BRASSELER USA
DENTAL INSTRUMENTATION

Motor Handpiece System for Root Canal Enlargement

EndoDrive PLUS™

OPERATION MANUAL

OM-E0202E 001

Please Read this operation manual carefully before use and keep for future reference.

Thank you for purchasing the EndoDrive PLUS.
This product should be used by qualified personnel for dental purposes only.
This product is used primarily for root canal enlargement. Read this Operation Manual carefully before use for operation instructions, care and maintenance. Keep this Operation Manual for future reference.

■ Classifications of equipment
- Type of protection against electric shock :
  – Class II equipment : ⧈
- Degree of protection against electric shock :
  – Type B applied part : 🚹
- Method of sterilization or disinfection recommended by the manufacture
  – See 8. Sterilization
- Degree of protection against ingress of water as detailed in the current edition of IEC 60529 :
  – Foot Control (Option) : IPX1 (Protected against vertically falling water drops)
- Degree of safety of application in the presence of a flammable anaesthetic mixture with air or with oxygen or nitrous oxide :
  – EQUIPMENT not suitable for use in the presence of a flammable anaesthetic mixture with air or with oxygen or nitrous oxide.
- Mode of operation :
  – Continuous operation

CONTENTS

⚠ Cautions for handling and operation

■ Read these safety cautions thoroughly before use and operate the product properly.
■ These indicators are to allow you to use the product safely and prevent danger and harm to you and others. These are classified by degree of danger, damage and seriousness. All indicators concern safety, and should be followed.

Classification	Degree of danger or damage and seriousness
⚠ **DANGER**	Explains an instruction where death or serious injury may occur.
⚠ **WARNING**	Explains an instruction where bodily injury or damage to device may occur.
⚠ **CAUTION**	Explains an instruction where possibility for minor to medium bodily injury or damage to device may exist.
⚠ **NOTICE**	Explains an instruction that should be observed for safety reasons.

⚠ DANGER

- Use the specified batteries for this product. Never use any other batteries than those that NSK specifies.

⚠ WARNING

- Intended use by dental professional, only.
- Do not spill water or a chemical solution onto or into the motor handpiece or control unit as it may result in fire or electric shock due to a short-circuit or breakage due to rusting.
- Keep away from patients with cardiac pacemakers.
- If you should notice battery fluid leak within the control unit, deformation of the control unit casing or partial discoloring, immediately stop use and contact Brasseler USA.
- Should the leaking battery fluid get into your eyes, immediately wash eyes thoroughly with clean water and see your doctor. Failure to do so may result in loss of sight.
- Should the battery fluid leak and adhere to skin or clothing, immediately wash the exposed skin thoroughly with clean water and completely wash away the fluid. Failure to do so may result in skin irritation.
- If the product will not be used for a long period, remove the batteries from the product to avoid fluid leak.
- When installing the product, provide space of approximately 10cm around the Control Unit for easy access to the inlet and the Power Cord
- The system may present a possibility of malfunction when used in the presence of electromagnetic interference wave. Do not install the system in the vicinity of the device which emits magnetic waves.
- Always consider the safety of the patient when using this product.

⚠ CAUTION

- Exercise sufficient care in using the product by giving patient safety first priority.
- The product is to be used only for dental treatment by qualified personnel.
- Only use the EndoDrive Plus adapter. Never use any other AC adapters.
- Observe the allowable rotation speed which the file manufacturer specifies for use.
- Do not use a bent, damaged, deformed or non-ISO-conforming file. Using such a file may result in personal injury due to its unexpected breaking or flying off during rotation.
- Do not use or leave the product in a high-temperature environment such as under strong direct sunlight, in a car under a blazing sun, by a fire, or near a stove.
- Check the product before use, paying attention to looseness, vibration, noise and temperature (heat generation). If any abnormal condition is found even slightly at that time, immediately stop use and contact Brasseler USA.
- Do not allow any impact on to the Product. Do not drop the Product.
- Do not attempt to disassemble the product or tamper with the mechanism.
- Always clean the shank of the file to be installed. Allowing dirt to enter the chuck could cause loss of concentricity and deterioration of chucking force.
- Before changing the head or File, turn off the power of the motor handpiece. Changing with the power kept on may cause unintended rotation.
- Pay attention to the direction of batteries when replacing. Forcing batteries in the wrong direction may cause damage and fluid leakage due to a short circuit.
- Do not allow conductive materials such as wires, safety pins, etc., to enter into the battery case.
- If chemical, solvent or antiseptic solution is deposited on this product, immediately wipe it away. Discoloration or deformation may occur if not removed.
- The system functions normally in the environment where the temperature is at 10-40°C (50-104°F), humidity at 10-85% RH, atmospheric pressure at 700-1060hPa, and no moisture condensation in the Control Unit. Use at outside of these limits may cause malfunction.
- EndoDrive PLUS needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information.
- Portable and mobile RF communications equipment can affect EndoDrive PLUS.
- The use of ACCESSORIES, transducers and cables other than those specified, with the exception of transducers and cables sold by the manufacturer of EndoDrive PLUS as replacement parts for internal components, may result in increased EMISSIONS or decreased IMMUNITY of EndoDrive PLUS.

- EndoDrive PLUS should not be used adjacent to or stacked with other equipment and that if adjacent or stacked use is necessary, EndoDrive PLUS should be observed to verify normal operation in the configuration in which it will be used.

⚠ NOTICE

- During rotation, the motor handpiece and the motor handpiece cord may affect computer and LAN cable. Noise could be heard during operation near a radio receiver.
- The motor handpiece consumes electricity very slightly even when the power supply is off. In addition, fully-charged rechargeable batteries, in general, discharge gradually over time even though it is not used. It is recommended to recharge the batteries just before use.
- When the motor handpiece stops automatically by detecting a low battery voltage, turning on the power again after a while may not detect the low voltage immediately. This is not a failure, but due to battery characteristics. The voltage drop does not coincide with the remaining battery capacity.
- Recharge rechargeable batteries after they deplete as much as possible. Repeating short-time use and subsequent recharging may shorten their operating time due to the "memory effect." Batteries may recover after repeating complete discharge and full charge for a few times. (This product is equipped with a "Refresh Mode" for this purpose.)
- The used Nickel Metal Hydride Batteries are recyclable, but their disposal may sometimes not be permitted by the country. Return them to Brasseler USA.
- When disposing of the control unit and Foot Control (Option), follow the instructions of your local government for disposal, as they contain materials which may become industrial waste.
- When discarding the contra angle head and motor handpiece, dispose of them as medical waste.
- Users are responsible for operational control, maintenance and inspection.
- Store the system in the place where the temperature is at -10-60°C (14-140°F), humidity at 10-85% RH, atmospheric pressure at 500-1060 hPa, and the system is not subject to air with dust, sulfur, or salinity.
- When trouble is found, contact Brasseler USA.
- This product does not consider patient's age (except infants), gender, weight or nationality.
- No special training is required for this device.

1. FEATURES

- Compact design.
- Able to operate for approx. 2 continuous hours at the rated load. (Dependent upon use conditions.)
- A large LCD panel enhances ease of use.
- Programmable up to 9 memory settings.
- The auto reverse function is activated depending on the load. A wide variety of functions such as "auto reverse", "auto stop" and "auto reverse off" are available. Combined with such functions nine different operation programs are memorable.
- The rotation of the motor handpiece can be activated by the ON/OFF button of the motor handpiece or the Foot Control (optional).
- The motor handpiece can be turned on and off by pressing the ON/OFF button alternatively. In addition, ON by keep depressed and OFF by releasing it is possible.
- The motor handpiece softly starts. Since it makes a brief stop before it starts in the reverse rotation, there are no vibration and shocks during this change over.
- The built in feedback circuit maintains rotation at a constant speed even when the load on the motor handpiece changes.
- Has energy saving feature. The power of the motor handpiece automatically turns off when not being used for 10 minutes. (Auto power-off function)
- The contra angle heads provided for this product are all autoclavable up to 135°C (excluding the motor handpiece).

2. SPECIFICATIONS

< Control Unit >

Model	NE131
Rated input	DC20V 0.5A
Output	DC7V 0.4A
Charging time	5hours approx.
Dimensions	W92 x D148 x H124mm
Weight	456g

< AC Adaptor >

Model	NE169
Rated input	AC120V 60Hz AC230V 50/60Hz
Dimensions	W70 x D110 x H58mm
Weight	120V : 934g 230V : 974g

< Motor Handpiece >

Model	EM13M
Rated input	DC7V 0.4A
Dimensions	Ø20 × L108mm
Weight	92g (including motor handpiece cord)

3. NAME AND FUNCTION OF EACH PART

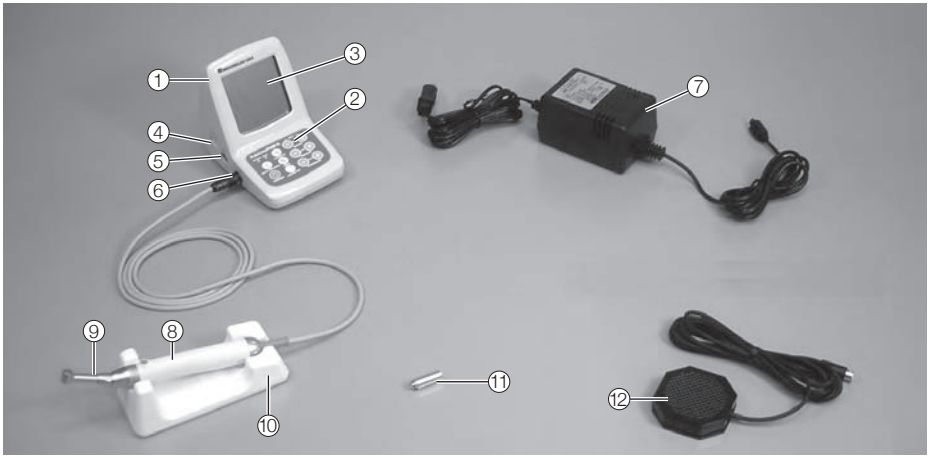


Fig. 1

① Control Unit
② Operation Panel
 * See Fig. 2 “Operation Panel and LCD Panel. ”
③ LCD Panel
 · See Fig. 2 “Operation Panel and LCD Panel.”
 · Error codes are displayed.
④ Power Cord Connector
 The AC adapter is connected.
⑤ Foot Control Connector
 The foot control (option) is connected.
⑥ Motor Handpiece Connector
 The motor handpiece is connected.
⑦ AC Adaptor
⑧ Motor Handpiece
⑨ Contra Angle Head (20:1)
⑩ Handpiece Stand
⑪ Spray Nozzle
 · This is used for lubrication.
⑫ Foot Control (Optional)

※ Operation Panel and LCD Panel.

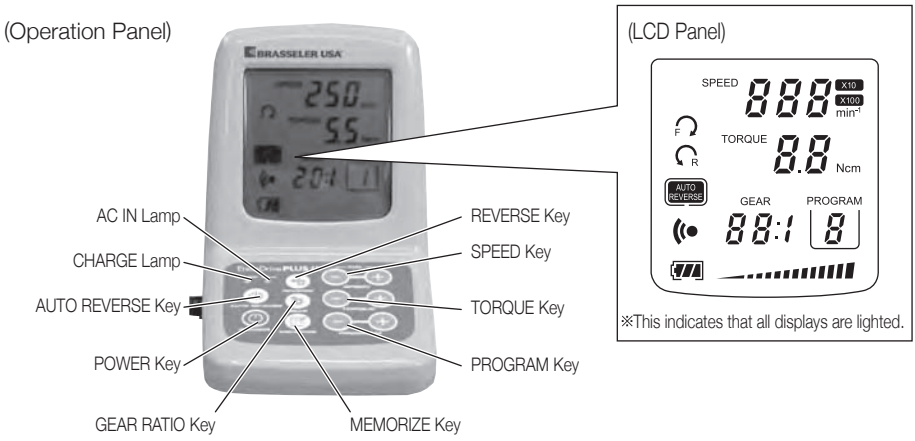


Fig. 2

• POWER Key

- Press the POWER key for more than one second to turn on the power and the LCD panel lights.
- Press the POWER key for more than one second while the power is on, turns off the power and the LCD panel turns off.

• SPEED Key

- The rotation speed can be changed.
- If the speed is to exceed the upper limit or fall below the lower limit, the alarm sounds.

LCD

The present rotation speed is displayed. The unit is (min^{-1}). " X10 or X100 " is displayed depending on the rotation speed.

• TORQUE Key

- The torque limit values can be changed.
- If the speed is to exceed the upper limit or fall below the lower limit, the alarm sounds.

LCD

The present torque limit value is displayed. The unit is (Ncm). When it reaches the maximum value, " ▬ ▬ " is displayed.

• PROGRAM Key

• A program can be selected.

LCD

The present program number is displayed. The program number is available from 1 to 9.

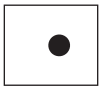
• The alarm sound volume can be adjusted. (Refer to P.14 6. (5) “Alarm Sound Volume Control”)

LCD

The present alarm mark is displayed.

High sound volume

Low sound volume



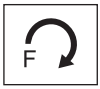
Limited OFF (The alarm sounds with a small sound volume at the time of confirmation and error, but it will not sound at the time of reverse rotation or when the torque limit has been reached.)

• REVERSE Key

• The rotational direction of the file can be changed by this key. It can also be changed while the file is in motion.
• The alarm sounds during reverse rotation.

LCD

The current rotational direction is displayed.



Forward Rotation (F).

Reverse Rotation (R).

• GEAR RATIO Key

• A gear ratio can be selected by this key. If the correct gear ratio is selected according to the contra angle head in use, an adequate rotation speed and torque limit value can be set.
• The gear ratio cannot be changed while the file is in motion.

LCD

The present gear ratio is displayed. The gear ratio is available at (1:1, 4:1, 10:1, 16:1 and 20:1).

• AUTO REVERSE Key

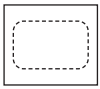
The auto reverse mode can be selected by this key. (Refer to P.11 "※ Auto Reverse Function.")

LCD

The present auto reverse mode mark is displayed.

AUTO REVERSE If the load is removed after auto reverse rotation, it returns to the normal rotation again.

AUTO STOP If the load is removed after autoreverse rotation, it stops.



AUTO REVERSE OFF Auto reverse rotation is not activated.
*There is no display.

• MEMORIZE Key

This key can preset program setting (rotation speed, torque limit value, gear ratio, auto reverse mode) and selecting the program. (Refer to P.12 6. (1) "Program")

• CHARGE Lamp (Orange)

This lamp lights or flashes while the batteries are being charged, in the battery refresh mode, (Refer to P.13 6. (3) "Battery Refresh") or an error has occured, regardless of the ON or OFF position of the power.

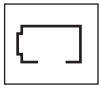
LCD

The battery mark will always be displayed even if the unit is powered OFF. The mark will be animated when the batteries are being charged or in the refresh mode (Refer to P.13 6. (3) "Battery Refresh").

Full charge or nearly full charge.

About 30-80% remains.

Less than about 30% remains. In this state, the auto reverse function may not activate. (Refer to P.11 "※ Auto Reverse Function")



Batteries are drained or remarkably low voltage. Charge the batteries.

⚠ NOTICE

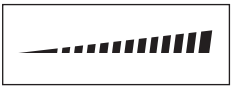
The mark of remaining amount of batteries indicates a voltage. When load is applied to the motor handpiece, the mark of remaining amount of batteries appears to become lower.

• AC IN Lamp (Green)

The lamp light will always be displayed when power is supplied by the AC adapter even if the unit is powered OFF

• Bar Display

LCD



The bar display graph which shows the degree of load applied to the motor while the file is in motion.

4. HOW TO CONNECT EACH PART

(1) Connecting Motor Handpiece

Align the ➡mark of the Motor Handpiece Cord Plug of the motor handpiece with the ▲ mark of the motor handpiece connector and insert the plug until it locks. (Fig. 3)

⚠ NOTICE

To remove the plug, hold the plug ring and pull it out.

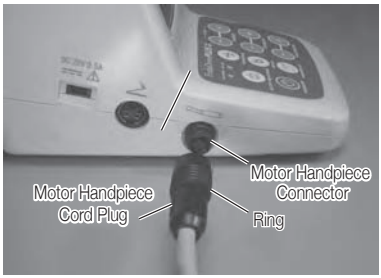


Fig. 3

(2) Connecting AC Adapter

Insert the jack of the AC adapter into the power connector with the ➡ mark of the jack down. (Fig. 4)

Fig. 4

(3) Connecting Foot Control (Option)

Securely insert the plug of the Foot Control (Option) into the Foot Control Connector with the ▲ mark of the plug down. (Fig. 5)

* The Foot Control is optional and is not required to operate the EndoDrive PLUS.

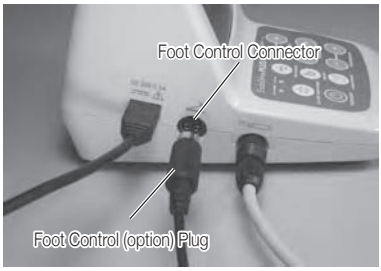


Fig. 5

5. HOW TO USE

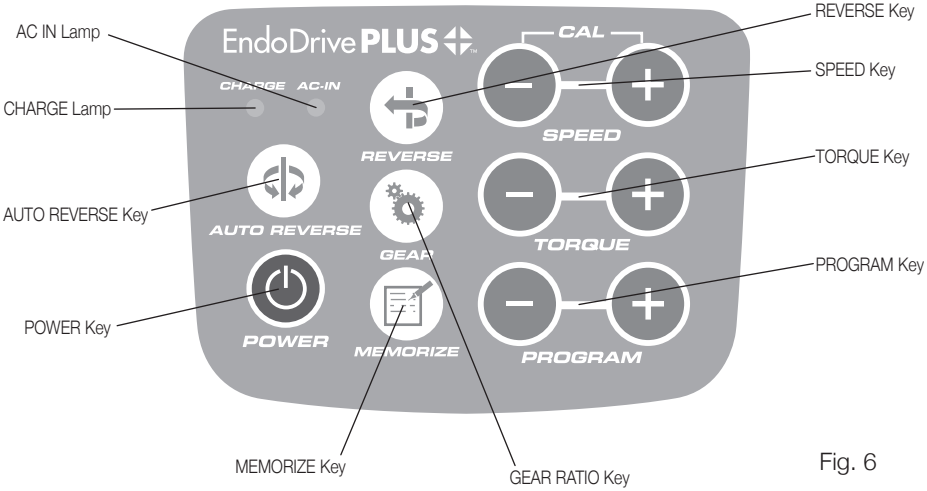


Fig. 6

(1) Charge (if batteries are used)

1) Insert the AC adapter plug into a power supply.
2) Confirm the AC IN lamp light is green.
3) The internal microcomputer checks the voltage of the batteries and starts charging, if necessary. If it starts charging, the CHARGE lamp lights, and the mark of the remaining amount of the batteries on the LCD panel will be animated.
   * There is no need to turn on the power.
4) When the CHARGE lamp turns off, charging has been completed.

⚠ CAUTION

- Do not connect other than AC120V or AC 230V. If it connects to others, it may cause a malfunction.
- Since the AC IN lamp lights up to indicate that the supply power is on, it does not go out even after a charge is completed. See the CHARGE lamp to check the charging conditions.
- The charging normally takes approx. 5 hours, but it depends on battery use conditions. Older batteries are especially prone to significantly shorter charging and operating times.
- The temperature of the batteries is measured during charging. Proper charging cannot be preformed if the charger is placed in an environment which is subject to sharp temperature change (next to window, subject to direct sunlight, near air outlet or fan heater). Place it in a place where temperature change is minimal.
- Charging may not be started in the following case:
  - The temperature of a battery is too low or too high. (less than 0°C (32°F) or more than 40°C (104°F).)
  - The temperature of the batteries is executively high or low. (Lower than apporox. 0 degree or higher than approx. 40 degree)
  - A battery is not connected.
  - The voltage of a battery is abnormal. (See P.16 10. “ERROR CODE”)
- Batteries are automatically charged depending on conditions, even when the power is on. But when the motor handpiece is used, charging is suspended to protect the battery.

(2) Changing Contra Angle Head

- The contra angle head can be connected with the motor handpiece at 6 adjustable head positions. Align the positioning pins of the contra angle head with the positioning slots of the motor handpiece and insert the head until they click.
- When removing the contra angle head, pull it straight out. (Fig. 7)

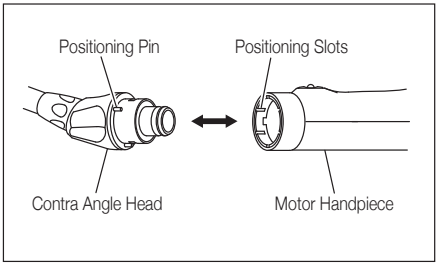


Fig. 7

⚠ CAUTION

- Turn off the power before attaching and detaching the contra angle head.
- Confirm that the contra angle head is securely assembled to the motor handpiece.

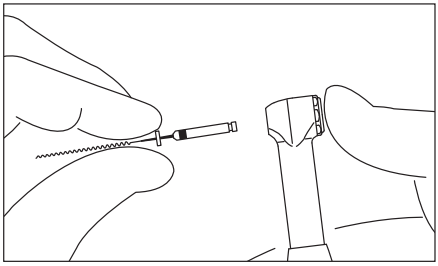
(3) Mounting and Removing File

<Mounting the File>

1) Insert the file into the chuck until it stops.
2) Lightly turn the file until it engages with the latch mechanism. Push it inward to click.

<Removing the File>

Depress the push-button and pull out the file.



* The contra angle head in the figure is MP-F20R. Fig. 8

⚠ CAUTION

- Turn off the power before mounting and removing the file.
- After the file is locked in place, lightly pull on the file to make sure the file is locked.
- Always clean the shank of the file to be installed. Allowing debris to enter the chuck could cause loss of concentricity and deterioration of chucking force.

(4) Preparatory Operations

1) Charge the batteries (Refer to P. 9 5 (1) “Charge (if batteries are used)”) or securely insert the plug of the AC adapter into a power supply.
2) Hold down the POWER key for more than one second to turn on the power.
3) Select a gear ratio by pressing the GEAR RATIO key. If the correct gear ratio is selected according to the contra angle head in use, an adequate rotation speed and torque limit value can be set.
4) Select the rotational direction by pressing the REVERSE key. The key changes over to the forward rotation (F) and reverse rotation (R) each time it is pressed.
5) Select the auto reverse mode by pressing the AUTO REVERSE key. The key changes over to AUTO REVERSE, AUTO STOP and AUTO REVERSE OFF each time it is pressed. (Refer to P. 11 “※Auto Reverse Function”)

⚠ NOTICE

The GEAR RATIO key is fast-forwarded, when it is continuously held down.

(5) Operation

1) • Start the motor handpiece to pressing the ON/OFF button briefly. Press the button again to stop the handpiece. (Alternate operation)
   • Keep pressing ON/OFF button more than a second, the motor handpiece starts while the button is pressed. If you release the button, it stops. (Intermittent operation)
   • If the Foot Control (Option) is connected, stepping on the pedal starts the motor handpiece. Releasing the Pedal stops it.
2) If you want to make adjustment to the rotation speed and torque limit value, press the SPEED key and TORQUE key respectively.

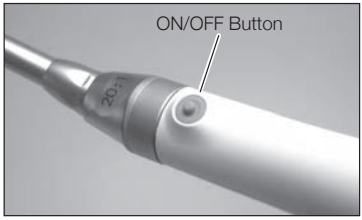


Fig. 9

⚠ NOTICE

- If the SPEED key and TORQUE key are continuously held down, they are fast-forwarded.
- If both ON/OFF button and Foot Control (Option) are equipped, the one which rotation instruction is first given has priority. For example, if you step on the Foot Control (Option) to start the motor handpiece, you cannot stop it by the ON/OFF button.

※ Auto Reverse Function

When the motor handpiece starts and its load reaches approximately half of the preset torque limit value, the alarm sounds. (at the time of on the bar display)
The alarm sound changes when the load approaches the torque limit value. (at the time of on the bar display)
When a further load exceeds the torque limit value, the following 3 modes can be selected:

AUTO REVERSE

The handpiece starts in forward rotation. When a load higher than the torque limit is applied, the file will rotate in reverse. When the load is removed, the file will return to normal rotation (forward) automatically.

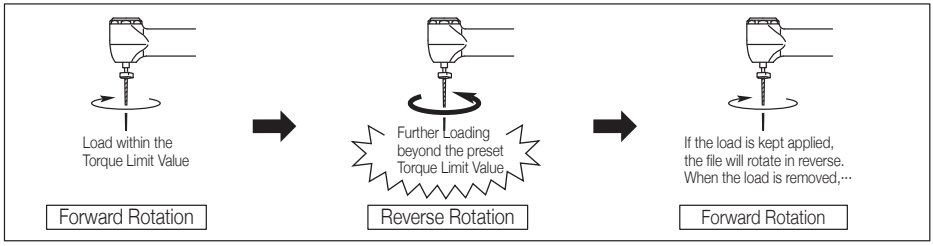


Fig. 10

AUTO STOP

The handpiece starts in forward rotation. When a load higher than the torque limit is applied, the file will rotate in reverse. When the load is removed, the motor rotation stops. If you want it to rotate again, re-press the ON/OFF key or re-step on the foot control (Optional).

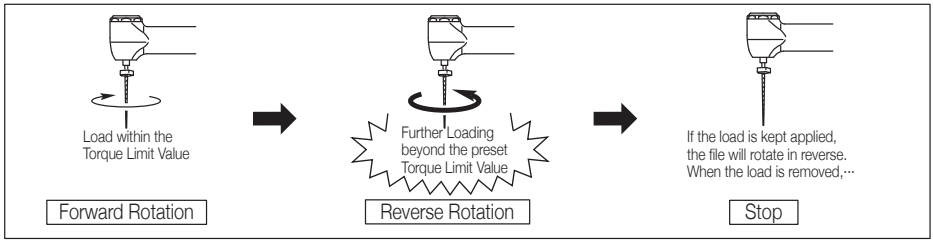


Fig. 11

AUTO REVERSE OFF

The motor handpiece stops without reverse rotation. In this instance, the LCD panel shows " ▬ ▬ ▬ " and the rotation speed alternately.

NOTICE

- When the reverse rotation (R) is set, the Auto Reverse Function is not activated.
- When the batteries go down (when the mark of the remaining amount of the batteries indicates " ▭ , ▭ "), the actual load may not reach the preset torque limit value. In this case (in the case of operation by batteries), this auto reverse function will not be activated. When high torque is required, use the AC adapter or use this product in a condition where the batteries are not significantly consumed (when the mark of the remaining amount of the batteries indicates " ▭ , ▭ ").
- If a load is continuously applied to the motor handpiece, it may automatically stop to prevent overheating. (The torque limit value indicates " 0.H " on the LCD panel). In this case, leave the motor handpiece for a while until it cools down. When the display returns to normal, the motor handpiece can be used.

(6) Completion of Medical Treatment

When the treatment is completed, return the motor handpiece to the handpiece stand and hold down the POWER key for more than one second to turn off the power.

NOTICE

If 10 minutes pass without operation of the ON/OFF button or Foot Control (Optional), the power turns off automatically. (Auto power off function) However, the power does not turn off automatically if the motor handpiece is in motion, even if it is not used.

6. CONVENIENT FUNCTIONS

(1) Program

You can change any preset values and have them memorized to your desired settings (rotation speed, torque limit value, gear ratio and auto reverse mode).

1) Press the PROGRAM key until it turns to the program number which you want to have memorized.

2) Adjust the rotation speed, torque limit value, gear ratio and auto reverse mode by each key according to your needs.

3) Hold down the MEMORIZE key for more than one second. When the alarm sounds, memorization is completed.

NOTICE

- The program cannot be memorized while the motor handpiece is in motion.
- The rotational direction is not memorized in the program. The program cannot be memorized if the rotational direction is set to the reverse rotation (R).
- If the PROGRAM key is kept pressed, it is fast-forwarded.
- The program is not memorized unless the MEMORIZE key is held down for more than one second. If the program number is changed by the PROGRAM key without pressing the MEMORIZE key, the initially memorized preset values remain. (Cancel function)

(2) Initialization of Program (Factory-set configuration)

The program can be returned to the original state configured at the time of factory shipment, if setup becomes confusing.

1) Turn off the power, when the power is on.

2) Connect the AC adapter and confirm that the AC IN lamp lights up.

3) Hold down the POWER key for more than one second, while pressing the AUTO REVERSE key and MEMORIZE key at the same time.

4) Release the keys when the LCD panel indicates " SEt ", and re-press the MEMORIZE key while this is displayed.

5) Initialization is completed, when " F 1n" is displayed.

NOTICE

- This function is not activated unless this product is powered by the AC adapter.
- If this function is used, all programs will disappear and return to the originally set values. Record the present program details according as needed.

(3) Battery Refresh

Nickel-metal-hydride batteries may result in a decrease in charging capacity, if additional charging (repeating a cycle of short-time use and recharging) is made. (Generally, this phenomenon is called a “memory effect.”) This Battery Refresh function is to resolve this phenomenon.

1) Turn off the power if the power is on.
2) Connect the AC adapter and confirm that the AC IN lamp lights.
3) Hold down the POWER key for more than one second, while pressing the REVERSE key.
4) The alarm sounds for a length of time, and the refresh mode is activated. At this time, the mark of the remaining amount of the batteries on the LCD panel is animated in the direction opposite to display at the time of charging. At the same time, the CHARGE lamp flashes slowly.
5) Leave it as it is. The batteries are discharged and recharged automatically.
6) Hold down the POWER key for a while, when you want to stop this process. (At this time, the power does not turn on.)

NOTICE

- This function is not activated, if not driven by the AC adapter.
- It may take up to 5 hours to discharge batteries.
- It takes 5 hours to discharge and 5 hours to recharge. Therefore, total of about 10 hours are required. For example, if dental treatment is finished at 7 p.m. and the refresh mode is set, the batteries will be fully charged by 5 a.m. the next morning at the longest.
- This function is not required for each charging. Try this function, if the operating time is shortened even if the batteries are relatively new.
- Do not repeat activation and deactivation of the refresh mode in a short time. It may result in enhancement of the memory effect.
- This function is fully effective for solution of a “memory effect.” However, it cannot be solved completely at one time due to characteristics of batteries. We recommend you repeat this process a few times according to need.

(4) Calibration

This function is to decrease fluctuation in the rotation speed of the motor handpiece and the difference in torque by the contra angle head.

1) Lubricate the contra angle head with the spray. (Refer to the “P14 7. (1) Lubricating Contra Angle Head.”)
2) Turn off the power if the power is on.
3) Connect the AC adapter and confirm that the AC IN lamp lights.
4) Turn on the power.
5) Hold down both buttons of the SPEED key simultaneously for more than one second.
6) The LCD panel displays “ CAL ” with the alarm sound.
7) Attach the contra angle head to the motor handpiece and press the MEMORIZE key.
8) If the motor handpiece begins to rotate, leave it as it is until it stops.
9) This process ends, if the rotation stops and the LCD panel display returns to its original state.
10) If you want to stop this process, turn off the power.

NOTICE

- Lubricate the contra angle head before Calibration.
- This function does not operate if AC adapter is not used.
- Do not touch or apply a load to the rotating shaft of the contra angle head. It obstructs accurate measurement.
- This function cannot completely absorb the individual difference of the actual motor handpiece and contra angle head.

(5) Alarm Sound Volume Control

The alarm sound volume can be controlled at the three steps of “BIG VOLUME, SMALL VOLUME and LIMITED OFF. ”
1) Keep pressing both buttons of the PROGRAM key simultaneously.
2) The alarm mark on the LCD panel changes, and the sound volume changes.
3) Release the PROGRAM key when the sound volume reaches your required level and the required sound level is set up.

⚠ NOTICE

- The sound level is retained, even if the power is turned off.
- If P.12 6. (2) “Initialization of Program (Factory-set configuration)” is executed, the sound is set to “BIG VOLUME.”

7. CLEANING

(1) Lubricating Contra Angle Head

- Lubricate the contra angle head only.
- Supply spray after each use and/or before each calibration and autoclaving.

1) Screw the spray nozzle onto the spray nozzle.
2) Insert the spray nozzle into the rear part of the contra angle head and lubricate the head for 2-3 seconds. (Fig. 12)

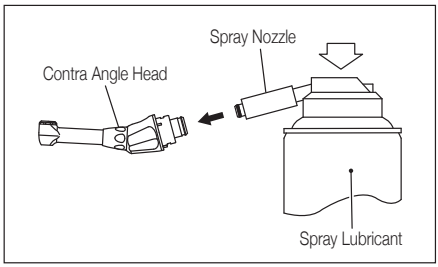


Fig. 12

(2) Cleaning Motor Handpiece

When the motor handpiece becomes dirty, wipe it off with a cotton cloth moistened with isopropyl alcohol.

⚠ CAUTION

- Do not lubricate the motor section of the motor handpiece.
- To clean the motor handpiece, do not use any solvent such as benzine and, thinner.
- Before mounting the lubricated contra angle head to the motor handpiece, wipe off extra oil. Stand on its end or lean it in the proper position for gravity draining. Mount it after excess oil has been drained.
- Hold the contra angle head securely to prevent it from flying off by the pressure of the spray.
- Supply lubricant until it comes out of the handpiece head (for approx. 2 seconds).
- Do not use a spray can upside down. In such a case, only spray gas comes out and oil is not sprayed.

8. STERILIZATION

- Sterilize the contra angle head only.
- For the sterilization method, we recommend the autoclave sterilization method.
- Sterilization is required first time you use and after each patient as noted below.

■ Autoclaving

1) Brush the debris off the surface of the contra angle head, and wipe it off with a cotton cloth moistened with isopropyl alcohol. Do not use metal brush.
2) Lubricate the head with the spray lubricant.
(Refer to the “P.14 7. (1) Lubricating Contra Angle Head.”)
3) Insert the head into an autoclave pouch and seal it.
4) Autoclavable up to max. 135°C (275ºF).
ex.) Autoclave for 20 min. at 121°C (250ºF), or 15 min. at 132°C (270ºF).
5) Keep the contra angle head in the autoclave pouch to keep it clean until you use it.

* Sterilization at 121°C (250ºF) for more than 15 minutes is recommended by EN13060 or EN ISO17665-1.

⚠ CAUTION

Do not apply high-temperature sterilization methods such as autoclave sterilization to any part other than the contra angle head.

9. CHANGING BATTERIES

The motor handpiece uses rechargeable batteries. They can be recharged 300-500 times, depending on the use conditions of the motor handpiece. If the operating time or recharging time becomes shorter or the rotation power becomes weaker, although the "memory effect" described in "⚠ NOTICE" is not applicable, the life of the batteries is depleted. In such a case, ask your dealer to replace the batteries or replace them with new ones yourself. (Refer to ■ Changing Batteries.") When replacing them yourself, be sure to observe the following "⚠ CAUTIONS ON CHANGING BATTERIES." Note that Brasseler USA shall not be held liable for any malfunction or failure resulting from your not following the "⚠ CAUTIONS ON CHANGING BATTERIES."

* we recommend our genuine Brasseler USA Batteries.
  Order Code : U421070

⚠ CAUTIONS ON CHANGING BATTERIES

- Do not open any part other than the battery cover.
- Be sure to purchase and use only the recommended batteries. Otherwise, batteries may cause damage, fluid leakage or explode.
- Do not work with wet hands. This may cause trouble due to short-circuiting of batteries and moisture infiltrating this product.

■ Changing Batteries

1) Turn off the power. Remove the AC adapter.
2) Remove the batteries after sliding the battery cover on the back of the control unit in the direction of the arrow. (Fig. 13)

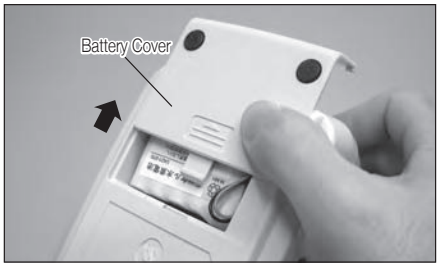


Fig. 13

⚠ CAUTION

Make sure to remove the AC adapter before changing batteries. Otherwise, it may cause a malfunction.

3) Take out the old batteries, and pull out the cord, holding it at the connector. (Fig. 14)

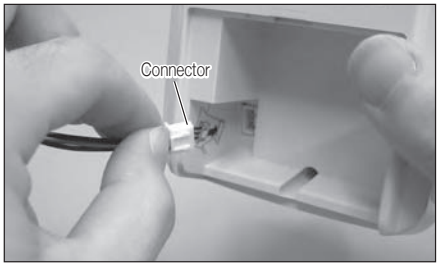


Fig. 14

⚠ CAUTION

Make sure to pull out the cord by holding the connector. Otherwise, it may cause a break in the cord.

4) Insert the connector of the cord of new batteries into the connector in accordance with the polarity indication label inside the battery chamber, and place the batteries into the chamber with care so as not to catch the cord.

⚠ CAUTION

In case of difficult to insert the connector onto the battery, the polarity may be incorrect. Do not insert it by force.

5) Close the battery cover. Make sure to charge the batteries before use.

NOTICE

The used nickel metal hydride batteries are recyclable, but their disposal may sometimes not be permitted by local laws. Return them to Brasseler USA.

10. ERROR CODE

If the motor handpiece stops due to an abnormality such as a malfunction, overload, break or wrong use, it automatically checks the state of the control unit and detects the cause of the abnormality and displays an error code on the LCD panel. If an error code is displayed, turn on the power again and check whether the same error code is displayed. If the same error code is displayed, take action by referring to the instructions provided in the “Check/Remedy” column in the following table.

NOTICE

If batteries are replaced while the AC adapter is connected, an incorrect error code may be displayed.

	Error code	Error	Cause	Check/Remedy
During rotation of the motor handpiece	E-0	Self-Check error	Malfunction of circuit	Contact Brasseler USA.
	E-1	Ovecurrent	The motor handpiece is locked. (at the time of the auto reverse mode)	Remove load
	E-2	Overvoltage	Malfunction of circuit	Contact Brasseler USA.
	E-4	Overheating of motor	High load was continuously applied to the motor handpiece for a relatively long time.	Leave it as it is until it cools down.
	E-5	Error of the brake circuit	Malfunction of circuit	Contact Brasseler USA.
	E-6	The axle locks up	The motor handpiece is locked. (at the time of startup)	Remove load
At the time of charging	E-C	Low voltage of batteries	The voltage of batteries is too low (The life of batteries or not iserted.)	Put the batteries into the battery chamber, or replace with new batteries.
	E-d	High voltage of batteries	The voltage of batteries is too high. (Malfunction of circuit)	Contact Brasseler USA.
	E-E	Beyond the range of working temperature	Beyond the range of working temperature or break in the thermistor in the battery section.	Use within the range of working temperature, or replace the batteries.
At the time of calibration	CE0	Beyond the upper limit	The operating life of the motor handpiece or contra angle has expired.	Replace the motor handpiece or contra angle head.
	CE1	Below the lower limit		
Other	E-F	Abnormal heat generation from batteries	The batteries generate abnormal heat.	Replace the batteries. If the heat generates from the new set of batteries, malfunction of the circuit may be suspected. Contact Brasseler USA.

11. TROUBLESHOOTING

When trouble is found, check the following again before contacting Brasseler USA. If none of these is applicable or the trouble is not remedied even after action has been taken, a failure of this product is suspected. Contact Brasseler USA.

<Control Unit, AC Adapter>

Problem	Cause	Solution
The power is not turned on.	The AC adapter is not connected.	Check the connection.
	The plug of the AC adapter is not inserted into the outlet, or there is no electricity in the outlet.	Check the connection.
	The batteries are empty.	Charge the batteries or use the AC adapter.
	No batteries are inserted.	Insert batteries, or use the AC adapter.
	The fuse has burnt.	Contact Brasseler USA.
AC IN lamp does not light.	The AC adapter is not connected.	Check the connection.
	The plug of the AC adapter is not inserted into the outlet, or there is no electricity in the outlet.	Check the connection.
	The fuse has burnt.	Contact Brasseler USA.
	The AC adapter's fuse has burnt.	Contact Brasseler USA.
The battery charger does not work. (The CHARGE lamp does not light.)	No batteries are inserted.	Insert batteries.
	The batteries are fully charged or in a state near full charge.	No problem
	The temperature of batteries is low.	If the temperature of batteries is less than 0°C (32°F), the batteries are not rechargeable. Charge the batteries in a warm room. (Be careful about moisture condensation.)
	The temperature of batteries is high.	It is normal that the batteries become a little bit warm right after charging. If the batteries are hot under normal operating conditions, not right after charging, there may be an abnormality. Contact Brasseler USA.
	An error code is displayed.	Refer to P.16 10. ERROR CODE.

<Motor Handpiece>

Problem	Cause	Solution
The motor handpiece does not rotate.	The motor handpiece cord is not connected.	Check the connection.
	The Foot Control (Option) is not connected.	Check the connection.
	There is a break in the motor handpiece or the motor handpiece cord.	Contact Brasseler USA.
The motor handpiece does not rotate. (The error code " E - 1 " is displayed.)	The contra angle head is clogged.	Clean or replace the contra angle head.
	There is a short circuit inside the motor handpiece or the motor handpiece cord.	Contact Brasseler USA.

Problem	Cause	Solution
The motor handpiece does not rotate. (“ - - - ” and the rotation speed are displayed alternately.)	The contra angle head is clogged.	Clean or replace the contra angle head.
	There is a short circuit inside the motor handpiece or the motor handpiece cord.	Contact Brasseler USA.
When turning on the power, the alarm sounds, and the motor handpiece does not rotate.	The power is turned on while pressing the ON/OFF button.	Check the ON/OFF button.
	There is a short circuit inside the ON/OFF button.	Contact Brasseler USA.
	The power is turned on while pressing the Foot Control (Option).	Check the Foot Control (Option).
	There is a short circuit inside the Foot Control. (Option)	Remove the foot control (Option), and rotate the motor handpiece by the ON/OFF button, or contact Brasseler USA.
The motor handpiece keeps rotating. (The Foot Control (Option) does not react.)	It is rotated by the ON/OFF button.	Stop the rotation by the ON/OFF button.
The motor handpiece keeps rotating. (The ON/OFF button does not react.)	It is rotated by the Foot Control (Option).	Release your foot from the Foot Control (Option) to stop, or pull out the plug of the Foot Control (Option).

12. WARRANTY

Brasseler USA warrants the handpiece against defects in manufacturing, workmanship and materials. Brasseler USA reserves the right to analyze and determine the cause of any problem. Warranty is voided should the handpiece not be used in accordance with this manual.

13. DISPOSING PRODUCT

- Please consult with Brasseler USA about waste disposal.
- The used nickel metal hydride batteries are recyclable, but their disposal may sometimes not be permitted by local laws. Return them to Brasseler USA.

Symbols

TUV Rhineland of North America is a Nationally Recognized Testing Laboratory (NRTL) in the United States and is accredited by the Standards Council of Canada to certify electro-medical products with Canadian National Standards.

Follow the waste of electric and electronic equipment (WEEE) Directive (2002/96/CE) to dispose of the product and accessories.

Consult operation instructions.

Manufacturer.

Class II equipment.

CE 0197 This conforms to CE European Directive of "Medical equipment directive 93/42/EEC."

Type B conforming component

EC REP Authorised representative in the European community.

IPX1 Protected against vertically falling water drops.

135°C Autoclavable up to Max.135°C. *for detail see Sterilization.

Marking on the outside of Equipment or Equipment parts that include RF transmitters or that apply RF electromagnetic energy for diagnosis or treatment.

Short-circuit-proof safety isolating transformer.

For indoor use only.

130° C To identify fuse boxes or their location.

E82323 20J8 LISTED SAC A71816D This product meets UL safety standard requirements.

153434 This mark is machine tool, electrical equipment and medical equipment Safety mark in Canada.

Guidance and manufacturer's declaration - electromagnetic emissions		
The EndoDrive PLUS is intended for use in the electromagnetic environment specified below. The customer or the user of the EndoDrive PLUS should assure that is used in such an environment.		
Emissions test	Compliance	Electromagnetic environment - guidance
RF emissions CISPR11	Group 1	The EndoDrive PLUS uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR11	Class B	The EndoDrive PLUS is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC61000-3-2	Class A	
Voltage fluctuations/flicker emissions IEC61000-3-3	Complies	

Guidance and manufacturer's declaration - electromagnetic immunity			
The EndoDrive PLUS is intended for use in the electromagnetic environment specified below. The customer or the user of the EndoDrive PLUS should assure that it is used in such an environment.			
Immunity test	IEC60601 test level	Compliance level	Electromagnetic environment - guidance
Electrostatic discharge (ESD) IEC61000-4-2	±(2,4) 6 kV contact ±(2,4) 8 kV air	±(2,4) 6 kV contact ±(2,4) 8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC61000-4-4	±2kV for power supply lines ±1kV for input/output	±2kV for power supply lines ±1kV for input/output	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC61000-4-5	±1kV line(s) to line(s) ±2kV line(s) to earth	±1kV line(s) to line(s) ±2kV line(s) to earth	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC61000-4-11	<5% Ut (>95% dip in Ut) for 0.5 cycle 40% Ut (60% dip in Ut) for 5 cycles 70% Ut (30% dip in Ut) for 25 cycles <5% Ut (>95% dip in Ut) for 5 sec	<5% Ut (>95% dip in Ut) for 0.5 cycle 40% Ut (60% dip in Ut) for 5 cycles 70% Ut (30% dip in Ut) for 25 cycles <5% Ut (>95% dip in Ut) for 5 sec	Mains power quality should be that of a typical commercial or hospital environment. If the user of the EndoDrive PLUS requires continued operation during power mains interruptions, it is recommended that the EndoDrive PLUS be powered from an uninterruptible power supply or a battery.
Power frequency (50/60Hz) magnetic field IEC61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE: Ut is the a.c. mains voltage prior to application of the test level.			

Guidance and manufacturer's declaration - electromagnetic immunity			
The EndoDrive PLUS is intended for use in the electromagnetic environment specified below. The customer or the user of the EndoDrive PLUS should assure that it is used in such an environment.			
Immunity test	IEC60601 test level	Compliance level	Electromagnetic environment - guidance
			Portable and mobile RF communications equipment should be used no closer to any part of the EndoDrive PLUS, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance
Conducted RF IEC61000-4-6	3Vrms 150 kHz to 80MHz	3 Vrms	$d = 1.2 \sqrt{P}$ $d = 1.2 \sqrt{P}$ 80MHz to 800MHz
Radiated RF IEC61000-4-3	3V/m 80MHz to 2.5 GHz	3 V/m	$d = 2.3 \sqrt{P}$ 800MHz to 2.5GHz Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m). Field strengths from fixed RF transmitters as determined by an electromagnetic site survey, should be less than the compliance level in each frequency range. Interference may occur in the vicinity of equipment marked with the following symbol: 
NOTE 1 At 80MHz and 800MHz, the higher frequency range applies.			
NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			
a Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobiles radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the EndoDrive PLUS is used exceeds the applicable RF compliance level above, the EndoDrive PLUS should be observed to verity normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the EndoDrive PLUS.			
b Over the frequency range 150kHz to 80MHz, field strengths should be less than 3 V/m.			

Cables and accessories	Maximum length	Complies with	
Motor Handpiece cord	1.5 m	RF emissions, CISPR11,	Class B/ Group 1
Foot Controler cord	2.5 m	Harmonic emissions,	IEC61000-3-2, Class A
AC Adapter	Plug side : 1.8m	Voltage fluctuations/ flicker emission	IEC61000-3-3
	Unit side : 1.8m	Electrostatic discharge (ESD)	IEC61000-4-2
		Surge	IEC61000-4-5
		Voltage dips, short interruptions and voltage variations on power supply input lines	IEC61000-4-11
		Power frequency (50/60Hz) magnetic field	IEC61000-4-8
		Conducted RF	IEC61000-4-6
		Radiated RF	IEC61000-4-3

Recommended separation distances between portable and mobile RF communications equipment and the EndoDrive Plus.

The EndoDrive PLUS is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the EndoDrive PLUS can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the EndoDrive PLUS as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter W	Separation distance according to frequency of transmitter m		
	150kHz to 80MHz $d = 1.2\sqrt{P}$	80MHz to 800MHz $d = 1.2\sqrt{P}$	800MHz to 2.5GHz $d = 2.3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

*Specifications may be changed without notice.

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