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English

NSK

Cordless Handpiece

ENDO-MATE TC2

Powerful Partners®

OPERATION MANUAL



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Thank you for purchasing the ENDO-MATE TC2
Read this Operation Manual carefully before use for operation instructions and care and maintenance guidelines. Keep this Operation Manual for future reference.

Application

This product is a cordless handpiece used primarily for root canal enlargement.

User

Only qualified personal is allowed to use the unit only in dentistry.

Prohibition

Do not use this motor handpiece for formation of an extremely bent root canal. Do not use this for implants other than endodontic treatment or other dental treatment.

■ Classification of Devices

Classification by type of protection against electric shock:

— Class II devices ⧈

Classification by degree of protection against electric shock:

— Applied part type B

Classification by sterilization or disinfection method allowed by the manufacturer:

— Refer to Sterilization.

Classification by mode of operation:

— Continuously operating device

Guidance and manufacturer's declaration - electromagnetic emissions		
The ENDO-MATE TC2 is intended for use in the electromagnetic environment specified below. The customer or the user of the ENDO-MATE TC2 should assure that is used in such an environment.		
Emissions test	Emissions test	Electromagnetic environment - guidance
RF emissions CISPR11	Group 1	The ENDO-MATE TC2 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 emmissions CISPR11	class B	The ENDO-MATE TC2 is suitable for use in all establishments, including domestic estabilishments and those directly connected to the public low-voltage power supply network that supplynetwork that spplies buidings used for domestic purposes.
Harmonic emissions IEC61000-3-2	class A	
Voltage fluctuations/ flicker emissions IEC61000-3-3	Complies	

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Guidance and manufacturer's declaration - electromagnetic immunity			
The ENDO-MATE TC2 is intended for use in the electromagnetic environment specified below. The customer or the user of the ENDO-MATE TC2 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	±6kV contact ±8kV air	±6kV contact ±8kV 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	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 to line ±2kV lines 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 secs	<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 ENDO-MATE TC2 requires continued operation during power mains interruptions, it is recommended that the ENDO-MATE TC2 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.			

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Guidance and manufacturer's declaration - electromagnetic immunity			
The ENDO-MATE TC2 is intended for use in the electromagnetic environment specified below. The customer or the user of the ENDO-MATE TC2 should assure that it is used in such an environment.			
Immunity test	IEC60601 test level	Compliance level	Electromagnetic environment - guidance
			Portable and mobile FRO communications equipment should be used no closer to any part of the ENDO-MATE TC2, 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	3Vrms	$d = 1.2\sqrt{P}$ $d = 1.2\sqrt{P}$ 80MHz to 800MHz
Radiated RF IEC61000-4-3	3V/m 80MHz to 2.5 GHz	3V/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 meters (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 ENDO-MATE TC2 is used exceeds the applicable RF compliance level above, the ENDO-MATE TC2 should be observed to verity normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the ENDO-MATE TC2.			
b Over the frequency range 150kHz to 80MHz, field strengths should be less than 3 V/m.			

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Recommended separation distances between portable and mobile RF communications equipment and the ENDO-MATE TC2

The ENDO-MATE TC2 is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the ENDO-MATE TC2 can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the ENDO-MATE TC2 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.

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⚠ 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, therefore always follow them.

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.

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⚠ DANGER

- Use the specified batteries for this product. Never use any other batteries than those that NSK specifies.
- This product is designed specifically for use with rechargeable batteries. Do not use manganese or alkaline batteries. Using and charging these by error may cause a fluid leak or explosion.
- Always replace both batteries with the same type at the same time. Using batteries of different-types or an exhausted battery with a fully charged one may cause a fluid leak or explosion.

⚠ WARNING

- This product is Medical Electrical equipment. EMC (Electromagnetic compatibility) is described in the accompanying documentation.
- Portable and mobile RF communications equipment can affect Medical Electrical equipment. Do not use RF equipment outskirts for the product.
- If the handpiece has not been used for long period of time, check it before use to perform correctly.
- Do not handle the power cord with wet hands. Failure to do so may result in an electric shock.
- Do not spill water or a chemical solution onto or into the motor handpiece or battery charger. Failure to do so may result in fire or electric shock due to a short-circuit or breakage due to rust formation.
- Do not disassemble or alter the motor handpiece.
- Do not drop the motor handpiece or battery charger. Place the battery charger on a flat and stable surface.
- Should the battery fluid leak and 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 you notice a battery fluid leak within the motor handpiece, deformation of the motor handpiece casing or partial discoloring, immediately stop use and contact your dealer.
- If you will not use the product for a long period of time, remove the batteries to avoid a fluid leak.
- Do not charge the handpiece without battery lord.
- Be careful not to drop conductive parts such as wires and safety pins into the charging terminal area of the battery charger.
- To charge the motor handpiece, only use a dedicated genuine NSK charger. Never charge this handpiece with a charger other than the genuine NSK charger. When inserting the motor handpiece into the charger, check that the buzzer sounds and the LED indicate charging (animation for remaining battery capacity). Unless charging is indicated, this function is not performed and burns may result by heat generation or liquid leakage may result, therefore, stop use and contact your dealer.

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- The motor handpiece has an electronic circuit (TORQUE LIMITER Function) to prevent files from breaking; however, files may still break due to metal fatigue if the torque is conditioned to be higher.

⚠ CAUTION

- Exercise sufficient care in using the product by giving patient safety first priority.
- The product is to be used for dental treatment only by qualified personnel.
- Use commercially available batteries as specified by NSK. Read the instruction manual included by the battery manufacturer thoroughly before 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 sudden breakage 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, pay 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 your dealer.
- 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 on may cause unintended rotation by accidental activation of the ON/OFF switch.
- When inserting the motor handpiece into the battery charger, position the handpiece correctly. Pushing it into the charger forcibly in the incorrect orientation may cause damage.
- Do not lubricate the motor handpiece. Only lubricate the head and shank.
- Do not heat sterilize the motor handpiece. Do not autoclave the motor handpiece.
- If you are using corrosive or harsh solutions please clean the motor handpiece etc., immediately after use. Failure to quickly clean the motor handpiece etc., can result in damage to the equipment or color changes of the outer casing.
- Do not reverse positive (+) and negative (-) when fitting the batteries.
- Do not throw the batteries into fire as the batteries will rupture, resulting in an accident.
- This equipment is for indoor use only.
- Observe the allowable rotation speed which the file manufacturer specifies for use.

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⚠ NOTICE

- The motor handpiece is designed for commercially available AAA nickel metal hydride batteries (rechargeable). Ni-Cad batteries can also be used, but the charging time and operating time become significantly shorter since the charging current differs.
- The motor handpiece consumes electricity very slightly even when the power 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 automatically stops by detecting a low battery voltage, leaving it for a while and turning on the power again may not detect the low voltage immediately. This is not a failure, but due to battery characteristics. Since the voltage drop does not coincide with the remaining battery capacity, consider it only as a yardstick.
- Recharge rechargeable batteries after they deplete as much as possible. Repeating short-time use and subsequent recharging may shorten their operating time due to a "memory effect." Batteries may recover after repeating complete discharge and full charge a few times.
- Since completely discharged batteries cannot be charged, replace with new ones.
- User shall be responsible for operation, maintenance and operation.

Symbols

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

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.

Class II equipment

Type B conforming component

Refer to the Operation Manual.

1. Features

- Ergonomic design and compact body.
- "6 position type head" allows direction of contra angle head to be changed and the ON/OFF key to be set to a position where it can be easily activated.
- The larger ON/OFF key enhances operability (compared with conventional products).
- Operates continuously for approx. 1.2 hour at rated load. (Dependent upon use conditions.)
- The liquid crystal panel enhances user friendliness.
- Memory for up to 5 programs .
- 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. The memory can store these functions combined with nine different operation programs.

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- The motor handpiece can be turned on and off by pressing the ON/OFF key. Alternatively the unit can be operated by holding down the ON/OFF key during operation and letting go of the ON/OFF key to stop the handpiece.
- The motor handpiece softly starts. Since the rotation briefly stops before changing direction there are no vibrations and shocks during the change of directions.
- Energy saving. The power of the motor handpiece automatically turns off when there are no operations for 10 minutes. (Auto power-off function)
- The feedback circuit, which keeps rotation at a constant speed even when the load on the motor handpiece changes, is built in.
- Non-contact charger prevents improper charging due to deterioration of metallic terminal.
- In spite of non-contact charging, this has realized rapid charging, shortening the time for charging.
- The contra angle heads provided for this product are all autoclavable at 135°C (excluding the motor handpiece).

2. Specification

Battery Charger

Model	NE233
Input Voltage	AC120/240V±10% 50/60Hz
Input Power	15VA
Charging Time	Approx. 90 min.

Motor Handpiece

Model	EM10M2
Input Voltage	DC2.4V±20%
Input Power	0.3VA

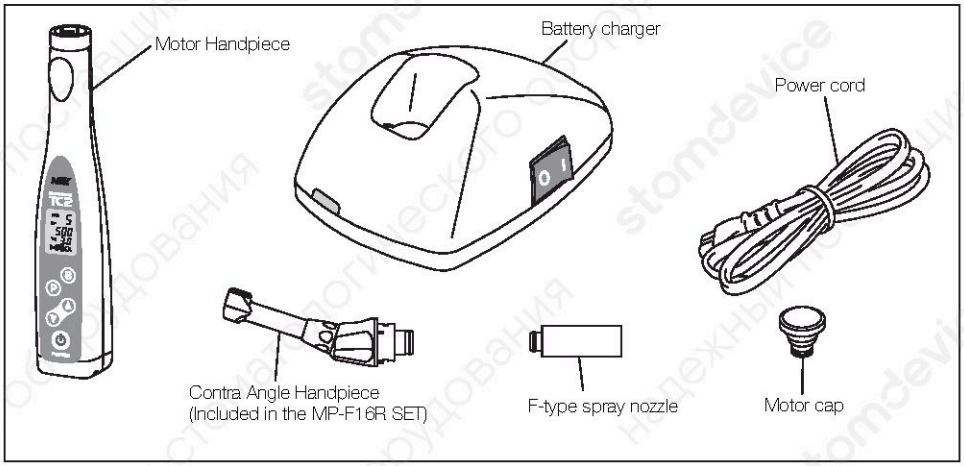
Use environment

Temperature	10 - 40 ℃
Humidity	10 - 75 % (Non condensing)
Atmospheric pressure	500-1060 hPa

Store environment

Temperature	-10 - 50 ℃
Humidity	10 - 80 % (Non condensing)
Atmospheric pressure	500-1060 hPa

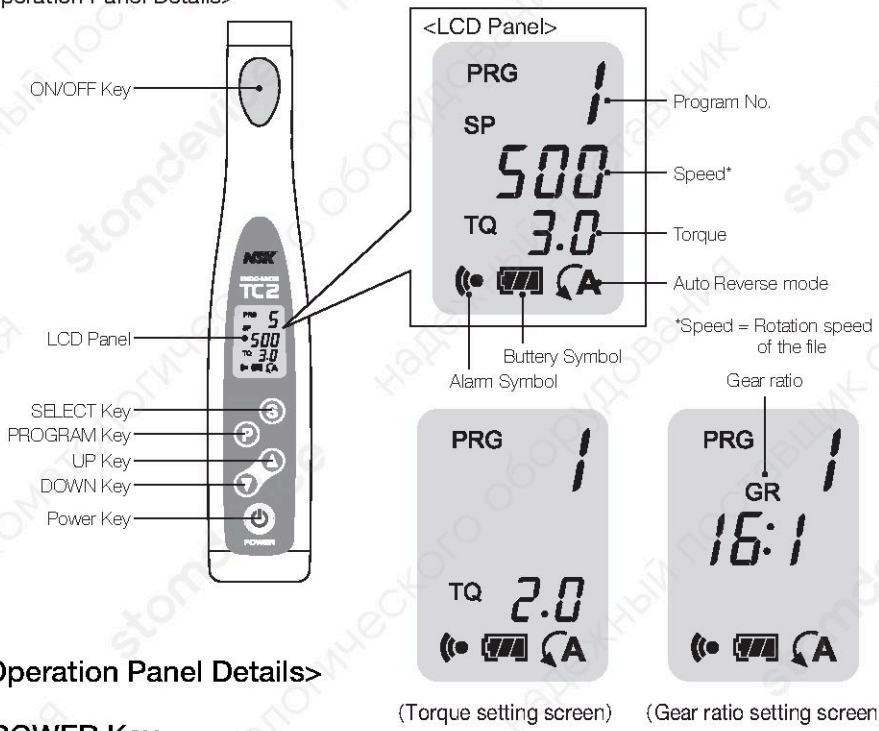
3. Name of each part



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4. Parts and its function

<Operation Panel Details>



(Torque setting screen) (Gear ratio setting screen)

<Operation Panel Details>

• POWER Key

- Holding down the POWER key for more than one second turns on the power and the LCD panel lights.
- Holding down the POWER key for more than one second while the power is on turns off the power and the LCD display turns off.

• ON/OFF Key

Pressing this switch, when the power is on, rotates the motor handpiece, and de-pressing the switch again stops the handpiece. (Normal rotation operation) Pressing and holding the switch for approx. one second or longer rotates the motor handpiece and releasing the switch stops the handpiece. (Temporary rotation operation)

• SELECT Key

Press the SELECT key to change speed, torque or gear ratio setting. Select the parameter for which you want to adjust the set value.
The following parameters can be changed in the following order: speed (SP) → torque (TQ) → gear ratio (GR). However, gear ratio cannot be set during rotation of handpiece.

Pressing and holding this SELECT Key for 1 second or longer, when the motor handpiece is stopped can change the Auto reverse mode. (See Auto Reverse)

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⚠ NOTICE

- If the speed or torque set value has reached the upper limit or lower limit when the gear ratio has been changed, the alarm sounds.
- The indication of "– –" for torque setting is the upper limit value of torque. If you attempt to set torque which exceeds this value, the alarm sounds.
- The speed can be set at any time if it is normally indicated.

• PROGRAM Key

A program can be selected.

The present program number is displayed. There are 5 programs available, numbered from 1 to 5.

Up to five programs can be set, and program settings can be memorized by pressing this key for one second or longer.

The following parameters can be set: Speed, torque, gear ratio and auto reverse setting.

• UP/DOWN Key

Use this key when adjusting the set value for each parameter.

Alarm sounds if the set value exceeds the upper limit or lower limit.

Unit to be set is min^{-1} for torque and N·cm for torque. Set torque suitable for contra angle.

For gear ratio, 4 : 1, 10 : 1, 16 : 1 or 20 : 1 can be set.

<LCD panel>

• AUTO REVERSE

The current auto reverse mode mark is displayed.

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

A AUTO STOP: If the load is removed after auto reverse rotation, it stops.

No Display AUTO REVERSE OFF: Auto reverse rotation is not activated. (There will be no symbol displayed)

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- **BATTERY Symbol**

The symbol indicating the battery status is displayed regardless of the ON or OFF position of the power. The symbol will be animated when the batteries are being charged or in the refresh mode

 : Full charge or nearly full charge

 : About 30-80% remains

 : Less than about 30% remains

 : Batteries are drained or in a remarkably low voltage. Charge the batteries.

NOTICE

The symbol indicating theremaining amount of the batteries indicates a voltage. When load is applied to the motor handpiece, the symbol indicating the remaining amount of the battery charge appears to become lower.

- **ALARM Symbol**

The present alarm symbol is displayed.

 : Alarm ON

No Display : Alarm OFF(No display)

NOTICE

Load alarm when the motor rotates and auto reverse sound can be set to ON/OFF. (Refer to 6 (4) Alarm Sound Volume Control)

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5. Operations

(1) Charging Batteries

1. Insert the power cord jack into the inlet at the back of the battery charger. (Fig. 4)
2. Insert the power cord and plug in. Make sure you have the correct model/voltage.
3. Turn on the power switch. At this time, check that the power lamp lights up. (Fig. 5)
4. Insert the motor handpiece into the battery charge. Charging starts with the charge mark flashing on LCD.
5. When the buzzer sounds and "FUL" is displayed on the liquid crystal panel, charging is completed.

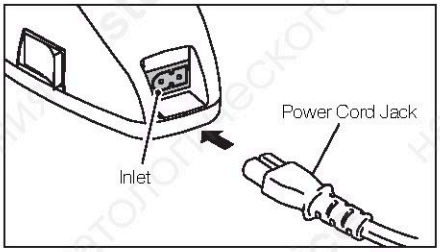


Fig. 4

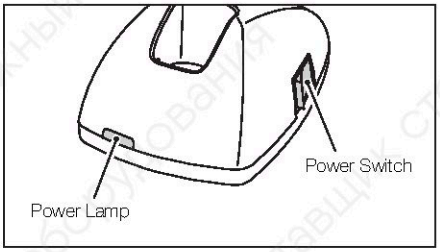


Fig. 5

⚠ WARNING

When the buzzer does not sound and the charging animation is not displayed despite batteries being replaced with new ones, immediately stop using and contact your dealer. (Refer to ■ Changing Batteries)

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⚠ CAUTION

- When the power lamp for the charger does not light up, the internal fuse may be faulty. In this case please contact your dealer.
- Be careful of handling when placing the motor handpiece in to the charger. Do not force the handpiece into the charger. Otherwise, failure may be occur.
- If the power cord is inserted into the jack or the power switch is pressed with unnecessary force, the cord or switch may be broken or a short-circuit may occur.
- Never use the battery charger for anything other than the motor handpiece of this product.
- The charging normally takes approx. 90 minutes, but it depends on battery use conditions, battery freshness, ambient temperature, etc. Older batteries are especially prone to significantly shorter charging and operating times.
- Batteries may slightly warm up during charging, but this is not a failure. If the handpiece is inserted or removed into/from the charger at short intervals, (approx. 5 minutes) charging cannot be properly completed and the battery compartment may feel hot. We recommend that you charge batteries for as longer periods as possible.
- The power of the motor handpiece should not be turned on immediately after it has been removed from the charger, wait at least approx. 2 seconds before you swith on the power.
- Completely discharged batteries cannot be charged. Replace them with new ones.
- Do not put anything (metal or other devices such as wire, safety pin, or coin) other than the handpiece on the charger. Otherwise, burn or failure may result due to heat generation.
- The temperature of the batteries is measured during charging. Proper charging cannot be performed 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 the batteries is excessively high or low. (Lower than approx. 0°C or higher than approx. 40°C)
  - · Battery voltage is sufficient
  - · Battery voltage is abnormal

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(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 out axially.

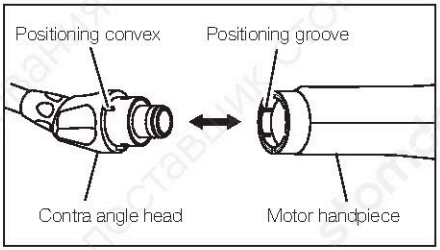


Fig. 6

⚠ CAUTION

- Turn OFF the power to remove or attach the contra angle head.
- Check that the contra angle head is securely connected to the motor handpiece.

(3) Mounting and Removing File

Insert file to contra angle head, lightly turn the file until it engages with the latch mechanism. Push it inward to click

File Removal, depress the push-key and pull out the file.

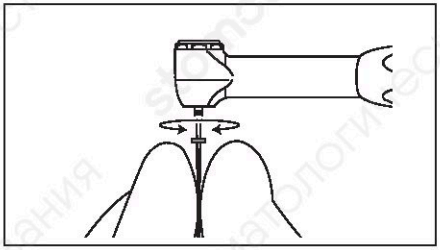


Fig. 7

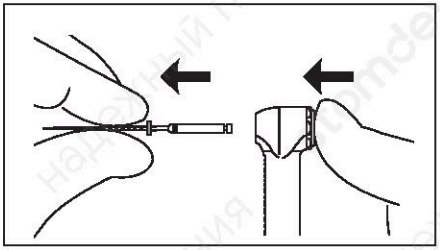


Fig. 8

⚠ CAUTION

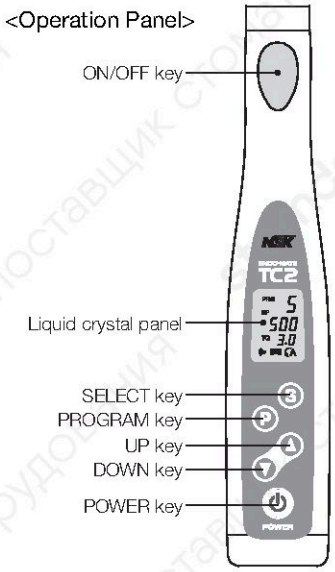
- When attaching and detaching the file, turn off the power beforehand.
- After the file is locked in place, lightly pull out the file to make sure the file is locked.
- Always clean the shank of the file to be installed before use. Allowing dirt to enter the chuck could cause loss of concentricity and deterioration of chucking force.
- Do not exceed the rotation speed recommended by the file manufacturers.

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(4) Preparatory Operations

1. Hold down the POWER key for more than one second to turn on the power.
2. Keep holding down the PROGRAM key until program No. suitable for file to be used is displayed.
3. When changing the set value of speed, torque, gear ratio or auto reverse, press the SELECT key, select the setting item and press the UP/DOWN key to change.



NOTICE

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

(5) Operation

If you press the ON/OFF key briefly, the motor handpiece starts. If you re-press the key, it stops. (Alternate operation)
If you hold down the ON/OFF key for more than one second, the motor handpiece starts while the key is pressed. If you release the key, it stops. (Intermittent operation)

■ Auto Reverse Function

Auto reverse setting can be changed by pressing the SELECT key for one second or longer while the motor handpiece stops. As the auto reverse mark flashes while the SELECT key is kept pressed, press the UP/DOWN key to adjust it.

: Auto Reverse

A : Auto Stop

: Auto Reverse OFF (flashes while the SELECT key is kept pressed, and goes out when it is released)

The alarm will sound when it becomes a value of half of a torque limit set up during motor handpiece rotation, and the alarm will change near the torque limit value. (Load alarm) When it continues applying a load and it exceeds the torque limit value you can select mode from the following three modes.

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AUTO REVERSING

The handpiece stop that it reaches for the loaded value, the file rotates in reverse. When a load is removed, the file returns to normal rotation (forward rotation) automatically

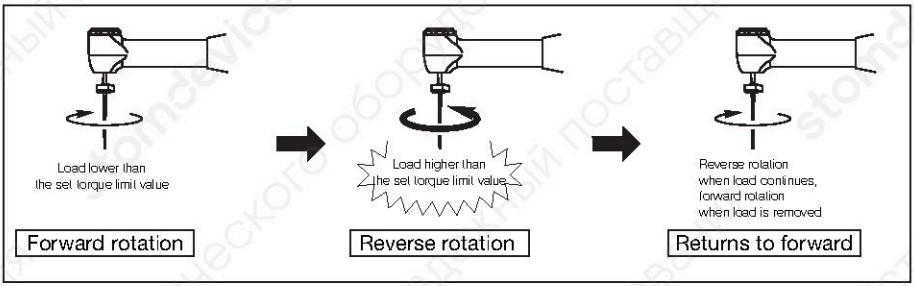


Fig. 9

AUTO STOP

The motor handpiece starts in reverse. When a load is removed, the motor handpiece stops. If you want it to rotate (forward-rotate) again, re-press the ON/OFF Key or re-step.

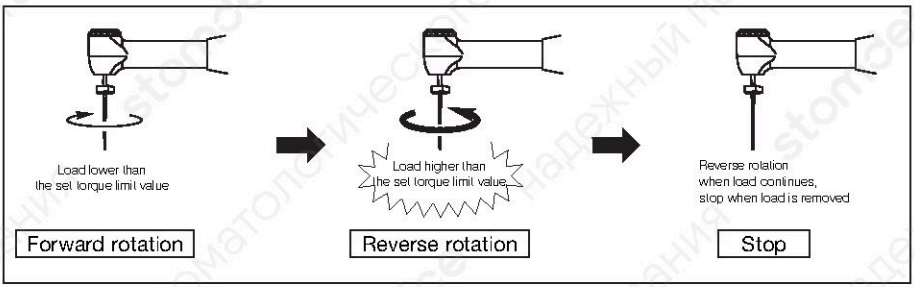


Fig. 10

AUTO REVERSE OFF

The motor handpiece stops without reverse rotation. If you want it to rotate (forward-rotate) again, re-press the ON/OFF Key or re-step.

⚠ CAUTION

- When the battery charge goes down, the actual load may not reach the preset torque limit value. In this case this auto reverse function will not be activated.
- If a load is continuously applied to the motor handpiece, it may automatically stop to prevent overheating. In this case, leave the motor handpiece for a while until it cools down.
- If the ambient temperature is low, the alarm may sound when the motor handpiece rotates, however, this is not a failure. If the alarm does not stop sounding even when the ambient temperature increases, clean the contra angle head and perform calibration. (Refer to 6 (3) Calibration)

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(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.

■Auto Power Off

If the key is not operated or approximately 10 minutes passes during rotation with no-load, the power is automatically turned OFF to save energy and prevent improper operation. However, if load is applied during rotation of the motor handpiece, the power is not turned OFF even during no operation.

■LAST MEMORY

The last setting used before the power is turned OFF is memorized. The setting when the power is turned ON next is as that immediately used before the power has been turned OFF.

6. Convenient Function

(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 UP/DOWN key according to your needs.
3. Hold down the PROGRAM key for more than one second. When the alarm sounds the settings have been memorized.

⚠ NOTICE

- The program cannot be memorized while the motor handpiece is in motion.
- The program is not memorized unless the PROGRAM key is held down for more than one second. If the program number is changed by the PROGRAM 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. Hold down the POWER key for more than one second, while pressing the PROGRAM key at the same time.
3. Release the keys when the LCD panel indicates " SEt ", and re-press the PROGRAM key while this is displayed.
4. Initialization is completed, when " F in "is displayed.

⚠ NOTICE

If this function is used, all programs will disappear and return to the originally set values. Record the present program details if required before you carry out this operation.

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(3) 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 NSK PANA SPRAY/PANA SPRAY Plus (option). (Refer to the "7 (1) Lubricating Contra Angle Head.")
2. Turn on the power.
3. Hold down UP/DOWN key simultaneously for more than one second.
4. The LCD panel displays "CAL" with the alarm sound.
5. Attach the contra angle head to the motor handpiece and press the UP/DOWN key. (Remove the bar or TEST bar.)
6. If the motor handpiece begins to rotate, leave it as it is until it stops.
7. This process ends, if the rotation stops and the LCD panel display returns to its original state.
8. If you want to stop this process, turn off the power.

⚠ NOTICE

- This function does not work unless remaining battery capacity is sufficient.
- Perform calibration after cleaning the contra angle head. Residual contamination on the rotating shaft will impair correct measurement.
- Do not touch or apply a load to the rotating shaft of the contra angle head. It will obstruct accurate measurement.
- This function cannot completely absorb the individual difference of the actual motor handpiece and contra angle head.

(4) Alarm Sound Volume Control

1. Setting alarm sound

You can turn ON/OFF the alarm (load alarm) which sounds near the torque limit value when the motor handpiece rotates and the alarm during auto reverse (auto reverse sound).

1. Turn on the power
2. Keep pressing the POWER key for one second or longer while pressing the SELECT key.
3. The alarm mark and ON or OFF on the LCD panel, and the sound volume changes.
4. Press the SELECT key to select ON or OFF for alarm sound.
5. Display on the liquid crystal panel (LCD) returns to the original state if no operation is performed for a while.

⚠ NOTICE

The volume setting is memorized automatically to the last setting and remains unchanged even if the power is turned off.

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7. Cleaning

(1) Lubricating Contra Angle Head

- Lubricate the contra angle head only.
- Apply PANA SPRAY/PANA SPRAY Plus after each use and/or before each calibration and autoclaving

1. Lubricate it before each autoclaving or once a day if you do not autclave, using PANA-SPRAY/PANA-SPRAY Plus lubricant. Screw the F type spray nozzle onto the Pana-Spray nozzle by approx. 10 turns.
2. Insert the F type spray nozzle into the rear part of the contra angle head and lubricate the head for 2-3 seconds. If the handpiece does not push into nozzle enough, oil may not go around into the handpiece and it may flows backward.

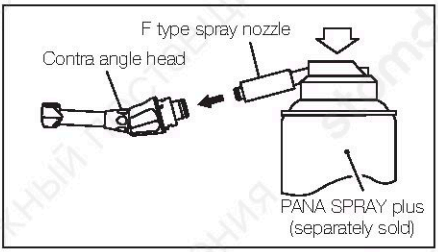


Fig. 11

(2) Cleaning Motor Handpiece

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

(3) Cleaning Charger

When the charger becomes dirty, wipe it off with a cotton cloth moistened with surgical spirit.

⚠ CAUTION

- Do not lubricate the motor handpiece.
- Before mounting the lubricated contra angle head to the motor handpiece, wipe off excess oil. Stand it on its end or lean it in the proper position for gravity draining. Mount it after excess oil has been completely drained.
- Hold the contra angle head securely to prevent it from flying off by the pressure of the spray.
- Hold the PANA SPRAY (option) upright.
- When cleaning the motor handpiece, do not use any solvent such as benzene and, thinner.

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8. Sterilization

Sterilize the contra angle head only.
For the sterilization method, we recommend the autoclaving. Autoclave sterilization required after each patient as noted below.

■ Autoclaving

1. Brush the dirt off the surface of the contra angle head, and wipe it off with a cotton cloth moistened with surgical spirit. Do not use a metal brush.
2. Lubricate the head with the PANA-SPRAY/PANA-SPRAY Plus. (Refer to the "7 (1) Lubricating Contra Angle Head.")
3. Insert the head into an autoclave pouch and seal it.
4. Autoclavable up to a max. 135°C (275°F).
   ex.) Autoclave for 20 min. at 121°C (250°F), or 15 min. at 132°C (270°F).
5. Keep the handpiece in the autoclave pouch to keep it clean until you use it.

* Sterilization at 121°C for more than 15 minutes is recommended by EN13060 or EN554.
* Performing sterilization according to our instruction has minimal effect on the instruments. Life span is generally determined by wear and damage due to use.

⚠ CAUTION

- Do not heat sterilize the motor handpiece.
- Skip dry cycle if the temperature could exceed 135°C (275°F).
- Since the lowermost tray inside the chamber of the autoclave is close to a heater and the temperature in that place may locally exceed 135°C (275°F), place the head on the central or upper tray.
- Do not wipe with, or clean or immerse in, high acid water or sterilizing solutions.

9. Motor Cap

When the contra angle head is removed from the motor handpiece for battery charging, lubrication, or sterilization, mount the motor cap onto the motor handpiece to prevent debris from entering.

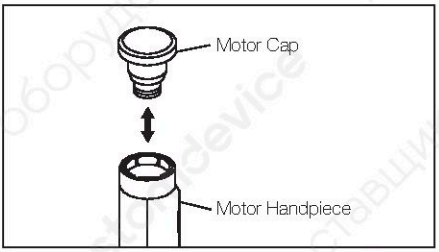


Fig. 12

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10. Saffty System

The motor handpiece monitors temperature of the batteries. If the batteries can potentially become abnormally hot, this system functions and the motor handpiece automatically stops. In such a case, wait until the motor handpiece cools down sufficiently. If this safety system functions repeatedly, either the batteries or motor handpiece is not in the normal operating condition and you should contact your dealer.

11. 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 becomes shorter or the rotation speed becomes slower, although the "MEMORY EFFECT" described in "⚠NOTICE" is not applicable, the batteries may be at the end of their life expectancy. In such a case, ask your dealer to replace the batteries or replace them with new ones yourself. (Refer to the "■Changing Batteries.") When replacing them by yourself, be sure to observe the following "⚠CAUTIONS ON CHANGING BATTERIES." Please note that NSK shall not be liable for any malfunction or failure resulting from you changing the batteries yourself and not following the "⚠CAUTIONS ON CHANGING BATTERIES."

⚠ CAUTIONS on CHANGING BATTERIES

- Do not open any part other than the battery cover.
- Use only batteries as specified by NSK.
- Designated Batteries : AAA (marking may be different) nickel metal hydride batteries, nominal 1.2 V
- Do not use non-charging type batteries such as alkaline batteries and manganese batteries. Charging with these batteries may cause fluid leaks, explosion or chlorine gas generation.
- Should the battery fluid leak and get into your eyes, immediately wash thoroughly with clean water and seek medical attention.
- 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 a skin irritation.
- Always replace two batteries of the same type by the same manufacturer at the same time. Using batteries of different-types, an exhausted battery with a fully charged one, or a new battery with an old one may cause a fluid leak or explosion.
- Do not work with wet hands. Failure to do so may result in rust formation on battery terminals or moisture intrusion inside, and could cause failure of the product.

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■ Changing Batteries

Prepare small screwdrivers (Phillips, flatblade).

1. Turn off the power of the motor handpiece.
2. Remove the rubber cover from the battery cover with a thin flatblade screwdriver. (Fig. 13)
3. Remove the screw fixing the battery cover with a Phillips screwdriver. (Fig. 14)
4. Remove the battery cover by sliding it toward the charging terminal. (Fig. 15)
5. Remove old batteries.
6. Insert new batteries according to the polarity marking in the battery box. A mix-up between the plus and minus sides will not allow operation of the handpiece.
7. Attach the battery cover.
8. Tighten the screw with a Phillips screwdriver. Do not overtighten it.
9. Insert the rubber cover back into the screw hole of the battery cover in the originally inserted direction.

Changing of batteries is now completed. Charge them fully before use.

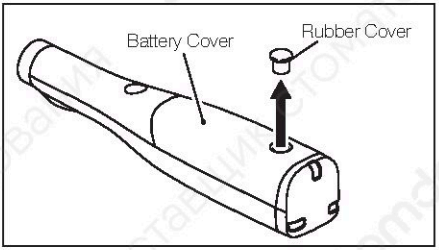


Fig. 13

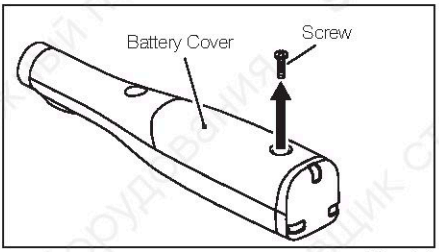


Fig. 14

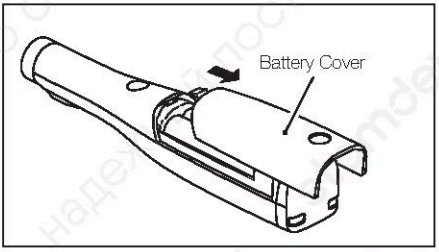


Fig. 15

⚠ CAUTION

- Do not misplace the rubber cover and screw.
- The used nickel metal hydride batteries are recyclable, but their disposal may sometimes not be permitted by the respective country. Return them to your dealer.

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12. 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.

	Error code	Error	Cause	Check/Remedy
During rotation of the motor handpiece	E-0	Self-Check error	Malfunction of circuit	Contact your dealer
	E-1	Overcurrent	The motor handpiece is locked. (at the time of the auto reverse mode)	Remove load
	E-2	Overvoltage	Malfunction of circuit	Contact your dealer
	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.
At the time of Charging	E-9	Charger failure	Malfunction of charger	Contact your dealer
	E-c	Low voltage of batteries	The voltage of batteries is too low (The life of batteries or not inserted.)	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 your dealer.
	E-E	Outside the range of working temperature	Outstanding the range of working temperature or break in the thermistor in the battery section	Use within the range of working temperature.
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 your dealer
At the time of calibration	C 0	Beyond the upper limit	The operating life of the motor handpiece or contra angle has expired	Replace the motor handpiece or contra angle head.
	C 1	Below the lower limit		

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13. Troubleshooting

When trouble is found, please check the following again before consulting your dealer. 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 your dealer.

Problem	Cause	Solution
The power is not turned on.	Batteries have fully discharged. (Has the handpiece been left with batteries inserted for a long time?)	Recharge the batteries. If battery does not fully discharge, charge will start. If the battery fully discharge, change it for new.
	No batteries are inserted.	Insert batteries.
	The internal fuse has burnt.	Contact your dealer.
The battery charger does not work. (The CHARGE animation does not display)	Batteries have been completely discharged.	Replace with new batteries.
	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.	If the temperature of batteries is more than 40°C, the batteries are not rechargeable. Charge within the range of working temperature. 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 your dealer.
	The voltage of a battery is too high	Check that no battery other than nickel-hydrogen battery is used.
	The motor handpiece is correctly set to the charger.	Correctly set.
	Metal such as wire or safety pin is placed on the charger.	Remove metal on the charger.
	An error code is displayed.	See 12. Error Code.
The battery charger does not work. (the power for the charger is not turned ON)	The power cord plug is not inserted into the outlet.	Insert the power cord plug into the outlet.
	The power cord jack is not inserted into the inlet on the charger.	Insert the power cord jack into the inlet on the charger.
	The power for the charger is OFF.	Turn ON the power for the charger.
	The fuse has burnt.	Contact your dealer.

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The motor handpiece set to the charger abnormally gets hot.	If nothing is displayed on the liquid crystal panel of the handpiece even when it is set to the charger, failure in the circuit is predicted.	Contact your dealer.
The motor handpiece does not rotate.	The contra angle head has jammed up.	Clean or replace the contra angle head.
Power from the motor handpiece is weaker than usual.	Batteries are weakened (lower remaining battery capacity)	Charge the batteries.
The Auto Reverse does not work.	Batteries are weakened (lower remaining battery capacity)	Charge the batteries.
Rotation speed of the motor handpiece is lower.	Batteries are weakened (lower remaining battery capacity)	Charge the batteries.
The alarm sounds when the motor handpiece is rotated.	The ambient temperature is low.	Use in a warm room.
	There is some residual contamination on the rotating shaft of the contra angle head.	Clean the contra angle head.

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14. Warranty

Manufacturer warrants its products to the original purchaser against defects in material and workmanship under normal practices of installation, use and servicing. Batteries etc., are disposable components, and are not covered by this warranty.

15. Disposign Product



- Please consult with the dealer from whom you purchased regarding waste disposal.
- The used nickel metal hydride batteries are recyclable, but their disposal may sometimes not be permitted by the respective country. Return them to your dealer.

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