cord, be sure to use one heavy enough to carry the current your product will draw. An undersized cord will cause a drop in line voltage resulting in loss of power and overheating. Table (below) shows the correct size to use depending on cord length and nameplate ampere rating. If in doubt, use the next heavier gauge. The smaller the gauge number, the heavier the cord.

Minimum gauge for cord

Ampere Rating		Volts	Total length of cord			
		120 V 240 V	7.5 m (25 ft.) 15 m (50 ft.)	15 m (50 ft.) 30 m (100 ft.)	30 m (100 ft.) 60 m (200 ft.)	45 m (150 ft.) 90 m (300 ft.)
More Than	Not More Than					
0	6		18	16	16	14
6	10		18	16	14	12
10	12		16	16	14	12
12	16		14	12	Not Recommended	
Only the applicable parts ot the Table need to be included. For instance, a 120 volt product need include the 240-volt heading.						

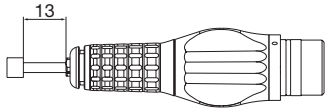
B. OTHER WARNING INSTRUCTIONS

① Do not exceed the " Maximum Allowable Motor Rotation Speed " (Refer to "◆ Specifications ").
② 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.
③ Always wear cap, gloves, long sleeve shirt, safety glasses and hearing protection anytime this device is in use.
④ Do Not Touch the attachment or motor when the system is operating.
⑤ This is a high torque system and burs 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.
⑥ Check that the collet has been securely tightened prior to each use. Burs can fly loose from the chuck and injure operator or anyone nearby.
⑦ 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.
⑧ 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.
⑨ 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 pedal can be used to vary speed.
⑩ Do not hit or drop the attachment or motor because the shock can damage internal components. Always set the control unit on a flat, hard, steady surface.
⑪ If the control unit, 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.
⑫ 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.
⑬ Use only tools with shank diameter tolerance similar to the chuck I.D. tolerance.
⑭ The motor has a nakanishi Smart switch which provides a click sensation. Be careful when operating the switch, because the motor is on/off.
⑮ Do not exceed 13mm overhang for mounted grindstones. In case overhang must exceed 13mm reduce the motor speed in accordance with Table 1 .
⑯ Do not disassemble, modify or attempt to repair the control unit, motor, motor cord, attachment and foot pedal. Additional damage internal components. Service must be performed by NSK NAKANISHI or an authorized service center.

Table 1. Overhang versus Speed

Overhang (mm)	Maximum Operating Speed min^{-1}
20	N × 0.5
25	N × 0.3
50	N × 0.1

N : Max. operating speed at 13 mm overhang.



C. CAUTION

① The system function normally in the environment where the temperature is at 0 - 40 °C. humidity at 10 - 85% RH, atmospteric pressure at 500 -1060 hPa, and no moisture condensation in the Unit. Use at outside of these Limits may cause malfunction.
② Store the system in the place where the temperature is at -10 - 60 °C, humidity at 10 - 85 % RH, and the system is not subject to air with dust, sulfur, or salinity.
③ Do not install system next to RF noise sources malfunctions can occur.
④ Install equipment so that the power supply cord can be pulled out without hindrance in event of emergency.
⑤ This system is not approved for use in flammable or explosive environments or with flammable or explosive materials.
⑥ Never oil the bearings. This attachment is assembled with permanently greased bearings.
⑦ 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.
⑧ 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.
⑨ When using large cutting tools, tools with a head diameter larger than 4 mm rotate the motor and attachment at slow speed. It is very easy to bend and break large cutting tools at high rotation speeds.
⑩ If the motor protection circuit repetitively 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.
⑪ 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.
⑫ Do not disassemble or alter the product by yourself.
⑬ Be sure to replace fuse with the correct type and rating.
⑭ Do not spill any liquid on the controls.
⑮ Please be careful not to be injured by the grinder or bur.
⑯ Be sure to turn the power off before cleaning and maintenance of the Handpiece.

D. NOTICE

① Do not tighten the collet without mounting a cutting tool or dummy bur as this will result in damage to the collet and spindle.
② Don't use pencils, pens or other sharp objects on the Front Panel buttons.
③ User is solely responsible for maintaining control of operation, maintenance and periodic inspection of the system.
④ Equipment to be send back to manufacturer for servicing / repair.
⑤ Only use with original power supply cord. In case of damage, contact NSK / NAKANISHI service center.

◆Component Names

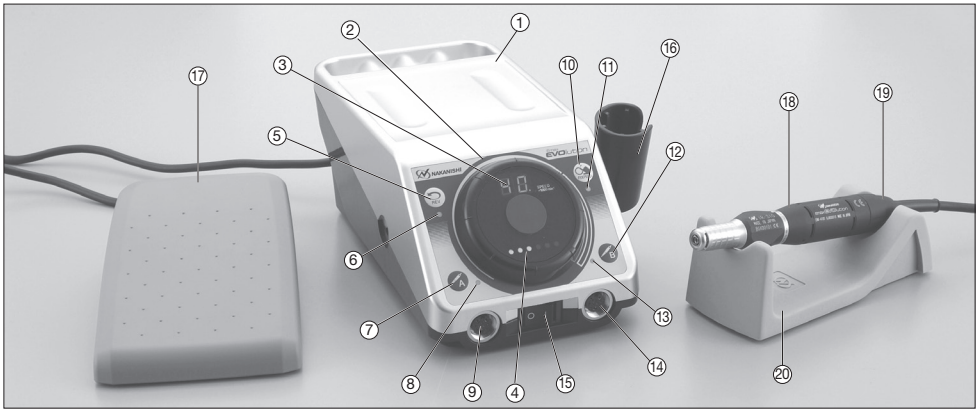


Fig. 1

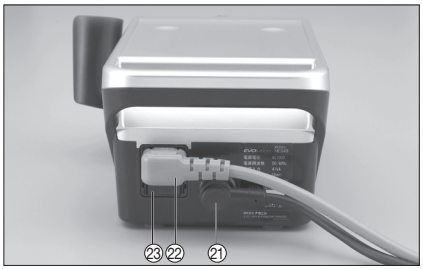


Fig. 2

① Control Unit
② Speed Control Knob
③ Speed Display
④ Load Meter
⑤ Forward / Reverse Selector Switch
⑥ Forward / Reverse LED
⑦ Motor A Switch
⑧ Motor A LED
⑨ Motor A Connector
⑩ FIXPEED Switch
⑪ FIXPEED LED
⑫ Motor B Switch
⑬ Motor B LED
⑭ Motor B Connector
⑮ Power Switch
⑯ Handpiece Holder
⑰ Optional Foot Pedal (FC-64)
⑱ Motor Handpiece (IR-310, ENK-410S)
⑲ NAKANISHI Smart Switch
⑳ Handpiece Stand
㉑ Foot Pedal Connector
㉒ Power Cord
㉓ Power Connector Assembly

◆Setting Up the Control Unit

1.Connecting the Motor / Attachment

Insert the motor cord plug into the Motor A Connector ⑨ or the Motor B Connector ⑭, and align the pin on the plug with the groove on the connector and tighten the motor cord plug nut. (**Fig. 3**)

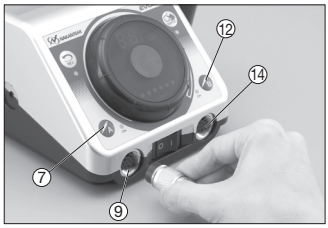


Fig. 3

2.Connecting the Optional Foot Pedal

Insert the foot pedal cord plug into the Foot Pedal Connector ㉑ and align the pin on the plug with the groove on the connector. (**Fig. 4**)



Fig. 4

3.Connecting the Power Cord

Insert the Power Cord ㉒ plug into the Power Connector Assembly ㉓ on the back of the control unit securely and carefully align the pins. (**Fig. 5**)



Fig. 5

◆Operating Procedures

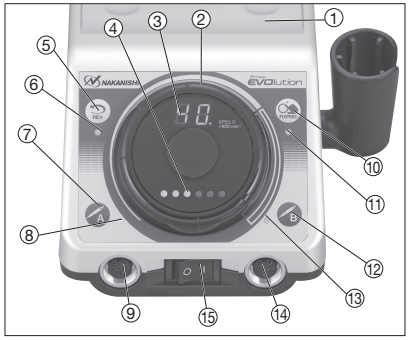


Fig. 6

(1) Insert the Power Cord Plug ㉑ in a grounded wall outlet.

(2) Make sure the Speed Control Knob ② is set at the lowest speed position.

(3) Turn Power Switch ⑮ ON , and check if Speed display ③ shows.

(4) Select the direction of rotation with the Forward/Reverse Selector Switch ⑤. Each time this switch is pressed, the direction changes. When the FWD. / REV. LED ⑥ is not lit, it shows Right hand rotation (FWD.)

(5) To switch between motor A and motor B press either A ⑦ or B ⑫ to select the respective motor. The LED on the control unit for the selected motor will light. Either push A ⑦ or B ⑫ again to start rotation or push the NAKANISHI Smart Switch on the appropriate motor.

⚠ CAUTIONS

- **If the motor LED is already lit pressing the A ⑦ or B ⑫ button will start rotation. Please look carefully at the control unit's front panel before pushing the motor select button.**
- **Motor A and B can not be run simultaneously.**

Operation 1

Manual Operation

(6) Set the rotation speed with the Speed Control Knob ② and check the speed on the Speed Display ③.

(7) Select the desired motor by pressing either Motor Switch A ⑦ or B ⑫.

A ⑦ = A Motor B ⑫ = B Motor

After selecting the motor either press the NAKANISHI Smart Switch ⑲ or press the Motor Switch again.

(8) To stop the motor rotation either press Motor Switch A ⑦ or B ⑫ or the NAKANISHI Smart Switch again.

Operation 2

Foot Pedal Operation

(6) Set the maximum rotation speed with the Speed Control Knob ② and check the speed on the Speed Display ③.

(7) Depress Foot Pedal ⑰ 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 Peda l ⑰.

*** Auto Speed System**

To fix the speed within the range set by the Speed Control Knob ②, with the motor running, depress the Foot Pedal ⑰ to the desired speed and press Motor Switch A ⑦ or B ⑫, depending on which motor is being used. The Motor LED on the control unit will flash and the rotation speed will be maintained even if the Foot Pedal ⑰ is released. To cancel the Auto Speed System press Motor Switch A ⑦ or B ⑫, the NAKANISHI Smart Switch ⑲ or depress the Foot Pedal ⑰ again.

◆Memory-Speed Function, FIXPEED

(1) Setting the Memory Speed Function
First with the motor stopped, preset the desired speed on the Speed Control Knob ②. Next, press the FIXPEED Switch ⑩ for more than 1 second. A 'beep' will sound and the FIXPEED LED ⑪ 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 over 30,000 min^{-1}.

(2) Using Memory Speed Function
Select the desired motor by pressing either Motor Switch A ⑦ or B ⑫.
A ⑦ = A Motor B ⑫ = B Motor
After selecting the motor either press the NAKANISHI Smart Switch ⑲ or press the Motor Switch again. The FIXPEED LED ⑪ will flash when the motor is running. During Foot Pedal ⑰ operation the FIXPEED set in memory will act as the upper limit and the Foot Pedal ⑰ will still vary speed.

(3) Clearing the FIXPEED Memory
Push and hold the FIXPEED Switch ⑩, a 'beep' will sound and the FIXPEED LED ⑪ will shut off. The FIXPEED memory is cleared.

(4) To Undo the Clear
Press the FIXPEED Switch ⑩, the FIXPEED LED ⑪ will light. The FIXPEED memory has been restored.
* When the Emax EVOlution system is shipped from the factory, the FIXPEED is preset for both motor A and B to 20,000 min^{-1}.

◆Load Monitor LED

The motor handpiece /control unit load is displayed by 6 LED's (3 Green, 2 Yellow,1 Orange). Continuous operation is possible with up to all 3 green LED's lit.

◆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 an Error Code appears on the Speed Display ③.

Resetting the Motor Protection Circuit

During manual operation the circuit can be reset by pressing Motor Switch A ⑦ or B ⑫ again. During foot pedal operation, release the Foot Pedal ⑰ completely and the circuit will be reset.

◆Turn-On-Memory Function

When the Power Switch ⑮ is turned On, the rotation direction and FIXPEED selections being used when the unit was shut down are restored. Please pay careful attention to the rotation direction.

◆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 ③ will display an Error Code.

Error cord	Description	Cause
E 0	Self-check error	・Abnormal internal memory ・Broken internal memory
E 1	Overcurrent detection error (Hard)	・Long-time use at a high load (overcorrect) ・Shorted cord (power line) ・Shorted motor winding
E 2	Overvoltage detection error	・Shorted cord (power line),damaged circuit ・Broken internal circuit
E 3	Motor sensor error	・Faulty sensor (Hall IC) ・Disconnected motor cord ・Severed cord (signal line)
E 4	Unit overheat error	・Temperature rise in the unit due to longtime use at a high load ・Unit placed under high temperature
E 5	PAM circuit error	・Abnormal voltage generated in start / stop circuit ・Faulty start / stop circuit from PAM (L Slide)
E 6	Rotor lock error	・Open chuck ・Faulty handpiece ・Motor Faulty ・Faulty sensor (Hall IC) ・Severed cord (signal, power line)
E 8	Overvoltage detection error (Soft)	・Long-time use at a high load (overcorrect) ・Shorted cord (power line) ・Shortstop of the motor winding
E 9	ITRIP error	・Faulty motor and circuit
E F	Foot pedal error	・Faulty Foot Pedal or Shorted Foot Pedal cord ・Broken internal circuit

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

◆ Fuse Replacement

Fuses are located in the Power Connector Assembly ㉓. Depress the spring tabs located on the top and bottom of the Power Connector Assembly and remove it to change the fuses. (T1.6AH250V for 120V, T800mAH250V for 230V). (**Fig. 7**)



Fig. 7

⚠ NOTICE

Please make sure to replace fuses with the 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.

◆Maintenance Mode

This system incorporates a maintenance mode to check the function of the switches, display, foot pedal, motor, and etc. To activate the Maintenance Mode press and hold the FIXPEED Switch ⑩ and Motor Switch A ⑦ simultaneously and turn the Power Switch ⑮ on. Hold the buttons until the unit 'beeps' (about 2 seconds). With maintenance mode activated the Speed Control Knob ② will switch between function checks and the function will be displayed in the Speed Display ③. 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 ⑤, and the LEDs will light one by one to verify their normal operation. To cancel this test press the Forward / Reverse Selector Switch ⑤ again.

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

Press the Forward / Reverse Selector Switch ⑤ and the Speed Display ③ 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) 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 ⑤ again.

4. [Pd] : Foot Pedal check

Press the Forward / Reverse Selector Switch ⑤, and the Speed Display ③ will display alphanumeric characters (0-9, A-F) according to the degree of depression of the Foot Pedal ⑰. Also depressing the foot pedal slightly lights the Motor A LED ⑧ and depressing it fully extinguishes the LED. If the Speed Display ③ does not change smoothly or the Motor A LED ⑧ does not light properly, the Foot Peda l ⑰ may be bad. To cancel this check, press the Forward / Reverse Selector Switch ⑤ again,

5. [in] : Initializing Function

Press the Forward / Reverse Selector Switch ⑤ until a 'beep' is heard. The settings for rotation direction and other settings will be reset to factory defaults.

Rotation Direction : FWD (Forward)
Motor Selector Switch : A
FIXPEED : 20,000min^{-1}

◆Motor and Attachment Operation

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. 8**)

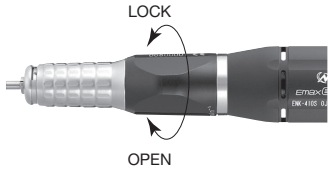


Fig. 8

⚠ 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.

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. 9**)

*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. 10**)

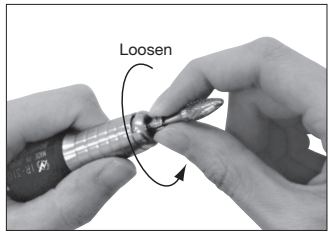


Fig. 9

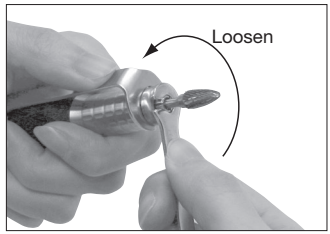


Fig. 10

(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 and Adjustment of the Chuck

Apply a thin coating of oil to the chuck before installation. Open the Bur Lock Ring, insert a dummy bur cr cutting tool into the chuck and then turn the chuck clockwise by hand until it stops. Next, turn the chuck back, counterclockwise, about 1/5 of a turn to allow the bur to be easily released when the chuck is open. Finally, turn the Bur Lock Ring until it clicks, locking the bur in place. (**Fig. 11**)

* The chuck's clamping force can be adjusted as shown in **Fig. 11**, if the bur slips or the bur can not be removed, make adjustments as shown above.

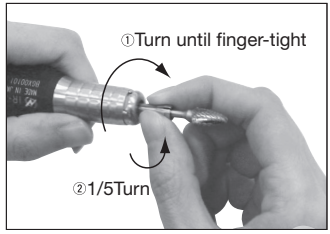


Fig. 11

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.

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

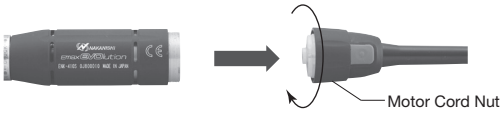


Fig. 12 Removal



Fig. 13 Connecting

⚠ CAUTION

- **Do not remove the motor cord except when exchanging the motor cord.**
- **Be careful not to lose an o-ring between the motor and the motor cord when exchanging the motor cord.**
- **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.**

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. 14**)

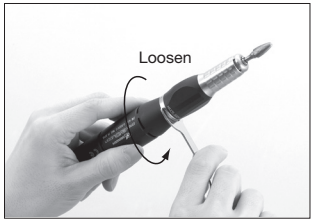


Fig. 14

⚠ 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. 15)

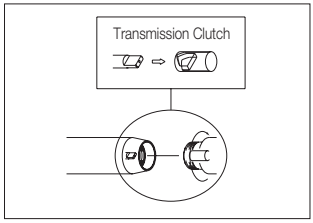


Fig. 15

◆Handpiece Stand

On the bottom of the Handpiece stand, the tools necessary for attachment maintenance and a spare chuck (optional) can be mounted. (**Fig. 16**)



Fig. 16

◆Handpiece Holder

Insert the handpiece holder into the hole at the each side with the control unit, and fix it with the provided screw to fit the usable angle. (**Fig. 17**)

The attachment example of handpiece holder shows **Fig. 18**, **Fig. 19**, **Fig. 20.**

If the holder is attached as **Fig. 20**, be sure to insert only the standard motor ENK-410S.

And there is the case the holder can't be used all for the attachments.



Fig. 17

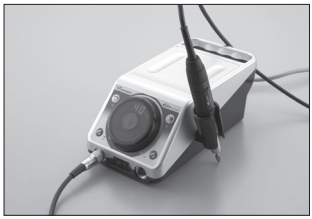


Fig. 18

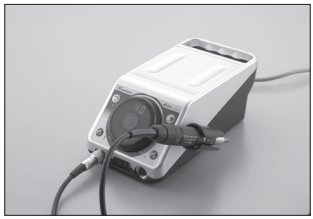


Fig. 19



Fig. 20

◆Specifications

Control Unit

Model Number	NE249
Power Requirements	AC120V, 50/60Hz, 41VA / AC230V, 50/60Hz, 41VA
Weight	2.3kg
Dimensions	W130 x D254 x H97mm

Handpiece Stand

Model Number	K-274
Weight	120g

Handpiece Holder

Model Number	K-273
Weight	20g

Motor

(1) Standard Type

Model Number	ENK-410S
Motor Rotation Speed	1,000 - 40,000min^{-1}
Max. Output	73W
Max. Torque	4.3cN.m
Weight (W/O Cord)	90g
Cord Length	1.5m

(2) Torque Type

Model Number	ENK-250T
Motor Rotation Speed	1,000 - 25,000min^{-1}
Max. Output	76W
Max. Torque	4.8cN.m
Weight (W/O Cord)	147g
Cord Length	1.5m

Attachment

Model Number	IR-310		
Maximum Allowable Motor Rotation Speed	Less than 40,000min^{-1}		
Weight	92g		
Collet Chuck	ø3.0mm (CHH-3.0) ø2.35 (CHH-2.35)		
Noise Level *1	Sound pressure level	L_{pA}	Less than 70 dB(A)
Vibration Level *2	3-axis vibration total value	a_{hd}	1.15 m/s^2
	Uncertainty	K	0.61 m/s^2

Foot Pedal

Model Number	FC-64
Weight	460g

The noise and vibration levels are measured values in accordance with the respective standards, and these values are not guaranteed under all usage conditions.

*1 Measurement standard: EN IEC 62841-2-23：2026
Conditions: ENK-410S Rotation Speed: 40,000 min^{-1}

*2 Measurement standard: EN ISO 28927-12：2012
Conditions: ENK-410S Rotation Speed: 40,000 min^{-1}
Feed Force: 3 N

◆European EC Directive Conformation

The products complies with the following overseas safety standards.

North American Safety Standards(UL,CSA)
・UL 61010-1 ・CAN/CSA-C22.2 No.61010-1-12
European Directive
・Low Voltage Directive(2014/35/EU) ・EMC Directive(2014/30/EU) ・RoHS Directive(2011/65/EU)
UK Regulation
・The Electrical Equipment (Safety) Regulations ・Electromagnetic Compatibility Regulations ・The Regulation of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations

◆Troubleshooting

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

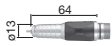
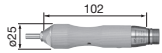
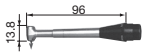
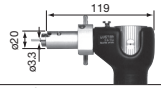
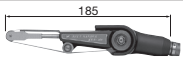
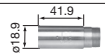
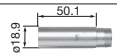
Control Unit and Motor

Trouble		Cause / Check	Remedy
Speed Display does not light		The power plug is disconnected.	Insert the power plug correctly.
		The fuse is blown.	Replace it with a specified fuse. If the reason the fuse has blown is unknown, ask for an inspection.
		Power Switch is faulty.	Ask for repair.
"Speed Display ⊂⊃ " and "Set Rotation Speed" is displayed repeatedly.		Put the power switch, depressing the foot pedal ?	Put the power switch again without depressing the foot pedal. When the trouble is repeated if so, put out the plug of foot pedal and reset the power switch. Then the trouble is repeated, ask for repair.
The motor and handpiece do not run	Foot Pedal dose not work.	The connection of the foot control cord plug is loose.	Connect the foot control cord plug correctly.
		Maintenance mode (4) “Pd”: Check to see if the foot control operates normally.	If the foot control dose not operates normally, ask for repair of the foot control or replace it with a new one.
	Error code E0 appears.	Turn on the power again.	If the same error code appears, ask for repair of the unit.
	Error code E1 appears.	Turn on the power again.	If it operates normally, the error display is temporarily due to overload,which is not a problem.
		If you have two or more units, replace the motor and check the operation.	If it operates normally after replacing the motor and the motor cord, the motor and/or the motor cord may be shorted. Ask for repair of the motor and/or the motor cord. If the same error code still appears after replacing, ask for repair of the unit.
	Error code E2 appears.	The motor cord is disconnected.	Connect the motor cord correctly.
		If you have two or more units, replace the motor and the motor cord and check the operation.	If it operates normally after replacing the motor and the motor cord, the motor and/or the motor cord may be severed. Ask for repair of the motor and/or the motor cord. If the same error code still appears after replacing, ask for repair of the unit.
	Error code E3 appears.	The motor cord is disconnected.	Connect the motor cord correctly.
		Maintenance mode (3) “HL”: Confirm whether you work by a motor signal check normally.	If any problem is found during a check, the motor cord may be severed or the sensor in the motor may be faulty. Ask for repair.
	Error code E4 appears.	After stopping to cool it down place for about 10 minutes, check the operation again.	If it operates normally, there is no problem. Check the operating environment, storage location, etc., for high temperature. If the same error code appears frequently, ask for repair of the unit.
	Error code E5 appears.	Turn on the power again, and repeat starting and stopping several times.	If it operates normally, there is no problem. If the same error code appears, ask for repair of the unit.
	Error code E6 appears.	The chuck is open.	Lock the chuck. If any problem is found during a check, the motor cord may be severed or the sensor in the motor may be faulty. Ask for repair.
		Maintenance mode (3) “HL”: Confirm whether you work by a motor signal check normally.	If any problem is found during a check, the motor cord may be severed or the sensor in the motor may be faulty. Ask for repair.
		Check turning a tip with a finger lightly and turning around it lightly.	If the rotation is abnormal, ask for repair of the motor and handpiece.
	Error code E8 appears.	Turn on the power again.	Error indication is a temporary thing by the overload if I work normally. There is not it abnormally.
		If you have two or more units, replace the motor cord and check the operation.	If it operates normally after replacing the motor cord, the motor and/or the motor cord may be shorted. Ask for repair of the motor and/or the motor cord. If the same error code still appears after replacing the motor cord, ask for repair of the unit.
	Error code E9 appears.	If you have two or more units, replace the motor cord and check the operation.	If it operates normally after replacing the motor cord, the motor and/or the motor cord may be shorted. Ask for repair of the motor and/or the motor cord. If the same error code still appears after replacing the motor cord, ask for repair of the unit.
	Error code EF appears.	Maintenance Mode (4) “Pd”: Check whether Foot Pedal operates normally by Foot Pedal Chuck.	If it does not operate normally, change the Foot Pedal for new or ask for repair.
The rotation speed does not rise.		The maximum rotation speed for operation by foot pedal should be set with the Speed Control Knob.	Set the maximum rotation speed with the Speed Control Knob.

Attachment

Trouble	Cause/Check	Remedy
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.
	Bur is bent or damaged.	Replace the bur.
High Runout	Contaminants in chuck or spindle.	Clean the chuck and spindle ID.
	Chuck is worn.	Replace the chuck.
	Bearings worn.	Send for Service.
Bur slips out	Chuck is Loose.	Adjust the Chuck.

◆Optional Motors and Handpieces

Product	Model No.	Specification
	Standard Type Motor ENK-410S	1,000-40,000min^{-1} Brushless Motor. Excellent combination of high speed, light weight, small diameter, high torque and FWD/REV rotation.
	Torque Type Motor ENK-250T	1,000-25,000min^{-1} Brushless Motor. Higher power and higher torque than Standard motor ENK-410S.
	Ring Type Attachment IR-310	Ring type chucking system makes it easier to change tools.
	Lever Type Attachment IH-300	Simple lever turning for bur exchange. Designed to make it light weight and fit to pen-grip type holding. ø2.35mm, ø3.0mm or ø3.175mm (1/8")
	Torque Type Attachment HG-200	Chuck Diameter ø6.0mm or ø6.35mm (1/4")
	BMH-300	This unique slim body makes it ideal for cutting and grinding the bottom surface of deep ribs or holes Chuck diameter ø3.0mm or ø3.175mm (1/8") Optional ø2.35mm
	MFC-300S MFC-300M	90° MINI ANGLE TYPE Attachment for Chamfering Deep Hole, Bur Only ø1.6mm
	90° Angle Attachment IC-300 45° Angle Attachment KC-300	90° Angle attachment with ø3.0mm or ø3.175mm (1/8") Collet Chuck. When using it with Rubber Pad or Felt buff in lower speed, please use RG-01 Reducer together.
	Reciprocating Type Compact Grinder LUSTER LS-100 Reciprocating Type Compact Grinder (Built in motor) LUSTER NLS-110	The grinding surface can be set at any between 0 and 360 Stroke range:0-6mm adjustable by allen wrench.
	MINI-LUSTER ML-8	Stroke range of 0.8mm, Reciprocating Stroke (variable):Approx0-9,000 times/min. Suitable for polishing narrow grooves, details, etc. Stroke range of 0.8mm.
	Fine Belt Sander KBS-101	8mm Belt (Grits #120, #240, #400) 6mm Belt (Grits #120, #240, #400) 4mm Belt (Grits #120, #240, #400)
	1/4 Reduction Gear RG-01	May be Connected between Motor and Attachment for 4 time the Regular Power
	Extension Joint CN-01	Joint used by Connection between Attachment and Motor to Extend the Length

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