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C-SMART-I

User Manual EN



PRO

ENDO MOTOR

COXO®
Professional Dental Manufacturer
SINCE 2003

CE 0197

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Introduction

Congratulations on your purchase of the endo motor.
Read this operation Manual carefully before use for operating instructions, care and maintenance. Keep this manual for future reference.

Notice

The trademarks mentioned in this manual are the property of their legally registered companies.
The file manufacturers, file system names and the file names referred to in this manual are for identification purposes only and are the property of their respective manufacturer or brands.

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

The device is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the device can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the device 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		
	150 kHz to 80 Mhz $d=1.2\times P^{1/2}$	80 Mhz to 800 MHZ $d=1.2\times P^{1/2}$	80 MHz to 800 Mhz $d=2.3\times P^{1/2}$
0.01	0.12	0.12	1.23
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	2.3

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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Guidance and Manufacture's Declaration – Electromagnetic Immunity

The device is intended for use in the electromagnetic environment specified below. The customer or the user of device should assure that it is used in such an environme.

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment – guidance
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz 6 Vrms in ISM ban 3 V/m 80 MHz to 2.7 GHz	3 Vrms 150 kHz to 80 MHz 6 Vrms in ISM bands	Portable and mobile RF communications equipment should be used no closer to any part of the device, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter
Radiated RF IEC 61000-4-3	385MHz-5785MHz Test specifications for ENCLOSURE PORT IMMUNITY to RF wireless communication equipment (Refer to table 9 of IEC 60601-1-2:2014)	3 V/m 80 MHz to 2.7GHz 385MHz-5785MHz Test specifications for ENCLOSURE PORT IMMUNITY to RF wireless communication equipment (Refer to table 9 of IEC 60601-1-2:2014)	Recommended separation distance $d=1.2\times P^{1/2}$ $d=1.2\times P^{1/2}$ 80 MHz to 800 MHz $d=1.2\times P^{1/2}$ 800 MHz to 2,5 GHz 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[a] should be less than the compliance level in each frequency range[b] Interference may occur in the vicinity of equipment marked with the following symbol:

NOTE 1 U_T is the a.c. mains voltage prior to application of the test level.
NOTE 2 At 80 MHz and 800 MHz, the higher frequency range applies.
NOTE 3 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 mobile 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 device is used exceeds the applicable RF compliance level above, the device should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the device.

b Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

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Guidance and Manufacture's Declaration – Electromagnetic Immunity			
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Immunity test	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment – guidance**
Electrostatic discharge (ESD) IEC 61000-4-2	±8 kV contact ±2 kV, ±4 kV, ±8 kV, ±15 kV air	±8 kV contact ±2 kV, ±4 kV, ±8 kV, ±15 kV air	Floors should be wood, concrete or ceramic tile. If floor are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2kV for power supply lines ±1 kV for Input/output lines	±2kV for power supply lines ±1 kV for Input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±0.5 kV & ±1 kV differential mode ±0.5 kV, ±1 kV & ± 2 kV common mode	±0.5 kV & ±1 kV differential mode ±0.5 kV, ±1 kV & ± 2 kV common mode	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 IEC 61000-4-11	100 % *UT* (100% dip in *UT*.) for 0.5 cycle 100 % *UT* (100% dip in *UT*.) for 1 cycle 30 % *UT* (70% dip in *UT*.) for 25/30 cycles 100 % *UT* (100% dip in *UT*.) for 250/300 cycle	100 % *UT* (100% dip in *UT*.) for 0.5 cycle 100 % *UT* (100% dip in *UT*.) for 1 cycle 30 % *UT* (70% dip in *UT*.) for 25/30 cycles 100 % *UT* (100% dip in *UT*.) for 250/300 cycle	Mains power quality should be that of a typical commercial or hospital environment. If the user of the device requires continued operation during power mains interruptions, it is recommended that the device be powered from an unit eruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3A/m	3A/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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15 EMC

This product needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided, and this device can be affected by portable and mobile RF communications equipment.

CAUTIONS

- Do not use a mobile phone or other devices that emit electromagnetic fields, near the device. This may result in incorrect operation of the device.
- This device has been thoroughly tested and inspected to assure proper performance and operation!
- This device should not be used adjacent to or stacked with other equipment and that if adjacent or stacked use is necessary, this device should be observed to verify normal operation in the configuration in which it will be used.

Guidance and Manufacture's Declaration – Electromagnetic Emission		
The device is intended for use in the electromagnetic environment specified below. The customer or the user of device should assure that it is used in such an environme.		
Emission test	**Compliance**	**Electromagnetic environment – guidance**
RF emissions CISPR 11	Group 1	The device use 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 CISPR 11	Class B	The device is suitable for use in all establishments, including domestic establishments directly connected to the public low-voltage power supply network with specific requirement.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

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1 General information

	Warning		Caution
 NOTE	Additional information, explanation on operation and performance.		For indoor use only
	Refer to instruction manual/booklet		Special disposal of waste electrical and electronic equipment (Directive 2002/96/EEC)
	Serial number		Manufacturer
	Keep dry!		Direct current
	Fragile		Type B applied part
	Class II product		Vertical up
	European Union agent		CE marked product

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2 Indications for use

The device is the supplementary root-canal treatment device which can assist the dentists to shape more standard root-canal in the process of root-canal treatment based on the micro-electronic control technology. This instrument contributes to alleviate the dentist's working intensity.

This device must only be used in hospital environments, clinics or dental offices by qualified dental personnel.

3 Contraindications

- In cases where a patient has been fitted with an implanted heart pacemaker (or other electrical equipment) and has been cautioned against the use of small electrical appliances (such as electric shavers, hair dryers, etc.) it is recommended not to use the device.
- The device should not be used for severely curved root canal preparation.
- Do not use the device for implant or any other dentist procedure outside endodontics.

4 Warnings

The device must only be used in suitable locations and only by specialized physicians licensed to practice dentistry.

In this chapter, a description of serious adverse reactions and potential safety hazards for the product or the user/patient is included.
Read the following warnings before use.

WARNINGS

- The device must only be used in suitable locations and only by specialized physicians licensed to practice dentistry.
- Confirm that the operating voltage and the mains voltage are compatible.
- Use the specified battery for this product. Never use a battery other than those specified by manufacturer.
- Use the manufacturer AC adapter for this product. Never use any other AC adapters.
- If you do not use the device for a long period of time, remove the battery to avoid fluid leak.
- If you should notice battery fluid leak, deformation of the motor handpiece casing or partial discoloring, immediately stop use and contact your distributor.

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Problem	Cause	Solution
The motor stops automatically	Auto reverse is not set	Go to setup mode and set the Auto reverse option to On
	The load is too large to exceed the maximum output of the device	Manually release the load
	Lip hook wire connection unreliable	Reconnect
	File holder is not connected to file	Reconnect
M3 mode apex locator display exception / no display	Lighting device failed	Replace the lighting device
	The root canal is in poor condition	Follow the prompts of **8.3.1.4 TIps for successful Length measurement**
	The control unit has failed	Follow the steps described in **8.4 Function check of the apex locator**. If there is a problem, contact your dealer
	Motor wire	Replace the motor handpiece
File frequently reversed	The torque value is set too low	Adjust the torque setting
	Apex locator is not accurate	Follow the prompts of **8.3.1.4 Tips for successful Length measurementt**
	Lip hook wire failure	Replace the lip hook wire
Light is not on	LED lighting is set to off	Set the LED light switch to on
	Lighting device is unreliable	Reconnect
	Lighting device failed	Replace the lighting device

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14 Troubleshooting

If the device is not working properly, please check the following table before calling our service center.

Problem	Cause	Solution
Cannot turn on the power	The battery is low	Please charge in time
	Battery failure	Replace the battery
Cannot charge the battery	The adapter is not reliably connected	Check that the adapter connection is reliable
	Battery failure	Replacement battery
The battery is running out quickly	The charging time for the battery is too short	Charging time for more than 5 hours or until the screen shows full charge
	Battery aging	Replacement battery
M1 mode apex locator imprecise / not sensitive	Test wire connection unreliable	If the test wire icon is flashing, reconnect the test wire or you can contact the file clip to lip hook directly to check the connection status
	The test wire has an open circuit or a short circuit	Replace test wire
	The root canal is in poor condition	Follow the prompts of 8.3.1.4 **Tips for successful Length measurement**
	The control unit has failed	Follow the steps described in 8.4 **Function check of the apex locator** If there is a problem,contact your dealer
Cannot start the motor / motor does not work	The motor handpiece connection is unreliable	If the contra angle icon flashes, it indicates that the motor handpiece connection is unreliable.
	Low voltage protection	Please charge in time
	Contra angle stuck	Clean or replace the contra angle
	Motor handpiece failure	Replace the motor handpiece
	Control unit failure	Contact the dealer
When the motor is running, the torque value is high	Contra angle wear, resistance becomes larger	Enter the setup mode and run the calibration procedure. If the calibration fails, replace the contra angle

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WARNINGS

- Do not disassemble or alter the motor handpiece.
- Do not expose the unit, motor handpiece or battery charger to any liquid.
- Do not expose the device to direct or indirect sources of heat. Operate and store the device in a safe environment.
- Do not drop the device.
- In order to avoid possible risks due to electromagnetic interference, do not use any electrical medical device or electrical device of any other kind in close proximity to the device.
- The device may possibly malfunction if used in the presence of an electromagnetic interference wave. Do not install the device in the vicinity of any device that emits magnetic waves.
- Do not use the device in the presence of free oxygen or anesthetic substances or flammable products.
- None of the device components are delivered disinfected or sterilized: components such as control unit, motor and motor cable need to be disinfected, the contra-angle and Lip hook needs to be sterilized prior to first use and in between each patient!
- The plastic enclosure is not sealed, do not use any liquid or spray directly on the unit, especially on the monitor or near the electrical sockets.
- Follow the file manufacturer's instructions for use of the endodontic files.
- The file system shown on the display must always match the file in use. This is of the utmost importance in order to avoid misusing reciprocating files and continuous rotary files.

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5 Precautions

- Read these safety precautions thoroughly prior to use. These precautions allow you to use the product safely, preventing harm to you and others.
- Refer to the WARNINGS chapter to verify any special care to exercise before starting to use the complete device.
- Before changing the contra-angle or file, turn off the power of the unit. Changing with the power kept on may cause unintended rotation by accidental touch of the ON/OFF key.
- 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.
- Pay attention to the direction of the battery connector when installing. Forcible setting in the wrong direction may cause damage and fluid leakage due to a short circuit.
- Fully-charged rechargeable batteries generally discharge gradually over time even though the device is not used. It is recommended to recharge the battery just before use.
- When disposing of the control unit, follow the instructions of your local government for disposal, as they contain materials which may become industrial waste.
- This product does not consider a patient's age, gender, weight or nationality.

The manufacturer declines any responsibility in the case of:

- Use of the device for applications other than those specified in the instructions for use and maintenance.
- Modifications or repairs performed by persons not authorized by the manufacturer.
- Use of non-original components or components other than those specified in the Standard Components chapter.
- File breakage due to missus
- Accessories or device breakages due to sterilization: none of the device components are sterilizable (except for the contra-angle).

6 Adverse Reactions

There are no known adverse reactions.

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11 Operating environment and Storage, Transportation conditions

11.1 Operating environment

Ambient temperature:	+5°C - +40°C
Relative humidity:	20% - 80%
Air pressure:	860 hPa - 1060 hPa

11.2 Transportation and storage conditions

Ambient temperature:	+5°C - +40°C
Relative humidity:	≤93%
Air pressure:	860 hPa - 1060 hPa

12 Technical parameter

Adaptor:	input: 100-240V~ 50-60Hz
	output: d.c. 10V 1.5A
lithium battery:	Voltage: DC7.4V
	Capacity: 2600mAh
Speed range:	150rpm-650rpm
Torque range:	0.6-5.2N.cm
Protection against electrical shock:	type B
Protection type against electrical shock:	class II(adaptor)

13 Recycling and Disposal

This product and its packaging are designed to be as environmentally friendly as possible.

Disposal:

Dispose of used equipment according to the regulations and standards of your country (region).

Ensure that all components do not become contaminated during disposal.

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- Steam sterilizer according to DIN EN 13060 or DIN EN 285.
- The Sterilization validation has been performed in compliance with DIN EN ISO 17665 (Valid installation and operation qualification (IQ and OQ) and product-specific performance qualification (PQ).

- **Maximum Sterilization temperature 134 °C (273 °F); plus tolerance according to ISO DIN EN ISO 17665.**
- **Sterilization time (exposure time at Sterilization temperature) at least 18 min. at 134 °C (273 °F).**

- The rapid Sterilization method or the Sterilization method of unpacked accessories is not permitted.
- Also do not use any hot air Sterilization, no radiation Sterilization, no formaldehyde or ethylene oxide Sterilization and no plasma Sterilization.

9.2.6 Storage

After Sterilization, the instruments must be stored in the Sterilization package and kept dry and dust-free.

9.2.7 Material Resistance

When selecting the cleaning and disinfecting agents, please ensure that they do not contain phenol, strong acids or strong aldehyde disinfectants or anticorrosion solutions. The material is resistant up to 137 °C/279 °F (maximum exposure temperature).

10 Guarantee

- Product and technical services are in charge of our company, the technical department will provide technical support for you when there are technical problems.
- The main unit is guaranteed for 24 months from the date of purchase.
- The accessories (adaptor and power cord)are guaranteed for 6 months.
- The guarantee is valid for normal usage conditions. Any modification or accidental damage will render the guarantee void.

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7 Components, installation and charging

7.1 Standard Components


Control unit


Motor handpiece

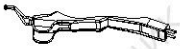

Contra angle


File clip


Lip hook


Test wire


Lip hook wire


Lighting device


Tester


AC adapter


Handpiece stand


User Manual

7.2 structure

① Charging socket / test wire socket
② Lip hook wire socket
③ Motor handpiece socket
④ Power button



Fig. 1

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7.3 How to connect each part

CAUTIONS

Do not pull on the wire when removing the part with the wire.

7.3.1 Connecting and Disconnecting the Motor Handpiece

a. Connecting

Align the ◄► mark of the cord plug with the notch of the motor handpiece socket ① (Fig.1) at the left side of the device and insert the plug until it locks.

b. Disconnecting

Hold the plug ring and pull it out. Do not twist in any direction.

7.3.2 Connecting and Disconnecting the Contra angle

a. Connecting

The contra angle can be connected at 6 adjustable head positions. Align the positioning pins of the contra angle with the positioning slots of the motor handpiece and insert the head until it clicks.

b. Disconnecting

When removing the contra angle, pull it straight out.

CAUTIONS

- When connecting and disconnecting the contra angle, turn the power off beforehand.
- Check that the contra angle is securely assembled to the motor handpiece.

7.3.3 Inserting and Removing the lighting device

a. Inserting

Insert the lighting device into the motor handpiece(Fig.2), clamp the contra angle and file(Fig.3).



Fig.2



Fig.3

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Disinfection

- Place the cleaned and inspected accessories into the disinfection bath for the prescribed contact time; the accessories must be sufficiently covered. For better disinfection of the inner parts, the file clip must be pressed and released five times during disinfection process.
- Then remove the accessories from the disinfection bath and rinse them thoroughly with water for at least five times for 1 min. and press and release the file clip five times. Inspect, dry and pack the accessories as quickly as possible after removal (see chapter INSPECTION, and PACKING). Please make sure that the accessories do not have direct contact.

9.2.3 Inspection/Maintenance

Check all accessories after cleaning or cleaning / disinfection. Defective accessories should be immediately discarded. These defects include:

- Plastic deformation
- Corrosion

Accessories which are still contaminated must be cleaned and disinfected again.

Maintenance is not required. Instruments oil must not be used.

9.2.4 Packing

Please pack the accessories into disposable Sterilization packages (single disposable packaging) meeting the following requirements:

- Compliant with DIN EN ISO/ANSI AAMI ISO 11607
- Suitable for steam Sterilization

9.2.5 Sterilization

Use only the Sterilization methods listed below; other Sterilization methods are not permitted.

- Steam Sterilization
- Fractional vacuum/pre-vacuum (at least three vacuum cycles) method or gravity displacement method (product must be sufficiently dry).

The less effective gravitational method should only be used if the fractional vacuum method is not available.

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9.2 Cleaning, Disinfection and Sterilization (according to DIN EN ISO 17664)

The procedure for cleaning, disinfection and Sterilization applies only to the accessories lip hook, file clip and contra-angle.

9.2.1 Pre-treatment

Pulp and dentin residues must be removed immediately from the accessories (within maximum 2 hrs). Do not let them dry! After the accessories have been used on patients, place the accessories for cleaning, pre-disinfection and interim storage directly into a bowl filled with an appropriate cleaning and disinfecting solution (for max. 2 hrs). Then clean the accessories under running water or clean in a disinfecting solution to remove all visible contamination. The disinfectant should be aldehyde-free (aldehyde fixes blood stains), tested for effectiveness (e.g. CE mark), suitable for accessories disinfection and compatible with the accessories. Only use clean, soft brushes to manually remove contamination or a clean, soft cloth which you only use for this purpose. Do not use metal brushes or steel wool. For better cleaning of the inner parts, the file clip must be pressed and released five times during cleaning process. Please note that disinfectants used for pre-treatment are only for personal protection and do not replace disinfection when cleaning is completed. The pre-treatment process should be performed in every case.

⚠ CAUTIONS

Do not use an automated procedure or ultrasonic bath to clean or disinfect the accessories.

9.2.2 Manual Cleaning and Disinfection

Cleaning

- Place the pre-cleaned accessories into the cleaning bath for the prescribed contact time, the accessories must be sufficiently covered (if necessary careful brushing with a soft brush). For better cleaning of the inner parts, the file clipmust be pressed and released five times during cleaning process.
- Then remove the instruments from the cleaning bath and rinse them thoroughly with water for at least three times for 1 min. and press and release the file clip five times.

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b. Removing

Push along the direction of the socket (Fig. 4) and take it down (Fig. 5).



Fig.4



Fig.5

CAUTIONS

When inserting and removing, please do not shake, so as not to damage the plug.

7.3.4 Inserting and Removing the File

a. File insertion

- Insert the file into the chuck until it stops;
- Lightly turn the file until it engages with the latch mechanism. Push inwards to click.

b. File removal

Press the push-key and pull out the file.

CAUTIONS

- When attaching and detaching the file, turn the power off 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. Allowing dirt to enter the chuck could cause deterioration of chucking force.

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7.3.5 M1 mode connection (only apex locator function)

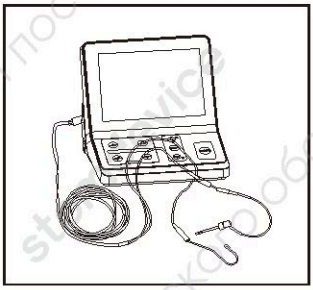


Fig.6

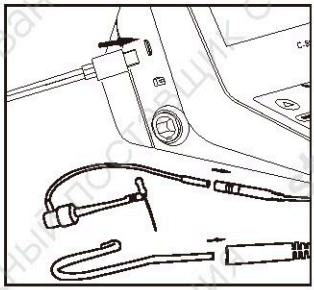


Fig.7

Connect the test wire with lip hook and the File clip to the Control unit, test wire's plug must be fully inserted into the test wire socket.

7.3.6 M2mode connection (only motor function)

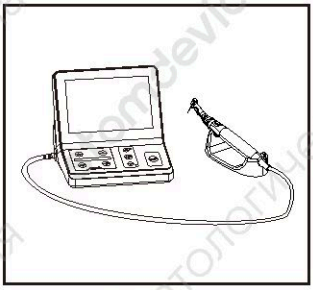


Fig.8

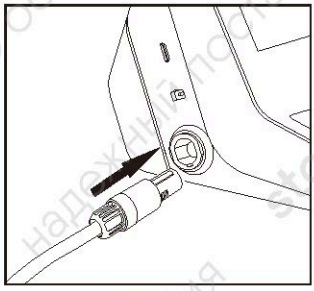


Fig.9

- Connect the motor cable to the Control unit' s motor handpiece socket;
- Connect the contra angle to motor handpiece;
- Install the lighting device;
- Insert the file.

7.3.7 M3 mode connection(Dual mode Motor & Apex locator)

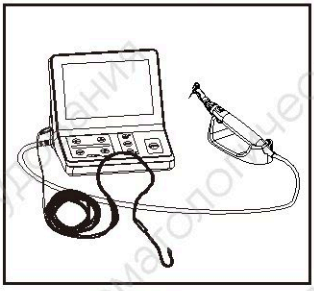


Fig.10

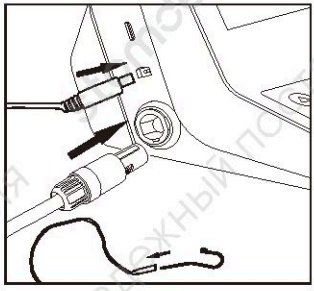


Fig.11

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9 Maintenance, Cleaning and Disinfection

9.1 General

The device is maintenance free and does not contain user serviceable parts.

NOTE

Service and repair should be provided by factory trained service personnel only.

- The surface of the device , test wire ,lip hook wire, motor cable and lighting device should be cleaned using tissue or soft cloth soaked with aldehyde free disinfecting and detergent solution (bactericidal and fungicidal).

CAUTIONS

- Wipe The surface of the device , test wire ,lip hook wire, motor cable and lighting device with a clean cloth, lightly moistened with a non-aggressive disinfectant.
- Do not apply any liquid or spray directly on the device, especially on the display.
- Do not use high-proof alcohol for disinfection.

- The accessories lip hook , file clip and contra-angle must be cleaned, disinfected and sterilized prior to each use. Thorough cleaning and disinfection are essential prerequisites for effective Sterilization. The specific instructions for cleaning/ Sterilization must be applied according to the instructions in chapter 9.2 “Cleaning,Disinfection and Sterilization”。In addition, the operating instructions of the devices used in your practice must be followed. As part of your responsibility for accessories sterility, always ensure that only validated methods for cleaning/disinfection and Sterilization are used, that devices (disinfector, sterilizer) are regularly maintained and inspected and that the validated parameters are maintained with each cycle.
- In addition, always observe the validated legal regulations and regulations on hygiene relating to your practice or the hospital. This applies in particular to the guidelines regarding effective prion inactivation.
- For your own safety, always wear protective gloves, glasses, mask when handling contaminated accessories.

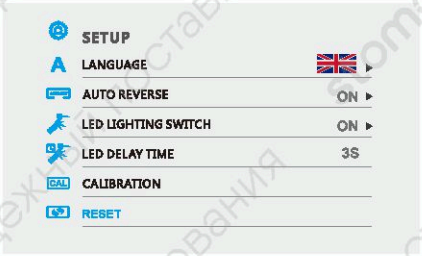
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8.6 Factory Default Parameters

To return to the original default parameters, follow the general reset instructions:



A



B

- Press the MODE key for a few seconds (A) to enter setup state;
- Press SET key to select RESET (B);
- Press the ▲/▼key to enter the RESET state;
- When the factory reset is complete, the display returns to the M1 interface.

CAUTIONS

Please note that: when the factory settings are restored, all personal settings will be lost.

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- Connect the motor cable to the Control unit's motor socket;
- Connect the contra angle to the motor handpiece and insert the file;
- Install the lighting device and catch the file;
- Connect the lip hook wire to the Control unit and connect the lip hook.

7.4 Changing the Battery

CAUTIONS

PRECAUTIONS ON CHANGING BATTERY:

- Do not open any part other than the battery cover
- Be sure to purchase and use only the original battery. Otherwise, may cause breakdown or injure.
- Ensure that the AC adapter is disconnected and turn off before changing the battery.
- Do not change the battery with wet hands as this may cause short-circuiting of the battery and moisture infiltrating the device.
- The used battery must be disposed of in accordance with the local regulations.

- Turn the power off;
- Disconnect the AC adapter;
- Remove the screw from the cover with a screw driver，and remove the battery cover;
- Insert the battery cord connector into the device connector in accordance with the polarity indication inside the battery compartment and place the battery into the compartment with care so as not to catch the cord;

NOTE

In case of difficulty in inserting the connector, the polarity may be incorrect. Do not insert it by force.

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- Close the battery cover and lock the screws;
- If you need to replace the battery, remove the battery and unplug the battery connector.

CAUTIONS

When removing the battery cord, make sure to hold it at the connector. Failure to do so may damage the cord.

7.5 Charging

Charge the battery according to the following steps:

- Connect the charger's connector to the Control unit's charging socket ① (Fig. 12).
- Connect the plug of the charger to a power outlet.
- It takes about 4 hours to fully charge and about 5 hours for fully discharged batteries (E.g., the device is not used for a long time).
- When charging, the charging status will be displayed on the screen (Fig.13).

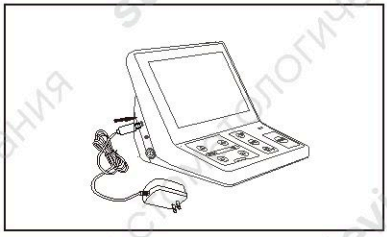


Fig.12



Fig.13

NOTE

The device can not be used during charging.

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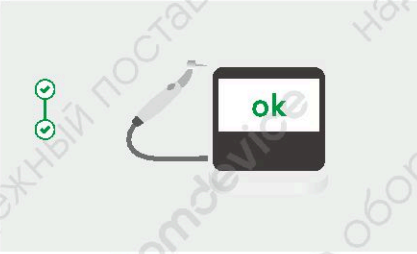


Fig. 40 Contra-angle is OK

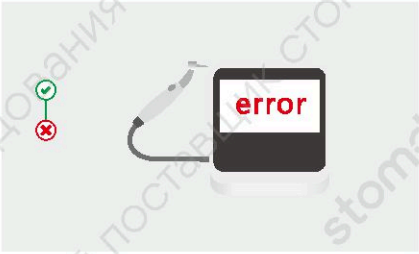


Fig. 41 Contra-angle is ERROR

CAUTIONS

ERROR message indicates that the contra-angle is not operating properly. Please contact your local dealer or contact the factory directly for assistance.

NOTE

- Should you at any time wish to stop the calibration process, turn the power off.
- Calibrate every time the contra angle is lubricated or replaced after sterilizing, or at least once a week (Lubricating the Contra angle , Cleaning ,Disinfection and Sterilization see the operation manual of contra angle).
- Do not touch or apply a load to the contra angle chuck during calibration.

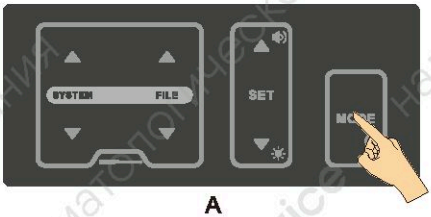
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8.5 Calibration

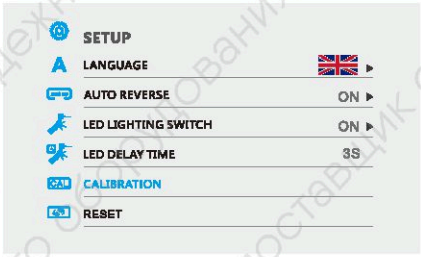
This function is to decrease fluctuation in the rotation speed of the motor handpiece and the difference in torque by the contra angle.
Calibration is recommended when using a new/other contra angle or after an extended period of operation, as the running properties can change with usage, cleaning and sterilization.

The calibration steps as follows:

- Turn the power on.



A



B

- Press the MODE key for a few seconds (A) to enter setup state;
- Press SET key to select calibration (B);
- Press the ▲/▼ key to enter the calibration state;
- The screen will be prompted to insert the motor handpice (Fig.37);
- During the calibration process the display will read (Fig.38):

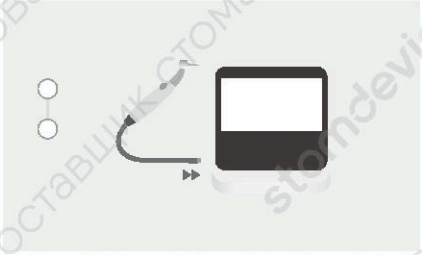


Fig. 38 Insert the motor handpice

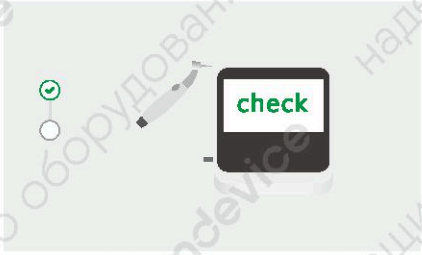


Fig. 39 Cerebration state

- The motor handpiece begins to rotate: leave it as it is until it stops.
- When the calibration process is completed, the rotation stops and the display reads:
- Then, the display returns to its original state.

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8 Step by step instructions

8.1 Language, LCD Panel and Operation Panel

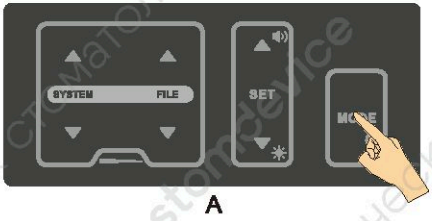
8.1.1 Switch-on and Switch-off the Unit

- Hold down the POWER button ④ (Fig. 1)for a few seconds. Then, the display will show the last mode before switching the device off.
- Press the POWER button again to turn off the power.

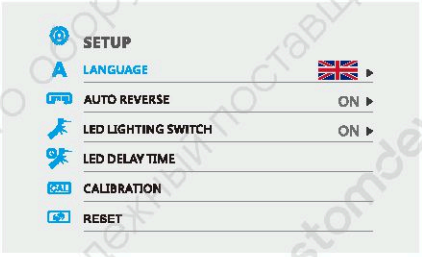
NOTE

If 5 minutes pass without operation, the power turns off automatically.

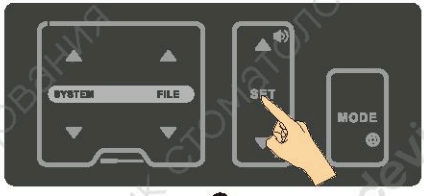
8.1.2 Language Select



A



B



C

- Press the MODE key for a few seconds (A) to enter setup state (B);
- Press the ▲ /▼ key to select the desired language (C);
- The change will be saved automatically. Press any key other than SET and ▲/▼key to exit the setup, or exit the setup automatically after a few seconds.

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8.1.3 LCD Panel



Fig.14 LCD Panel

A	Working area	Displays operating parameters in different modes.
B	Mode area	The device can be operated in three different modes: **M1**: Apex locator only, **M2**: Motor only, **M3**: (Dual mode) Motor with apex location function.
C	Motor option area	Display motor rotation direction, auto reverse, lighting and LED delay time. *M2 and M3 are available
D	Status area	BATTERYdisplays the present remaining amount of the battery : Full charge Approximately 30-80% remains. Less than 30% remains. Battery is drained or very low battery voltage. Charge the battery. NOTE: The remaining amount of battery mark indicates a voltage . When a load is applied to the motor handpiece，there remaining amount of battery mark appear to be come lower.
		SOUND VOLUME displays the current sound volume (see chapter 6.5.7. Sound Volume Adjustment). 4 marks can be displayed: High volume Low volume Minimum volume Limited off

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Fig. 36 Accessories are OK

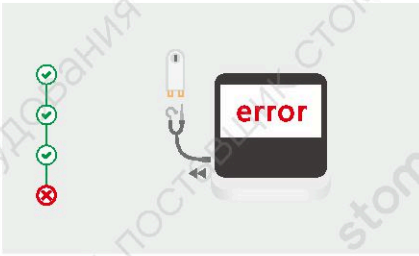


Fig.37 Accessories are ERROR

CAUTIONS

ERROR message indicates that the accessories are not functioning properly (wire breakage) or the contact area is dirty.
Please contact your local dealer or contact the factory directly for assistance.
CHECK mode will exit automatically after a few seconds .

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Test Wire Functional CHECK

NOTE

If the device functional CHECK is OK, then you have to proceed to the cables functional CHECK.

Connect the test wire to the device (Fig. 33).

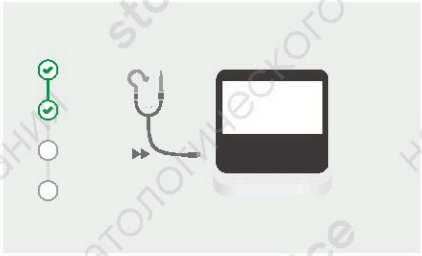


Fig. 33 Connect the test wire

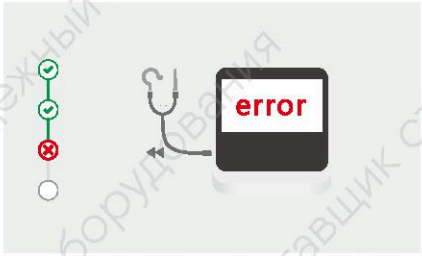


Fig. 34 Test wire is ERROR

CAUTIONS

ERROR message indicates that the test wire is not operating properly. Please contact your local dealer or contact the factory directly for assistance.

- Insert the File clip and lip hook (or replace the lip hook with another File clip) in the test wire.
- Connect File clip and lip clip (or a second File clip) to the contact strips on the tester as shown on the screen(Fig. 35).

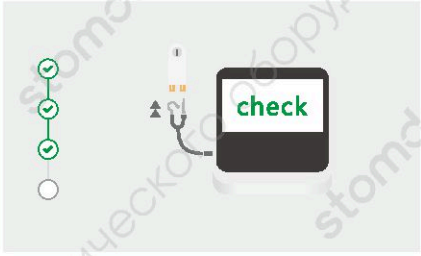


Fig.35 Connect tester

- Cables CHECK will start automatically and the results – either OK (Fig. 36) or ERROR (Fig. 37) - will be shown on the screen.

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D	Status area	Screen Brightness display the Brightness of the screen (see chapter 8.2.2. Screen Brightness Adjustment). 4 marks can be displayed brightest bright darker dark

8.1.4 Operation Panel



Fig.15 Operation Panel

1	SYSTEM▲/▼	Change the file system.
2	FILE▲/▼	Change the file within a system.
3	SET	Press this key to adjust the different parameters.
4	▲	a. Increase(SET or adjust) b. Adjust the sound volume(idle state)
5	▼	a. Decrease (SET or adjust) b. Adjust the screen brightness(idle state)
6	MODE	a. Short press to switch between 3 operating modes: Apex Locator, Motor, Dual mode b. Long press to enter Setup state.

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8.2 Sound Volume and Screen Brightness Adjustment

8.2.1 Sound Volume Adjustment

The sound volume can be adjusted to 4 different levels: high，low，Minimum and limited off.

- Press the key 4 [▲🔊] in the idle state to adjust the sound volume;
- The sound volume display on the LCD panel status area.

> **NOTE**
> The last sound volume is retained，even if the power is turned off.

8.2.2 Screen Brightness Adjustment

The Screen Brightness can be adjusted to 4 different levels.

- Press the key 5 [▼☼] in the idle state to adjust the screen brightness;
- The Screen Brightness display on the LCD panel Status area.

> **NOTE**
> The last Screen Brightness is retained， even if the power is turned off.

8.3 Operation

The device can be operated in three different modes:

① M1 apex locator only;
② M2 Motor only;
③ M3 as a combined unit (Dual mode)when the apex location function drives the endo-motor.

One of the three possible operating modes is selected with the key 6 [MODE]. On the operating panel, the mode number display on the LCD panel Mode area.

8.3.1 M1 - Apex locator only(without motor)

8.3.1.1 Connection

The connection method in this mode is shown in chapter 7.3.5 (Fig.6).

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8.4 Functional check of the apex locator

It is recommended to check the performance of the Apex Locator once a week. With the built-in inspection function, the special test plug can automatically check the basic functions of the instrument in the first step, and then inspect the accessories in the second step (Fig. 30).

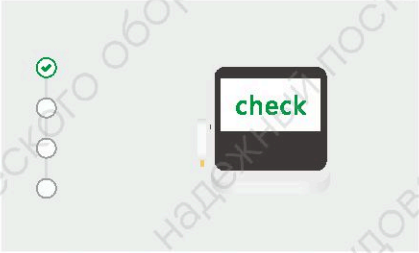


Fig.30 Device inspection

The specific steps to use the check function， as follows:

- Disconnect the test wire, adaptor and motor handpiece from the device.
- Device CHECK will start automatically if the tester inserted in the device and the results will be shown on the screen.
- Display shows OK (Fig. 31) ,Indicates that the device function is normal.
- Display shows ERROR (Fig. 32), Indicates that there is a fault.

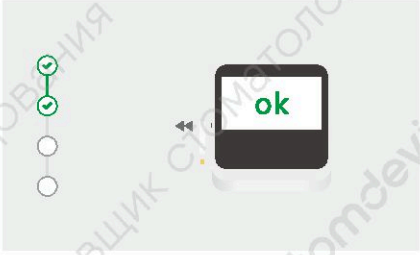


Fig.31 Device is OK

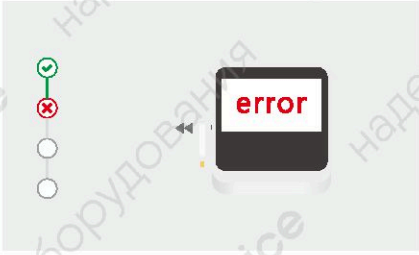


Fig.32 Device is ERROR

CAUTIONS

ERROR message indicates that the device is not operating properly.
Please contact your local dealer or contact the factory directly for assistance.

- Disconnect the tester from the device and prepare the test of the wire with accessories.

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Fig.29 Set Apex Position

8.3.3.6 Auto Reverse

See 8.3.2.6 Auto Reverse

8.3.3.7 LED lighting function

See 8.3.2.7 LED lighting function

8.3.3.8 Working

See 8.3.2.8 Working

Working length determination

- In M3 mode, As soon as the file makes contact with the root canal, the length measurement is started. During the apex area, with further progression of the file in the root canal, the numerical value on the graphical scale changes. The unit emits audible.
- When the file tip reaches the DR'S CHOICE apex position, it indicates that the apex is reached. The motor automatically reverses or stops depending on the selected auto reverse mode.

CAUTIONS

Do not forget to connect the lip clip to the patient prior to measurement. Occasionally, the graphical scale will make a sudden drop as soon as the file is inserted into the root canal, but it will return to normal state as the file is advanced down towards the apex.

8.3.3.9 Functional check of the apex locator

It is recommended to check the performance of the Apex Locator once a week，the detailed check methods, see Chapter 8.4 .

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8.3.1.2 Working area

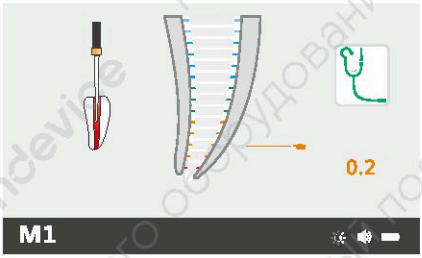


Fig.16 M1 interface

	Root apex area
	The position of the root apex set by the dentist.
	Full root canal, The movement of the file in the root canal is simulated.
	Test wire connection status:  disconnected  connected  File clip contact connects to lip hook directly, it can be used simply to test the test wire is normal. NOTE: It is recommended to check whether the test wire is normal frequently. If the File clip contact connects to lip hook directly, but this icon is not displayed, it indicates a poor contact. Then the user can do as follow: • Check proper connection of the wire. • Clean the File clip contact.

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8.3.1.3 working

1) Starting Length Measurement

- Connect the File clip and the lip hook to the test wire;
- Place the lip hook on the patient's lip on the opposite side of the tooth to be treated;
- Insert the file into the root canal and hold the file clip in the metal part of the file (Fig. 17);
- The file movement in the root canal is shown on the left side of the screen work area (Fig. 16).



Fig.17

NOTE

If no progress of the file indicate faulty connection:

- Check proper connection of the test wire.
- Clean the File clip contact.
- Irrigate the canal, if necessary, and start again.

CAUTIONS

- We recommend that not to continue the measurement if the faulty connection appears.
- Go to the CHECK Mode to check the performance of the device (see chapter 8.4).

2) Measurement

Coronal and Medial Area

- Slowly insert the measuring file into the canal;
- File movement along the coronal and medial section towards the apex area is represented on the full root canal image by the file continuously moving down (Fig. 18).

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8.3.3.3 Working area

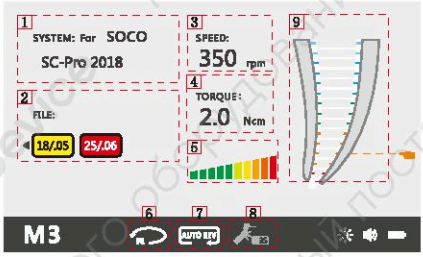


Fig.28 M3 interface

1	SYSTEM	See 8.3.2.3
2	FILE	See 8.3.2.3
3	SPEED	See 8.3.2.3
4	TORQUE	See 8.3.2.3
5	TORQUE BAR	See 8.3.2.3
6	ROTATIONAL DIRECTION	See 2.3.2.3
7	AUTO REVERSE	See 8.3.2.3
8	Motor and LED lighting	See 8.3.2.3
9	Root apex Area	Specially shows the Root apex area and indicates where the file was reached.

8.3.3.4 System and File Select

See 8.3.2.4 System and File Select

8.3.3.5 Changing Speed, Torque and set Changing Speed and Torque

- See 8.3.2.5 Changing Speed and Torque

Set the DR'S CHOICE apex position

Follow these steps to set the DR'S CHOICE apex position:

- Press the SET key, the apex setting icon becomes adjustable state, (Fig.29)
- Press the ▲/▼ key to adjust the apex position.

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8.3.2.8 Working

Start and stop the Motor handpiece

- The motor is started and stopped with the ON/OFF button on the handpiece.
- If you press the ON/OFFbutton briefly, the motor handpiece starts. If you re-press the button, its tops.

Manual Reverse

- Press the on / off button for more than 2 seconds to change the direction of file rotation (whether the motor is stopped or running).

The current direction of file rotation is displayed in the motor option area:



Means forward rotation

Means reverse rotation

NOTE

Only continuous rotary file systems can change the direction; reciprocating file systems can not change the direction.

Torque bar

When the motor handpiece starts and its load reaches approximately half of the preset torque limit value, the torque bar display ,when the load approaches the torque limit value，the torque bar display .

NOTE

This function is only available in continuous rotary file system.

8.3.3 M3 - Motor and Apex locator (Dual mode)

Press mode key to enter M3 mode，In this mode, as a combined unit (Dual mode) when the apex location function drives the endo-motor.

8.3.3.1 Connection

The connection method in this mode is shown in chapter 7.3.7 Fig.10,Fig.11.

8.3.3.2 Calibration

Calibration is recommended when using a new contra angle，the detailed calibration methods, see Chapter 8.5.

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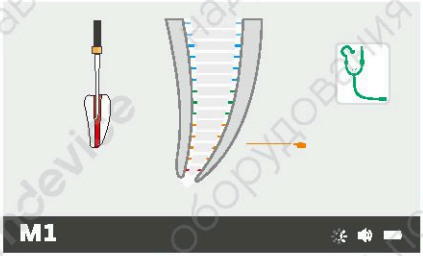


Fig.18 Coronal and Medial Area

Root Apex Area

- The movement of the file is displayed on root apex area;
- In the root apex area the indication dot indicates the exact position and changes accordingly from blue to green and then to yellow (Fig. 19, Fig. 20).

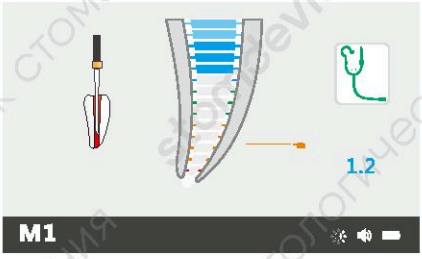


Fig.19 Apex Area-Blue

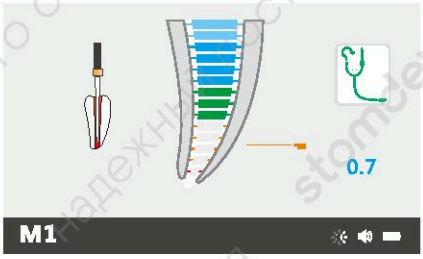


Fig.20 Apex Area-Green

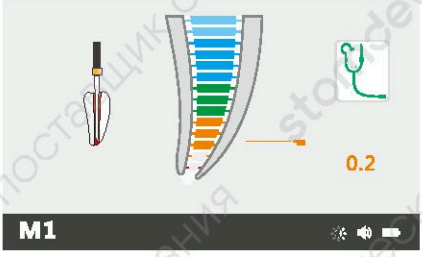


Fig.21 Apex Area-Yellow

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- File movement in the Apical Zoom is accompanied by audio signals, which serve as additional indication of the file tip position. The interval between the beeps becomes shorter the more the file approaches the apex.
- When the file tip reaches the apical foramen the indication dot is marked red and a constant sound is emitted(Fig. 22)

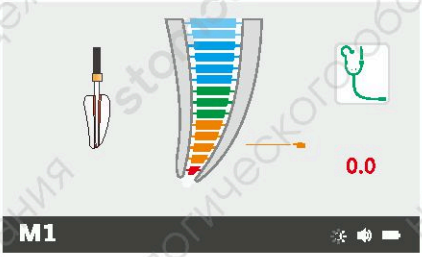


Fig.22 Apex Area-Red

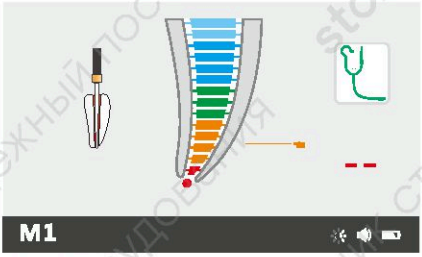


Fig.23 Beyond the apex foramen - Red dot

NOTE

The apex indication line shows the file tip position inside the root canal:

- Blue section:
  WARNING section , close to the apex area.
- Green to yellow section:
  Root apex area
- Red section:
  Apex foramen is passed

CAUTIONS

As with all electronic length determination devices, the bars shown in the root apex area do not represent the specific size.

Interruption of measurement

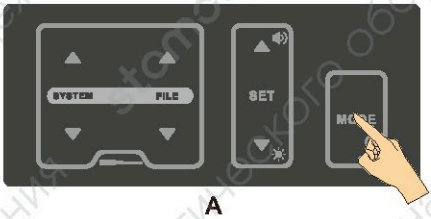
During the length measurement the File clip may be disconnected from the file and reconnected at any time (e.g. when the file is changed to a larger size or when the length of another root canal should be measured). The device detects automatically that a new length measurement cycle is initiated.

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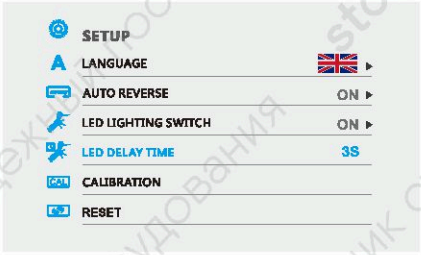
8.3.2.7 LED lighting function

When LED light is on, illumination will be provided during motor operation, and if the appropriate delay time is selected, the LED will continue to provide delayed illumination of the set time after the motor has stopped.

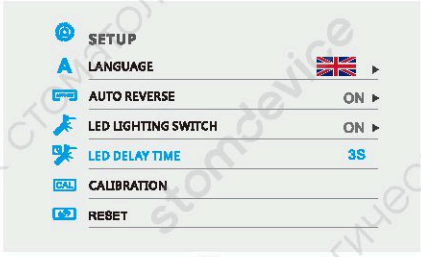
Set the LED lighting and delay time:



A



B



C

- Press the MODE key for a few seconds(A) to enter setup state;
- Press SET key to select LED LIGHTING SWITCH (B);
- Press ▲/▼key to on/off LED lighting;
- Press SET key to select LED DELAY TIME function (C);
- Press▲/▼ key to select different LED delay times.
- The change will be saved automatically. Press any key other than SET and ▲/▼key to exit the setting, or exit the setting automatically after a few seconds.

NOTE

When turning off the LED lighting function, the LED delay time function can't be selected.

Motor option area shows the state of LED lighting:



Means LED lighting function is not available;



Means lighting function is available and the delay time is 3S.

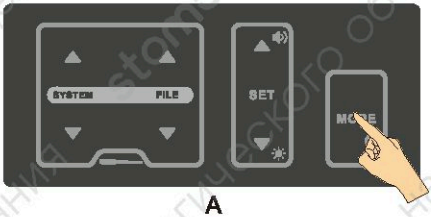
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AUTO REVERSE off:

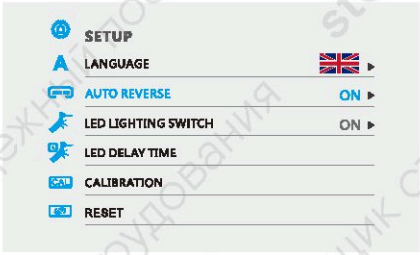
If, during operation the load reaches the preset torque limit value, the motor handpiece will stop without reverse rotation.

If you want the file to rotate forward again, press the ON/OFF button once.

On/off Auto Reverse Function:



A



B

- Press the MODE key for a few seconds (A) to enter setup state;
- Press set key to select AUTO REVERSE (B);
- Press ▲/▼ key to on/off AUTO REVERSE function;
- The change will be saved automatically. Press any key other than SET and ▲/▼key to exit the setting, or exit the setting automatically after a few seconds.

Motor option area shows the state of AUTO REVERSE ,

AUTO REV Means auto reverse function is available.

AUTO REV Means auto reverse is not available.

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8.3.1.4 Tips for accurate Length measurement

Condition of inaccurate measurement

Too fast movement or even jumping to the apex directly is indicated for the following reasons:

Symptom	Solution
Excess liquid in the pulp chamber or root canal (rinsing solution, blood or saliva), creating wrong conductive path and incorrect measurements.	Dry the access cavity with a cotton pellet/air-blower. Wait until excess bleeding can be stopped.
Gingival proliferation can lead to direct contact with the measuring file causing a short circuit and incorrect measurements	Isolate the access cavity by: • adequate preparation of filling • placing a rubber dam • electro cauterizing
The measuring file contacting metallic restorations (crown, parapulpal post, amalgam filling) may cause a short circuit and incorrect measurements	Enlarge the access cavity Carefully and isolate with flow composite. Widen the opening at the top of the crown carefully.

Too slow or extremely delayed movement is indicated for the following reasons:

Symptom	Solution
Obliterated root canal Impeding the conductive path and preventing normal device functioning.	• Compared with X-rays, find possible clues. • Catheterize with ISO 06/ 08 file till the working length.
Retreatment: Blockage by old canal filling material residue, impeding the conductive path and preventing normal device functioning.	Take an x-ray to re-check and try to completely remove the old root canal filling material before measurement.
Blockage by remnants of a medicated substance (e.g. calcium hydroxide) impeding the conductive path and preventing the normal operation of the device.	Remove the remnants Completely before measurement.

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Symptom	Solution
Extremely dry root canal impeding the conductive path and preventing the normal operation of the device.	Rinse root canal with irrigating solution such as NaCl or NaOCl and dry the access cavity with a cotton pellet/ air-blower.

CAUTIONS

In some cases, the position of the file can not be determined accurately.

Special condition symptom:

Symptom	Solution
Exceptionally large apex foramen due to lesion or incomplete formation.	May lead to shorter measurement than the actual length.
Root fracture or perforation	May lead to incorrect measurements.

Comparison of electronic length determination versus radiography:

X-ray radiography shows two-dimensional projection of three-dimensional root canal system. In some cases ,the radiograph display length does not match the electron assay length.

In the case of a lateral canal curvature ,the x-ray may show a shorter working length than the device's measured value.

Electronic length measured using the instrument is usually more accurate more accurate than the radiographic length on the X-ray.

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Fig.27 ADJUST SPEED

- The change will be saved automatically. Press any key other than SET and ▲/▼ key to exit the setting, or exit the setting automatically after a fewseconds.
- To return to default settings see chapter 8.7 Factory Default Parameters.

CAUTIONS

Before using the motor handpiece, verify the correctness of the changed parameters.

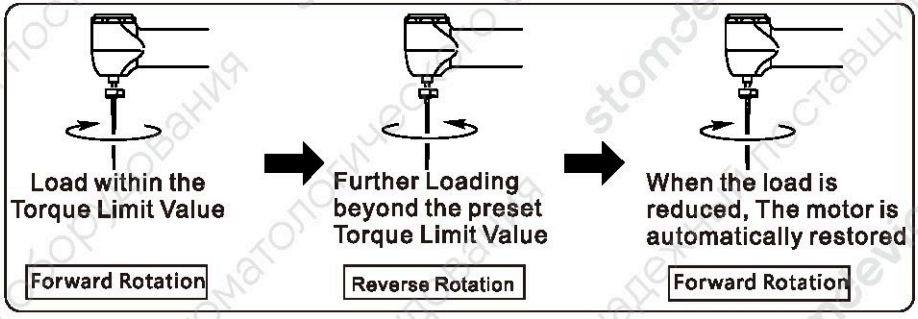
8.3.2.6 Auto Reverse

NOTE

In reciprocating motion, the auto reverse function is disabled.

AUTO REVERSE on:

If, during operation the load reaches the preset torque limit value, the motor handpiece will automatically rotate in the reverse direction. When the load is removed, the motor handpiece returns to normal forward rotation automatically.



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Selecting a File System

To choose a different file system, press the SYSTEM ▲ /▼ key. The file system shown in the display is the selected system.

1) Continuous Rotary File Systems

When a file system has been selected, the first file of the system will automatically be shown in the display.

Press the FILE ▼key to select the next file.
Press the FILE ▲key to select the previous file.

CAUTIONS

Do not use files designed for reciprocating motion in continuous rotation.

2) Reciprocating File Systems

Some files are designed specifically for use in reciprocation, whereby the device is driven first in a cutting direction and then reverses to release the device. The angles of reciprocation are precise and specific to the design of the device.If one of above mentioned reciprocating files has been chosen, the speed and torque display .

CAUTIONS

Do not use files designed for continuous rotation in reciprocating motion.

8.3.2.5 Changing Speed and Torque

CAUTIONS

While the motor handpiece is in motion,speed and torque can not be changed.

- When the desired continuous rotary file is selected, you can adjust speed or torque value;
- Press SET keys to select speed or torque to adjust;
- Press set ▲ /▼ key to adjust desired value ;
- The speed setting can be adjusted from 150 to 650 rpm. The torque setting can be adjusted from 0.6 to 5.2 N.cm;
- When the user changes the parameter, its value will prompt [ ], as shown in Fig.27;

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8.3.1.5 Set the DR'S CHOICE apex position:

This feature enables to mark an individual predetermined reference position at the required distance from the apex. This variable apical arrow can be set between the green bar and the yellow bar.

When DR'S CHOICE apical arrow is set, clear visual and audio indication is given that the file tip has reached this pre-selected position.

To set the DR'S CHOICE apex position, follow the next steps:

- Press the SET key, the apex setting icon becomes adjustable state, (Fig.24).
- Press the ▲ /▼ key to adjust the apex position.
- The changed value will be saved automatically. Press any key other than SET and▲ /▼ key to exit the setting, or exit the setting automatically after a few seconds.
- When measuring the root apex arrow shown as Fig.23 .

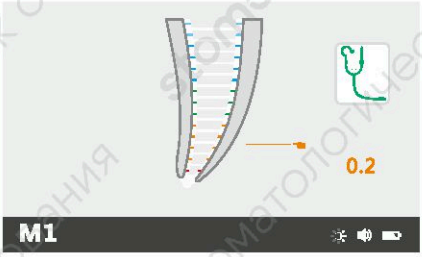


Fig. 24 Set the apex position

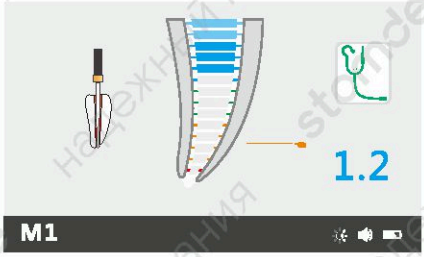


Fig.25 Measurement process

8.3.1.6 Functional check of the apex locator

It is recommended to check the performance of the Apex Locator once a week , the detailed check methods, see Chapter 8.4.

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8.3.2 M2 - Motor only (without apex locator)

Press mode key to enter M2 mode，In this mode, has Motor only, without apex locator function.

8.3.2.1 Connection

The connection method in this mode is shown in chapter 7.3.6 ,Fig.8,Fig.9;

8.3.2.2 Calibration

Calibration is recommended when using a new contra angle，the detailed calibration methods, see Chapter 8.5.

8.3.2.3 Working area



Fig.26 M2 interface

1	SYSTEM	Displays the selected file system
2	FILE	Displays the selected file(s) within the system.
3	SPEED	Displays the device rotation speed value (disabled for reciprocating systems).
4	TORQUE	Displays the torque limit value (disabled for reciprocating systems).
5	TORQUE BAR	Displays the bar graph which shows the degree of load applied to the motor while the file is in continuous rotation (disabled for reciprocating systems).
6	ROTATIONAL DIRECTION	Displays the current rotational direction of the file. 4marks can be displayed: Forward (clockwise) continuous rotation Reverse(counterclockwise) continuous rotation Reciprocating motion（the forward angle more than the reverse angle） Change the rotation direction, see 8.3.2.8.

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7	AUTO REVERSE	Displays the AUTO REVERSE function (disabled for reciprocating systems). AUTO REV AUTO REVERSE on AUTO REV AUTO REVERSE off: See8.3.2.6 Auto Reverse
8	Motor and LED Lighting	The motor handpiece is not connected to the Control unit Means the motor handpiece is connected to the Control unit and LED lighting function is not available. Means the motor handpiece is connected to the Control unit， LED lighting function is available and the delay time is 3S. See8.3.2.6 LED lighting function

8.3.2.4 System and File Select

File Library

The device contains a file library, the preset NiTi systems please refer the *torque card*. The manufacturer reserves the right to update the file library and the systems contained in it.

The device contains a user-created system called PROGRAM. Users can set parameters themselves

⚠ CAUTIONS

- Follow the file manufacturer's instructions for use of endodontic files.
- The file system shown on the display must always match the file in use. This is of the most importance in order to avoid misusing reciprocating files and continuous rotary files.
- Torque and speed values are subject to change by the file manufacturers without notice. Therefore, the preset values in the library must be checked prior to use.
- Torque values shown on the display are accurate and reliable only with contra angle properly maintained and lubricated.

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Ver1.5 Revision Date:20191014
Software version: Ver 4.0

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