Dentsply Sirona

X-Smart® Go

Cordless Endo Motor with Integrated Apex Locator

Instructions For Use

For dental use only ℞

EN

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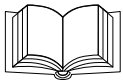

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Technical modifications on our product are not subject to notification.

Photos of our devices are not contractual.

Introduction

Congratulations on the purchase of **X-Smart® Go** product.

X-Smart® Go endo motor is indicated for root canal treatment, driving endodontic files in torque-controlled continuous rotation and reciprocating movement with embedded apex locator.

For optimal safety and performance, read these instructions for use carefully before use. Make sure you have understood and followed the clinical precautions – as well as the general warnings, precautions, and contraindications – before proceeding to root canal treatment. Keep these instructions for use for future reference.

1 Indication for use

X-Smart® Go is a cordless handpiece with apex localization capability, used for driving files in both continuous rotation and reciprocating mode during an endodontic procedure for enlargement of root canals, while monitoring the position of the endodontic file tip within the canal.

1.1 Intended purpose

The intended purpose of the device is to assist dental professionals in performing canal enlargement and or apex localization and working length determination during root canal treatment.

1.2 Intended use

The intended use of the device is to assist dental professionals in performing canal enlargement and or apex localization and working length determination during root canal treatment.

1.3 Patient target group

The intended patient population is patients who need to undergo root canal treatment.

1.4 Intended users

The device shall be used by skilled endodontic experts or by qualified dental practitioners performing root canal treatments.

2 Contraindications

X-Smart® Go endo motor is not recommended for use in patients that have a pacemaker or other implanted electrical devices.

3 Warnings

- **X-Smart® Go** endo motor must only be used in hospital environments, clinics, or dental offices either by skilled endodontic experts or by qualified dental practitioners performing root canal treatments.
- Use of this equipment adjacent to or stacked with other equipment should be avoided because it could result in improper operation. If such use is necessary, this equipment and the other equipment should be observed to verify that they are operating normally.
- Use of accessories, transducers, and cables other than those specified or provided by the manufacturer of this equipment could result in increased electromagnetic emissions or decreased electromagnetic immunity of this equipment and result in improper operation.
- Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part of **X-Smart® Go** endo motor, including cables specified by the manufacturer. Otherwise, it could result in degradation of equipment performance.

4 Precautions

- Do not use **X-Smart® Go** endo motor in the vicinity of devices emitting electromagnetic noise such as x-ray viewer with fluorescent lamps, film viewers, ultrasonic devices, etc.
- Protect **X-Smart® Go** endo motor from occasional spillage and direct spraying of liquids, including cleaners and disinfectants.
- Do not use **X-Smart® Go** endo motor in presence of flammable materials.
- **X-Smart® Go** endo motor should be used with the manufacturer's original accessories only.
- Do not press the contra-angle push-button when the motor handpiece is running or if it is coming to a stop. This will lead to detachment of the file or cause the push-button to overheat.
- Do not remove the contra-angle from the motor handpiece during operation.
- Only use undamaged root canal files. Please refer to the information provided by the manufacturer.
- Only insert the file when the contra-angle is stationary.
- Never place your fingers on the moving parts of the file while it is running or coming to a stop.
- Only use the original contra-angle.

- To improve the efficiency of the integrated apex locator, it is highly recommended to use a rubber dam system during the endodontic procedure.
- To ensure that short circuits do not impair the apex locator measurements, be particularly careful with patients fitted with metallic crowns, bridges, or large metallic fillings (avoid any contact of the file or the lip clip with metals).
- High concentrations of sodium hypochlorite may result in a lower accuracy of the apex locator measurements. For working length determination, we recommend using sodium hypochlorite solution at maximum 5% concentration.
- Make sure that the canal is wet enough to ensure reliability of the apex locator measurement.
- Ensure that the contra-angle or the file does not touch other instruments.
- Avoid excessive liquids inside the tooth cavity to prevent overflow and incorrect apex locator measurements.
- Teeth with open apices may give imprecise apex locator results.
- The use of apex locators alone without a preoperative and postoperative radiograph is not a recommended practice since apex locators may not be able to work properly in all conditions. It is mandatory to confirm radiographically the working length established using the apex locator.
- For your own safety, please use personal protection gear (gloves, mask).

5 Adverse reactions

None.

6 Step by step instructions

6.1 Content

Check the content of the equipment before use:

Motor handpiece	Contra-angle 6:1	Power bank
		

<table>
<tr><td>Charger
  </td><td>Measurement cable
  </td><td>Lip clip (2 pcs.)
  </td></tr>
<tr><td>File clip (2 pcs.)
  </td><td>F-type Spray nozzle
  </td><td>Protective silicone sleeve for contra-angle (2 pcs.)
  </td></tr>
<tr><td colspan="3">Disposable protective sleeve for Handpiece, replace for each patient (10 pcs.)
  </td></tr>
</table>

Info

Contra-angle with protective silicone sleeve, measurement cable with attached lip clip and file clip constitutes Applied Parts of the device.

6.2 X-Smart® Go endo motor overview

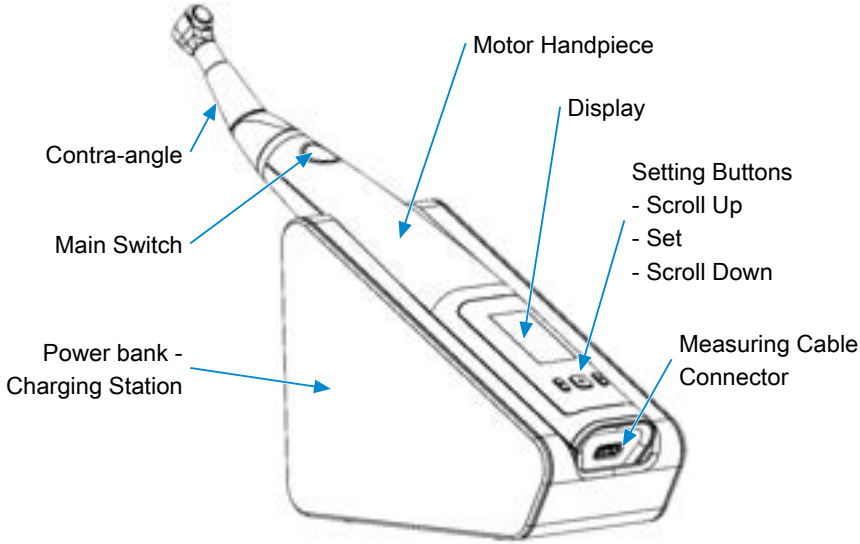


Fig. 1 : Front view

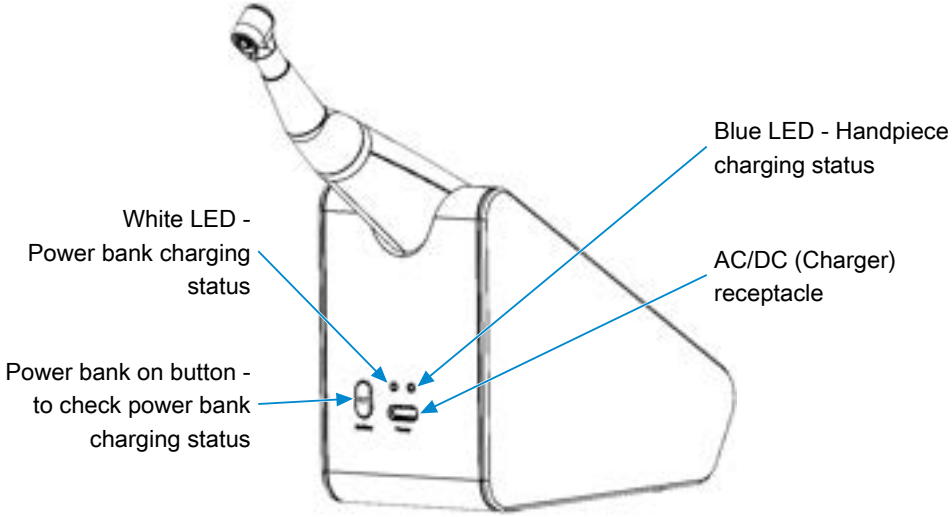


Fig. 2 : Rear view

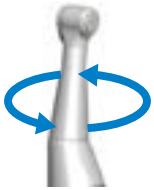
6.3 Setting up

6.3.1 Connect/Remove the contra-angle

- Insert the contra-angle into the motor handpiece – see [▶ Fig. 3]. Push the contra-angle all the way until a click is heard, ensuring it is securely attached.

Fig. 3 : Contra-angle connection

- The contra-angle rotates 360° so that the display can always be viewed easily.



- To remove the contra-angle from the handpiece, pull out the contra-angle horizontally when the motor handpiece does not run.

Fig. 4 : Contra-angle removal

6.3.2 Put on the handpiece protective sleeve

Put the protective sleeve on the handpiece.

⚠ WARNING

Replacement of the lithium-ion rechargeable batteries can be performed by trained service personnel only.

After placement, make sure that the sleeve is not torn.

After use, remove the protective sleeve and throw it away.

6.3.3 Connecting the AC/DC plug adapter

Select the plug adapter that matches your electric power outlet.

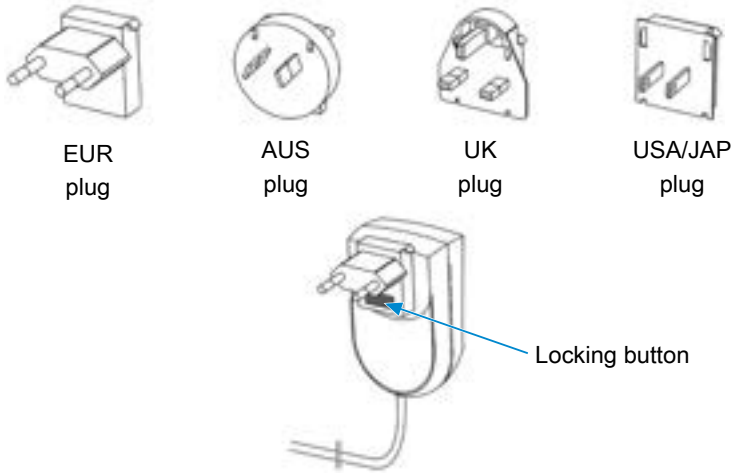


Fig. 5 : Plug adapters for the charger

Slide the plug adapter downwards into the slots until it locks in place with a click. To remove, press the locking button (see [▶ Fig. 5]) and pull out the plug adapter.

6.3.4 Recharging the battery

X-Smart® Go endo motor is a battery-operated portable device powered by a lithium-ion rechargeable battery. The handpiece is being charged via inductive (wireless) charging while it is placed on its power bank. Battery status is shown on the screen.

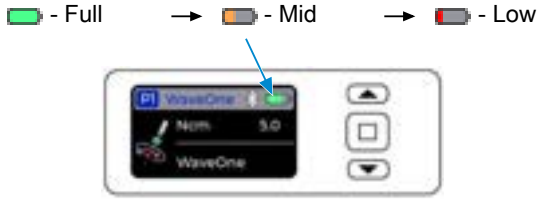


Fig. 6 : Battery status indicator

When the motor handpiece battery is low, the battery indicator on the screen will turn red, meaning that the battery requires recharging. However, **X-Smart® Go** endo motor will continue normal operation even with low battery so that a patient treatment can be completed before the device shuts down.

The power bank is also a battery-operated unit powered by internal lithium-ion rechargeable battery and serves as a charging station to charge the handpiece via inductive (wireless) charging. Power bank's battery status during operation is shown on the status LEDs.

⚠ WARNING

Replacement of the lithium-ion rechargeable batteries can be performed by trained service personnel only.

6.3.5 Charging the power bank

- Connect the charger cable to the charging receptacle on the power bank (see [▸ Fig. 2]). Plug the charger into the power outlet.
- White color LED on the power bank will blink, indicating that the power bank battery is charging. When charging is completed, the white LED will stop blinking and turn steady white.
  Charging time for the Power bank when the battery is fully depleted is approximately 3 hours.

6.3.6 Charging the X-Smart® Go endo motor

- Place **X-Smart® Go** endo motor on the power bank. Charging will begin automatically if the battery is low and needs to be recharged.
- A steady white LED on the power bank signifies that it is powered on, while a steady blue LED indicates that the motor is currently charging.
- While charging, the battery icon appears on the motor's screen (see [▸ Fig. 7]). Once charging is complete, the motor's screen and the blue LED on the power bank will turn off.

Fig. 7 : **X-Smart® Go** endo motor is charging

⚠ WARNING

While charging the power bank, the charger and the power bank should be outside patient environment (at least 1.5 m from the patient).

Duration of charging when motor handpiece battery is depleted: Approximately 3 hours.

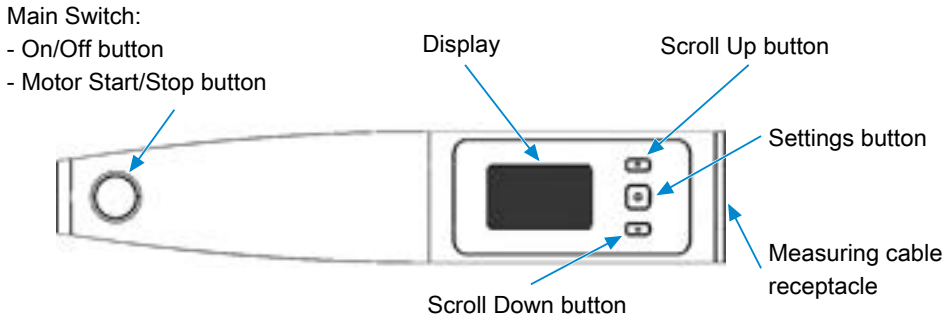
Info

- Use only the original charger.
- **X-Smart® Go** endo motor cannot be operated while charging.

If the battery is completely flat and the device does not turn on, please contact your distributor for battery replacement by trained service technician.

6.4 Operation of the motor

6.4.1 Motor handpiece description



- Connect the contra-angle to the handpiece and switch the device on by pressing the Main Switch button.

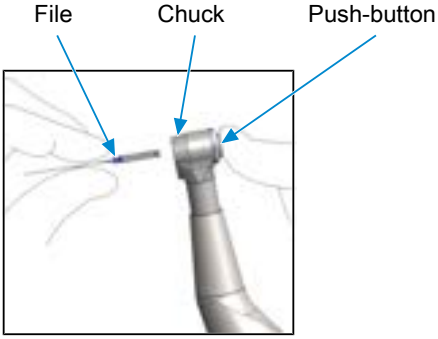
- To power the handpiece off, press the Main Settings button along with the Main Switch button.

- After switching the device on, the main screen is displayed (after a short logo animation). Status bar is in the upper part of the display. The status bar consists of:

1. Program memory slot number
2. Memory
3. Battery level indicator
4. Bluetooth connection indicator
   - Bluetooth is disconnected
   - Bluetooth is connected
   - Bluetooth is disabled

6.4.2 Install file

- Insert the file into the contra-angle chuck until it stops.
- Press the push-button on the contra-angle head and turn the file gently until it engages with the latch mechanism. Push inwards to click and release the push-button. Pull the file gently to make sure it is locked.
- To release the file, press the push-button on the contra-angle head and pull out the file.



⚠ WARNING

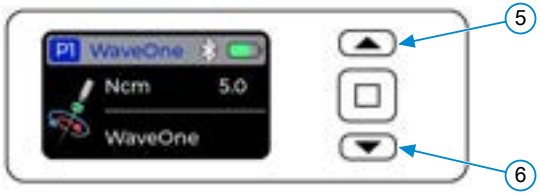
Before inserting and pulling out the file, the motor handpiece must be stopped.

6.4.3 Modes of operation and parameters setup

X-Smart® Go device features 10 memory programs, categorized as follows:

Memory	Description
	Preset memory programs containing embedded file systems:
P1	**WaveOne®**
P2	**RECIPROC®**
P3	**ProTaper Ultimate®**
P4	**TruNatomy®**
AL	Dedicated to electronic measurement; operates in Apex Locator mode without motor rotation.
M1	User-configurable memory programs allowing rotary custom settings and configurations.
M2	
M3	
M4	
M5	

- To scroll between the device memory programs, use the “Scroll up” (5) or “Scroll down” (6) buttons.



- Press and hold the “Main Settings” (7) button to access and modify the parameters settings for the selected program.

- To confirm your selection and to move to the next parameter, press the “Main Settings” button ⑦.
- To confirm your selection and exit, press the “Main Switch” button ⑧.

Info

Selected parameters for embedded files are set to the values recommended by the instrument manufacturer.

6.4.3.1 Mode (for User-programmable memory programs M1 – M5 only)

Select the operation mode of the motor by pressing the “Scroll up” or “Scroll down” buttons:

Mode	Description
CW	Clockwise rotation. Device is running in continuous rotation.
CCW	Counterclockwise rotation. Device is running in continuous rotation in reverse. * *When this mode is being used, an alert sound is activated.*

6.4.3.2 Speed

Set the rotation speed of the file by pressing the “Scroll up” or “Scroll down” buttons (press and hold the scroll button for fast scrolling).

Speed	Description
50 – 2,500 rpm	Rotation speed of the endodontic file.

To confirm your selection and to move to the next parameter, press the “Main Settings” button.

6.4.3.3 Torque

Set the max torque value by pressing the “Scroll up” or “Scroll down” buttons (press and hold the scroll button for faster scrolling).

Torque	Description
0.4 – 6.0 Ncm	Max torque that can be applied to the endodontic file: ● 6.0 Ncm for speed from 50 to 400 rpm ● 5.0 Ncm for speed from 450 to 500 rpm ● 4.0 Ncm for speed from 550 to 650 rpm ● 3.0 Ncm for speed from 700 to 1200 rpm ● 2.0 Ncm for speed from 1,250 to 1,500 rpm ● 1.5 Ncm for speed from 1,550 to 2,000 rpm ● 1.0 Ncm for speed from 2,050 to 2,500 rpm

⚠ WARNING

Use the torque and speed settings recommended by the file manufacturer.

6.4.3.4 Torque action

Select the action that the motor shall perform if the applied torque on the endodontic file reaches the maximum defined torque.

Torque Action	Description
Torque Release	The file automatically reverses direction until the torque is released, then returns to normal rotation.
Reverse	The file continues to rotate in reverse until the Motor Start/Stop button is pressed.

6.4.3.5 Apical action

Select the action that the motor shall perform when the tip of the endodontic file has reached the Apical limit.

Apical Action	Description
Off	No action
Reverse	The file automatically reverses direction until withdrawn from the apical limit, then returns to normal rotation.
Stop	The file automatically stops until the Motor Start/Stop button is pressed to start in reverse direction. When the file is withdrawn from the apical limit, it returns to normal rotation.

6.4.3.6 Dr's Choice

This feature enables to mark an individual predetermined reference position at the required distance from the apex. This variable apical line can be set between the 3rd blue bar and the last orange bar. When Dr's Choice apical line is set, clear visual and audio indication is given that the file tip has reached this pre-selected position.

To select the action that the motor shall perform when the tip of the endodontic file reaches the defined Dr's Choice position, see paragraph [▸ 6.4.3.5].

Info

When the apex position is reached (last orange bar), a solid tone is sounded, regardless of Dr's Choice position.

6.4.4 Device settings

- To enter the Settings Menu, use the "Scroll up" (1) or "Scroll down" (2) buttons to reach "Settings".

- Press and hold the "Main Settings" (3) button to access and modify the device settings.
- Use the "Scroll up" (1) or "Scroll down" (2) buttons to modify device settings. Use the "Main Settings" (3) button to advance in the settings menu.
- Press the Main Switch button to save your settings and exit.

The Settings menu features:

Volume	Set the volume level from Mute to High.

Auto-Shutdown	Set the automatic shutdown timer.
Dominant Hand	Rotate the user interface 180° degrees.
Motor Calibration	Automatic calibration of the motor with the contra-angle.
Apex Locator Test	Automated self-test of the Apex Locator.
CCW Alert Sound	Enable or disable the alert sound when CCW mode is running.
Apex Locator LEDs	Enable or disable the Main switch LEDs blinking according to apical position.
Bluetooth	Enable or disable the Bluetooth (intended solely for service purposes).
Set Factory Defaults	Reset the device to the factory default settings.
Version info	Device firmware information.

6.4.4.1 Volume - Sound adjustment

X-Smart® Go endo motor is equipped with an audio signal which enables monitoring of the torque and progression of the file within the canal in addition to visual monitoring.

The volume can be adjusted by pressing “Scroll up” (1) or “Scroll down” (2) buttons.

6.4.4.2 Automatic Shutdown

Automatic shutdown of **X-Smart® Go** endo motor can be adjusted between 2 min to 20 min of device non-use. Simply adjust the Automatic Shutdown slider to your preferred time duration by pressing “Scroll up” (1) or “Scroll down” (2) buttons.

6.4.4.3 Dominant Hand

This feature will rotate the display direction 180°.

Use the “Scroll up” (1) or “Scroll down” (2) buttons for “Right” or “Left” depending on user’s dominant hand.

6.4.4.4 Motor Calibration

Calibrating the motor automatically sets the rotational speed to ensure torque precision. Always calibrate the motor handpiece after the contra-angle has been sterilized, lubricated, or exchanged.

- Remove the endodontic file from the contra-angle prior performing the calibration.
- Make sure that the contra-angle is properly attached to the handpiece.
- Use the “Scroll up” (1) or “Scroll down” (2) buttons to select “Start”.

- Press the “Main switch” button (3) to start the calibration process.

- Calibration will be performed automatically.

⚠ WARNING

Do not insert any files during calibration. Risk of injury, as the motor changes rotational speed from the minimum to the maximum value during calibration.

6.4.4.5 Apex Locator Test

The automated self-test of the apex locator function verifies the device's accuracy and functionality before use. It conducts a series of internal checks to ensure the device is operating correctly.

- Use the “Scroll up” (1) or “Scroll down” (2) buttons to select “Start”.

- Press the “Main switch” button (3) to start the self-test process.

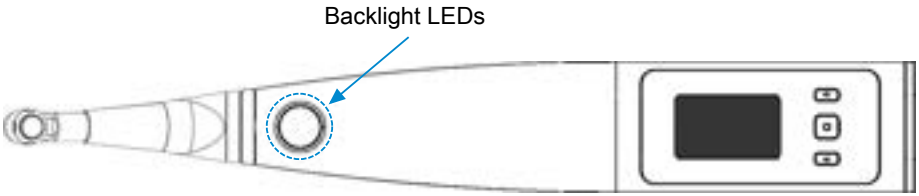
6.4.4.6 CCW Alert Sound

Enable or disable the alert sound when CCW mode is running.

Use the “Scroll up” (1) or “Scroll down” (2) buttons to turn “On” or “Off” the alert sound during CCW mode rotation.

6.4.4.7 Apex Locator LEDs

Enable or disable the backlight LEDs on the main switch to blink based on the apical position.



Use the “Scroll up” (1) or “Scroll down” (2) buttons to turn “On” or “Off” the LEDs blinking function.

6.4.4.8 Bluetooth

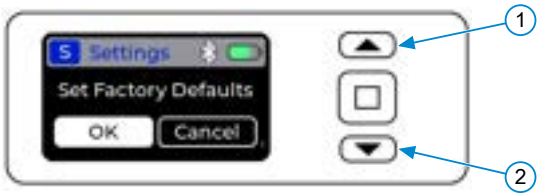
The Bluetooth feature is intended solely for service purposes, such as software updates. To enable or disable the Bluetooth on your endo motor device.

Use the “Scroll up” (1) or “Scroll down” (2) buttons to turn “On” or “Off” the Bluetooth function.

6.4.4.9 Set Factory Defaults

This option lets you reset all user-customized parameters to their original settings.

- Use the “Scroll up” (1) or “Scroll down” (2) buttons to select “OK”.



- Press the “Main switch” button (3) to restore default settings.

Info

Once user-edited parameters are reset, they cannot be recovered.

6.4.5 Canal measurement

X-Smart® Go features an integrated apex locator for length determination of the root canal.

The apex locator can be used in 2 ways:

- Separate Length Determination: The working length is determined manually (without the motor) using the file clip and the lip clip.
- Combined Length Determination (see [▶ 6.4.6.1]): The working length is determined while the root canal is being prepared. The motor and the apex locator are thus active simultaneously using the endodontic file inside the contra-angle and the lip clip.

6.4.5.1 Separate length determination (with hand file)

Turn on the device and select AL mode (see [▶ 6.4.3]).

The Apex Locator can be configured for either a landscape or portrait interface.

Portrait interface

Landscape interface

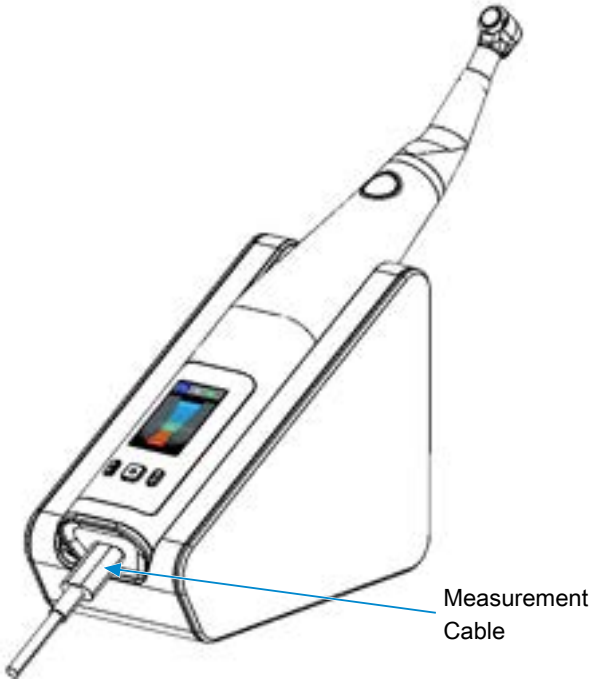
Press and hold the “Main Settings” (3) button to access and modify the AL settings. Press the “Main Settings” (3) button to reach AL interface selection.

Use the “Scroll up” (1) or “Scroll down” (2) buttons to change the AL interface, between Portrait and Landscape.

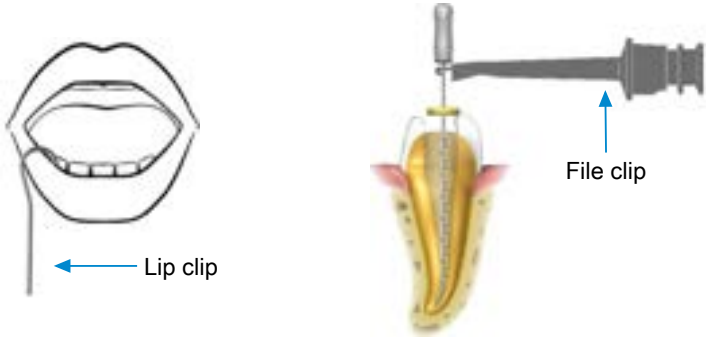
Press the Main Switch button to save your settings and exit.

Before connecting the measurement cable with attached lip clip and file clip to the patient, plug the measurement cable into the device receptacle.

For optimal display viewing angle place the handpiece into the power bank.



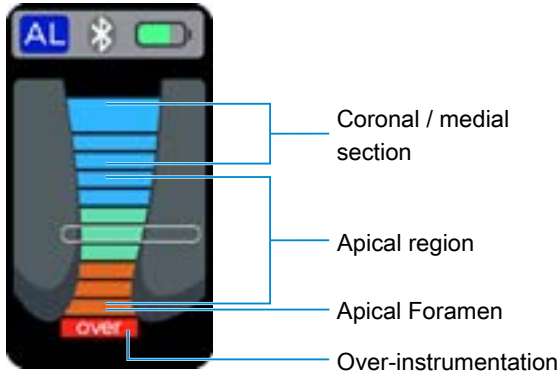
Attach the lip clip to the patient's lip and gently insert the file into the canal and connect the file clip to the metal shaft of the file.

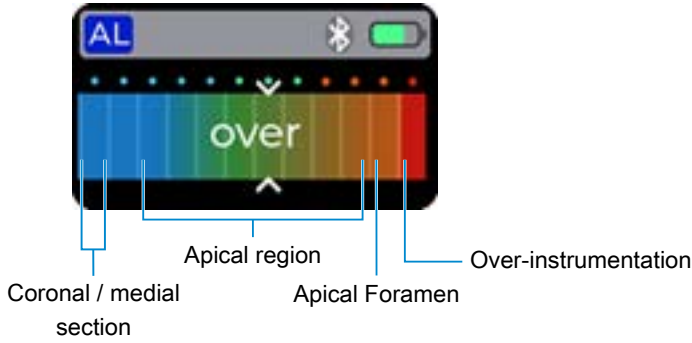


Info

To ensure optimal performance the file size should be adjusted to the canal diameter.

Two initial beeps indicate closed measurement circuit and beginning of length determination. The file movement in the canal is shown on the screen.





Info

Absence of the two beeps audio signal indicates a faulty connection. Disconnect the measurement cable from the patient and check cable connections, clean the file clip and the lip clip, moisten the canal if necessary and start again.

No other adjustments are required before starting apex localization.

The Apex Locator can also be activated automatically from any memory program by connecting the file clip to the hand file while the lip clip is attached. In this mode, only the landscape interface is displayed.

6.4.5.2 Apex localization

Advance the endodontic file slowly into the canal. The first two blue bars correspond to the coronal/medial section. As the file progresses in the canal, subsequent green bars in the apical region turn on gradually and the interval between the audio signals becomes shorter.

Info

The bars indication on the **X-Smart® Go** endo motor screen does not represent a distinct length or distance in mm or other linear units. It simply indicates the file progression towards the apex.

When the last orange bar is reached, a solid tone is emitted. The indication of the last orange bar on the **X-Smart® Go** endo motor screen relates to the apical foramen file position.

6.4.5.3 Over-instrumentation

A red bar (over) and an audio warning signal (rapid intermittent signal) indicate that the file has passed the apical foramen.

6.4.5.4 Completion of the measurements

- Before unplugging the measurement cable from the device receptacle, disconnect the lip clip and the file clip from the patient.
- Move the file stopper to the selected reference point on the tooth.
- Gently remove the file from the canal and measure the apical length between the stopper and the file tip.

Info

Determination of working length for canal shaping is a subject of dentist's professional judgment. In most cases subtraction of 0.5 mm from the measured "apical foramen" length provides clinically acceptable working length. Nevertheless, in each case the dentist should define proper working length based on his experience, apex locator readings, radiographs and other available data.

6.4.5.5 Cable connection test

In case measurement indication is not detected a cable connection test needs to be conducted. A connection test feature is included in **X-Smart® Go** endo motor to check the cables:

- Connect the measurement cable with attached file clip and lip clip and turn on the device.
- Connect the metal part of the file clip to the lip clip. Make sure that the accessories are cleaned properly before the test.

- "Cable connection test" icon  should appear on the screen.

- If no icon appears, the file clip or the measurement cable should be replaced.
- Repeat the test also with the lip clip and the endodontic file connected to the contra-angle.

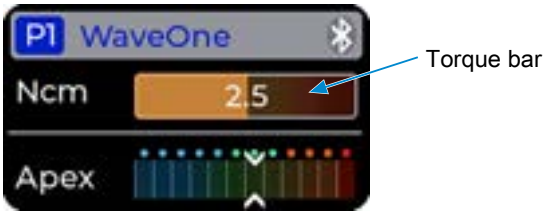
6.4.6 Operation

Select the memory program appropriate to the treatment to be performed. Insert the endodontic file into the contra-angle, verify that the operating parameters are matching to the selected file.

- Gently insert the endodontic file into the root canal and press the motor start/ stop button (1) once to start the motor operation. Do not keep the button pressed.

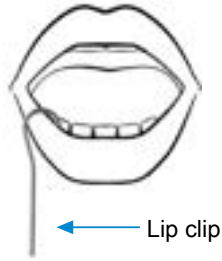
- During the operation of the motor, the torque bar is displayed on the upper part of the screen, and the apex locator scale is displayed on the lower part of the screen.

- As the torque level increases, the torque bar is filled from orange to red color and the torque numerical value changes accordingly.

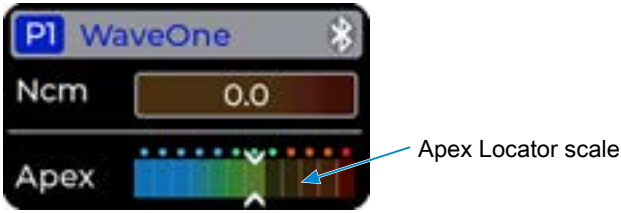


6.4.6.1 Combined length determination

In this mode the working length is determined while the root canal is being prepared. To use the apex locator put the Protective Silicone Sleeve on the contra-angle (after it has been sterilized), connect the measuring cable to the handpiece and attach the lip clip on patient's lip (there is no need to connect the file clip).



- While the root canal is being prepared, the apex locator readings are displayed on the lower scale on the screen.



Info

The bars indication on the **X-Smart® Go** endo motor screen does not represent a distinct length or distance in mm or other linear units. It simply indicates the file progression towards the apex.

7 Maintenance and reprocessing

7.1 General recommendations

- The device does not contain user serviceable parts. The service and repair should be provided by factory trained service personnel only.
- After each use, all objects that were in contact with infectious agents must undergo a complete reprocessing cycle consisting of:
  1. Pre-cleaning: Using single-use wipes or a soft cloth impregnated with a disinfecting and detergent solution (a bactericidal, fungicidal and aldehyde free solution), according to manufacturer's directions. We recommend using only a disinfecting solution which is approved for its efficacy (VAH/DGHM-listing, CE marking, FDA approval). Use of chemical agents may cause damage to the equipment. We recommend single-use wipes (e.g. CaviWipes™ or CaviCide™).
  2. Thorough cleaning.
  3. Disinfection.
  4. Sterilization (for sterilizable components).
- The following components must be reprocessed before the first use and between each patient: contra-angle and its protective silicone sleeve, lip clip and file clip.
- The handpiece, the power bank, measurement cable and charger cannot be sterilized but must be disinfected between patients using the cleaning and disinfection (Wipe) procedure.
- All damaged accessories should be discarded immediately. Dirty accessories must be cleaned, disinfected, and sterilized per the procedure described in section [▸ 7.3].
- The maximum number of sterilization cycles is:
  - File clip: 200.
  - Lip clip: 200.
  - Contra-angle: 200.
  - Protective silicone sleeve: 200.

7.2 Overview of the parts to be reprocessed

Part	Cleaning and disinfection			Steam-Sterilization
	Manual		Automated	
	Wipe	Brush (only cleaning)	Washer disinfector*	
Motor handpiece	X			
Power bank	X			
Measuring cable	X			
Charger	X			
Contra-angle		X	X	X
Protective silicone sleeve		X	X	X
Lip clip		X		X
File clip		X		X

X*: Required reprocessing step*

**: Cleaning and disinfection equipment*

7.3 Cleaning, disinfection and sterilization procedure

Foreword

For hygiene and sanitary safety purposes, the lip clip, file clip, contra-angle and protective silicone sleeve must be cleaned, disinfected and sterilized before each usage to prevent any cross-contamination between patients. This concerns the first use as well as the subsequent uses. Please note that the device handpiece, the power bank, the charger and the measurement cable cannot be sterilized.

General recommendations

- Use only a disinfecting solution which is approved for its efficacy (VAH/DGHM-listing, CE marking, FDA approval) and in accordance with the DFU of the disinfecting solution manufacturer. For all metal instruments, it is recommended to use anticorrosion disinfecting and cleaning agents.
- For your own safety, please wear personal protective equipment (gloves, glasses, mask).
- The user is responsible for the sterility of the product for the first cycle and each further usage as well as for the usage of damaged or dirty instruments where applicable after sterility.

- Limitations and restrictions on reprocessing:
  The appearance of defects such as cracks, deformations (bent, twisted), corrosion, loss of color, are indications that the devices cannot fulfil the intended use with the required safety level.
- Use only clean water in all cleaning and rinsing steps.

Step-by-step procedure

Motor handpiece, Power bank, Measuring cable and Charger

Cleaning and Disinfection (Wipe):

- After each patient use, remove and discard the handpiece protective sleeve.
- Clean and disinfect the motor handpiece, power bank, measuring cable and charger by using a single-use wipe or soft cloth soaked in disinfecting solution which is approved for its efficacy (VAH/DGHM-listing, CE marking, FDA approval) and in accordance with the instructions of the disinfecting solution manufacturer.
- We recommend single-use wipes (e.g. CaviWipes™ or CaviCide™). For thorough wipe cleaning and disinfection, observe the disinfectant manufacturer's instructions.
- Wipe off the disinfectant with a dry, clean, and lint-free cloth after it has taken effect. No visible impurities or liquid should remain on the device after disinfection.
- Inspect under bright light (at least 500 lux). If still dirty, repeat the process.
- Allow the motor handpiece to dry thoroughly before the next use or before reapplying a new protective sleeve.

⚠ WARNING

If using a disinfectant and detergent solution, do not spray it directly onto the device components. Use a soft cloth impregnated with the solution.

Contra-angle, Protective silicone sleeve, Lip clip and File clip

Cleaning, Disinfection and Sterilization:

Step	Operation	Instructions	Details and warning
1	Disassembling	• Detach the file and separate the contra-angle from the motor handpiece. If applicable, remove the protective silicone sleeve from the contra-angle. • Disconnect the measuring cable from the device and detach the lip clip and the file clip from the measuring cable.	For your own safety, please wear personal protective equipment (gloves, glasses, mask).
2	Pre-Disinfection	Pre-disinfect the contra-angle, protective silicone sleeve, lip clip and file clip immediately after use with disinfection wipes (for at least 30 seconds) making sure the entire surface is wet (pay special attention to hard-to-reach areas: push-button, chuck of the contra-angle and joint of the different parts).	• Follow instructions from the manufacturer of disinfection wipes. • Use disinfecting solution which is approved for its efficacy (VAH/DGHM-listing, CE marking, FDA approval) and in accordance with the instructions of the disinfecting solution manufacturer. • Use only wipes that do not have a protein-binding effect (i.e. aldehyde free) and do not contain chloride. We recommend single-use CaviWipes™ or CaviCide™.

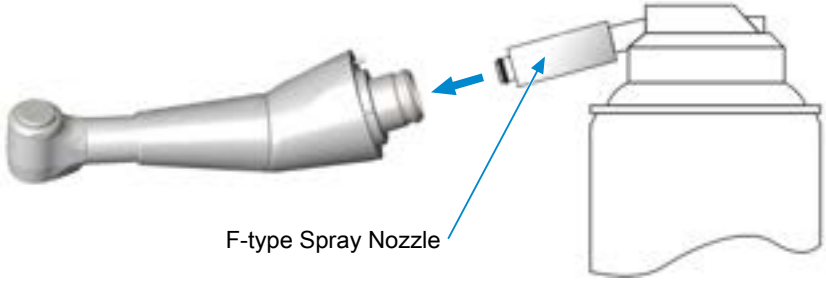
Step	Operation	Instructions	Details and warning
3	Manual Cleaning (Brush)	● Abundant rinsing (for at least 1 minute) under running water (ambient temperature) including manual brushing for at least 15 seconds. ● Inspect under bright light (at least 500 lux). If still dirty, repeat the process. ● After cleaning no visible impurities should remain on the accessories. ● Lubricate the contra-angle after cleaning.	● Use tap water for rinsing. ● In any case the contra-angle must be manually brushed with a soft brush (made from either nylon, polypropylene, acrylic) and especially in the confined areas: push-button, chuck of the contra-angle and joint of the different parts. ● The brush must be disinfected and cleaned and must be changed daily. ● The file clip should be activated during cleaning process (pressed and released several times).

Step	Operation	Instructions	Details and warning
4	Automated Cleaning with washer-disinfector *For contra-angle and silicone protective sleeve only*	● Place the contra-angle and silicone sleeve in a stainless steel or titanium holder to prevent contact between items. ● Load the holder into the washer-disinfector and run the approved cycle, e.g. cleaning at 65°C (149°F) for 5 minutes and disinfection at 90°C (194°F) for 5 minutes (Ao value > 3000). ● Use a detergent with cleaning properties, such as Neodisher Mediclean Forte at 0.4%. ● Ensure all parts are completely dry after the cycle. Wipe off any remaining liquid with a single-use non-woven cloth. ● Inspect under bright light (at least 500 lux). If still dirty, repeat the process. ● Lubricate the contra-angle immediately after thermal disinfection.	The washer-disinfector must be approved by its manufacturer for cleaning and disinfecting these products and comply with ISO 15883-1/-2, e.g. 90°C (194°F) and 5 min holding time. Refer to the instructions for use of the device for the respective use.

Step	Operation	Instructions	Details and warning
5	Packaging	● The contra-angle must be lubricated according to section “Lubricating the contra-angle [▸ 7.4]”, before sterilization. ● Pack in sterilization pouches in packaging suitable for sterilization and storage.	Use packaging which is resistant up to a temperature of 141°C (286°F) and compliant with ISO 11607.
6	Steam Sterilization	Steam sterilization at: 135°C (275°F) for 10 minutes Drying time after sterilization – 30 minutes Or 134°C (273°F) for 3 minutes Drying time after sterilization – 20 minutes	● All sterilizable components: contra-angle, protective silicone sleeve, lip clip (all variants), and file clip (all variants) must undergo steam sterilization after cleaning and disinfection. ● Steam sterilizers that comply with the requirements of EN 13060, Class B or Class S and are also suitable for the sterilization of these products. ● Follow maintenance and operation procedures of the autoclave provided by the manufacturer.
7	Storage	Keep all sterilized items in sterilization pouches in a dry and clean environment.	Sterility cannot be guaranteed if packaging is open or damaged (check the packaging before using the accessories).

7.4 Lubricating the contra-angle

- Lubricate the contra-angle only with dedicated spray. We recommend the use of the KaVo Spray or W&H Service Oil MD-400.
- Lubricating the contra-angle is mandatory after each use and before sterilization.
  - Screw the spray nozzle onto the spray with approx. 10 turns.



  - Insert the spray nozzle into the rear part of the contra-angle.
  - Hold the contra-angle securely to prevent it from detaching with the pressure of the spray and lubricate for 2-3 seconds until oil comes out from the contra-angle head.
  - Before attaching the lubricated contra-angle to the motor handpiece, wipe off excess oil. Place it on its end or lean it at an angle for gravity draining. Mount it after excess oil has been drained.

⚠ WARNING

- Do not lubricate the motor handpiece.
- Never use a spray can upside down.

8 Troubleshooting

8.1 Troubleshooting

Please review the checklist below should you experience a problem with your **X-Smart® Go** endo motor. If the problem persists after following the proposed solutions, please contact your distributor.

⚠ WARNING

The following patient related factors may prevent accurate apex locator readings:

- Blocked root canals.
- Teeth with large apices.
- Root fracture or perforation.
- Metal crowns or bridges if they come in contact with the file or the lip clip.

#	Problem	Possible cause	Solution
1	The device does not turn on by pressing the “Main Switch” button.	The button is functioning incorrectly.	Try pressing the “Main Switch” button several times. If the device still does not turn on, please contact your distributor.
		The battery is discharged.	Charge the battery.
		Electronic malfunction.	Contact your distributor.
2	The device shuts off during the procedure.	The battery is low.	Charge the battery.
3	Motor handpiece does not run.	Probably the program is set to AL mode.	Change the mode of the programs from AL mode.
4	Device is unresponsive or frozen.	Software glitch or temporary system error.	Perform a hard reset. Press and hold the on/ off button for about 8 seconds until the unit powers off, then restart the device.
5	The device does not charge while placed on the Power bank.	The Power bank battery is discharged.	Connect the charger to the Power bank.
6	No sound during the procedure.	The sound control is set at “Mute” level.	Adjust the sound level in the Settings menu.

#	Problem	Possible cause	Solution
7	Apex locator scale on the display is not steady during root canal measurements.	There is not a good contact between the lip clip and the oral mucosa.	Ensure a good contact between the mucosa and lip clip (Place the lip clip in the labial angle opposite the tooth to be treated).
		The file clip is soiled.	Clean the file clip with a single-use wipes.
		Deep caries provides a conductive path outside the canal.	Block the external conductive path.
		Perforation.	Remove the file, close the perforation and repeat the apex detection procedure, carefully inserting the file into canal.
		Large lateral canal.	Try continuing the procedure by gently advancing the file.

#	Problem	Possible cause	Solution
8	The transmission of the apex locator electric signal is interrupted. The device does not show file progression inside the canal.	Bad electrical contact.	Perform the Cable Connection Test sequence as described in the user manual, section [▶ 6.4.5.5].
		The file clip is not properly connected to the file.	Place the file clip on the metal part of the file below the plastic handle.
		The root canal is obliterated.	Check the comparative X-ray image for hints.
		In the case of retreatment: old filling material residues may block the root canal.	Remove old root filling material residues prior to use.
		The root canal may be blocked by the remnants of a medication (e.g. calcium hydroxide).	Completely remove the remnants prior to use.
		Root canal is extremely dry.	Rinse the root canal with NaCl solution. Dry the access cavity with a cotton pellet / air-blower.
		The selected file is too small for a large root canal.	If there is no proper contact to the root canal wall, use a larger ISO size file. Important: exactly fitting files lead to precise results.
		Electronic malfunction.	Contact your distributor.

#	Problem	Possible cause	Solution
9	Display reaction is erratic: apical foramen position or “Over” appears on the screen before the apical region is reached.	Short circuit due to excess liquid (irrigation solution, saliva, blood) in the pulp chamber.	Dry the access cavity with a cotton pellet / air-blower. In case of excess bleeding wait until it has stopped.
		A direct contact of the file with the gingiva or gingival proliferations, or metal crown.	For isolation: adequate preparation filling of access cavity; use a rubber dam.
		A direct contact of the file with metal restorations (crown, parapulpal post, amalgam filling).	Isolate the file by inserting it into a small, isolated tube before use.

8.2 Abnormal stop

The endo motor may stop working in the cases listed below:

#	Problem	Possible cause	Solution
1	Attention Motor Overload	The endo motor is continuously subjected to a heavy load, such as when the file becomes stuck in the canal and the motor is unable to rotate.	Press the motor start/ stop button to start the motor operation.
2	Low Battery	The Battery power is too low, or the motor was subjected to a heavy load momentarily.	Press the motor start/ stop button to start the motor operation. Charge the endo motor on its power bank.
3	E.7	Overcurrent or motor high temperature detected.	Let the motor cool down.
4	E.11	Max speed couldn’t be reached during calibration.	Restart the endo motor and try to perform calibration again. Try without the contra-angle angle.

#	Problem	Possible cause	Solution
5	E.12	High torque level detected during calibration.	Try without the contra-angle, then lubricate the contra-angle and try again.

8.3 Error codes

In case an error or problem is detected, the endo motor will stop, and an error code will appear in the display. Restart the endo motor, if the error code appears again, stop using the endo motor and contact your distributor. Please report the error code when requesting assistance.

Error code	Description	What to Do
E.1	The main control system stopped responding.	Turn the endo motor on again. If the message repeats, contact your distributor.
E.2	The motor drive stopped responding.	Restart the endo motor. If it happens again, contact your distributor.
E.3	The motor drive SW version is not compatible.	Restart the endo motor. If it happens again, contact your distributor.
E.4	The measurement SW version is not compatible.	Restart the endo motor. If it happens again, contact your distributor.
E.8	The system files library is not working correctly.	Restart the endo motor. If it happens again, contact your distributor.
E.9	The motor drive cannot communicate with the control unit.	Restart the endo motor. If it happens again, contact your distributor.
E.10	The motor could not start correctly.	Contact your distributor.
E.13	The apex locator did not pass its self-test.	Restart the endo motor and try to perform the apex locator test. If it happens again, contact your distributor.

9 Warranty

X-Smart® Go endo motor handpiece and power bank are warranted for 24 months from the date of purchase. The contra-angle is warranted for 12 months from the date of purchase, and the device accessories (measurement cable, charger, lip clip, file clip, protective silicone sleeve and batteries) are warranted for 6 months from the date of purchase. Within the warranty period the manufacturer undertakes, at its sole discretion, to repair or replace the faulty item without charge.

This product has been developed specifically for use in dentistry and is intended to be operated only by qualified dental professionals in accordance with the instructions contained in this manual. However, notwithstanding anything contained herein, the user shall always be solely responsible for determining the suitability of the product for the intended purpose and the method of its use. Any guidance on technology application offered by or on behalf of the manufacturer, whether written, verbal or by demonstration, shall not relieve the dental professional from his/her obligation to control the product and to make all professional judgments regarding its use.

Except for the warranties specifically set forth in this manual, the manufacturer provides no warranties or guarantees of any kind covering the product, expressed or implied, including, without limitation, any warranties as to merchantability or fitness for a particular purpose. Any claim for damage or breakage to the product in transit should be made to the carrier promptly upon discovery.

The warranty is valid for normal usage conditions. Any damage caused by accident, abuse, misuse, or because of service or modification other than by a person authorized by the manufacturer will render the warranty void.

10 Disclaimer

The manufacturer, its representatives and its distributors shall have no liability or responsibility to customers or any other person or entity with respect to any liability, loss or damage caused or alleged to be caused directly or indirectly by equipment sold or furnished by us, including, but not limited to, any interruption of service, loss of business or anticipatory profits, or consequential damages resulting from the use or operation of the equipment.

The manufacturer reserves the right to implement changes and modifications of the product at any time, to revise this publication and to make changes in the contents hereof without obligation to notify any person of such changes, modifications, or revisions.

11 Certification

X-Smart® Go endo motor complies with the following standards: IEC 60601-1 (Safety) and IEC 60601-1-2 (Electromagnetic compatibility), including conducted and radiated immunity tests as specified for equipment of Group 1 Class B.

12 Disposal of the product

Recycling: PLEASE DO NOT THROW AWAY! This product and all its components must be recycled through your supplier.

13 Reporting of incident to Manufacturer

Users shall report to the Manufacturer any serious incident related to the device, using this email: info@forumtec.net. Any personal information contained in this email is considered confidential and is accessible only by authorized personnel.

Any serious incident that has occurred in relation to the device should also be reported to the competent authority of the Member State in which the user and/or patient is established.

14 Technical characteristics

X-Smart® Go endo motor with integrated apex locator is a programmable electrical medical device, belongs to the following category of medical devices:

- Class II equipment
- Internally powered equipment
- Type BF Applied Parts
- Not suitable for use in the presence of flammable anesthetic mixtures with air, oxygen or nitrous oxide
- Continuous operation
- Expected service life: 3 years
- Ingress of liquids – not protected
- The device is intended for indoor use only
- Environmental conditions during storage/transportation:
  - Temperature: -20°C to +60°C (-4°F to 140°F)
  - Relative humidity: 10% to 90%, non-condensing
  - Atmospheric pressure: 106 kPa to 50 kPa
- Environmental conditions during device usage:

- Temperature: 10°C to +40°C (50°F to 104°F)
- Relative humidity: 10% to 90%, non-condensing
- Atmospheric pressure: 106 kPa to 70 kPa

X-Smart® Go endo motor is intended for use in electromagnetic environment specified for equipment of Group 1 Class B.

Specifications:

Device Name	X-Smart® Go
Dimensions Handpiece with contra-angle (L × D × H)	210 × 26 × 28 mm
Dimensions Power bank (W × D × H)	55 × 111 × 90 mm
Weight Handpiece with contra-angle	154 g
Type of screen	Color TFT display
Supply	3.6V Lithium-ion rechargeable battery (600 mAh – Handpiece) (3,200 mAh – Power bank)
Switching charger	Input: 100-240 V AC ~ 50-60 Hz Output: 5V DC, 2,000 mA
Contra-angle gear ratio	6:1
File shank attachment	Ø 2.35 mm ISO1797-1 Type 1
Minimum fitting length of shank	9.5 mm
Maximum overall length of the mechanized file	46 mm
Chuck type	Push-button

Description	Basic UDI-DI	EU Class.
X-Smart® Go	++D100B00XSGO00000093	Class IIa
X-Smart® Go Measurement cable	++D100B00XSGOAC0001MT	Class I
X-Smart® Go File clip	++D100B00XSGOAC0002MV	Class I
X-Smart® Go Lip clip	++D100B00XSGOAC0003MX	Class I
X-Smart® Go Charger	++D100B00XSGOAC0004MZ	Non-Medical
X-Smart® Go Power bank	++D100BSPXSGOAC0005TL	Class I

Description	Basic UDI-DI	EU Class.
X-Smart® Go Contra-angle 6:1	++D100B00XSGOAC0006N5	Class I
X-Smart® Go Protective silicone sleeve	++D100B00XSGOAC0007N7	Class I

Information about radio communications:

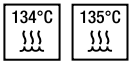
- Bluetooth 5.0 Low Energy Communication
- Frequency band: 2.402 to 2.480 GHz
- The effective radiated power is below 5 mW
- Europe: EU EN 300 328 V2.1.1
- USA: Contains FCC ID: RYYEYSHSN

15 Identification of symbols

Symbols used in these directions for use, packaging, device and parts.

Symbol	Identification
SN	Serial number
REF	Catalogue number
LOT	Lot number
⎓	Direct current (connection for power supply)
	Manufacturer
	Date of manufacture
	Class II equipment
	Type BF applied part
	Consult instructions for use

Symbol	Identification
	Refer to instruction manual/booklet
	Recycling PLEASE DO NOT THROW AWAY! This product and all its components must absolutely be recycled through your distributor
	Do not re-use
	Temperature limitation
	Humidity limitation
	Atmospheric pressure limitation
	Additional information, explanation on operation and performance
	Warning
MD	Medical Device
EU REP	Authorized Representative in the European Union
	Identifies the importer name and physical address
CH REP	Authorized Representative in Switzerland
UK REP	Authorized Representative in the United Kingdom
UK CA	UK Conformity Assessed marking
Segurança UL BR	INMETRO marking

Symbol	Identification
	Caution: Federal law (USA) restricts this device to sale by or on the order of a licensed healthcare practitioner
	Sterilizable in a steam sterilizer (autoclave) at temperature specified
	Non sterile
	Indicates the number of pieces in the package. “X” is replaced by the number of pieces in the package
	Keep Dry

Appendix

Electromagnetic Compatibility

Notes:

- **X-Smart® Go** endo motor requires special precautions regarding electromagnetic compatibility.
- It must be installed and prepared for use as described in section [▸ 6.3].
- Certain types of RF wireless communication equipment such as mobile telephones are likely to interfere with **X-Smart® Go** endo motor.
- The recommended radiation levels of RF wireless communication equipment specified in this paragraph must therefore be complied with.
- **X-Smart® Go** endo motor must not be used near or on top of another device. If this cannot be avoided, it is necessary – before clinical use – to check the equipment for correct operation under the conditions of use.

Electromagnetic Emissions

Notes:

- **X-Smart® Go** endo motor is intended for use in the professional healthcare facility electromagnetic environment specified in the tables below.
- The user and/or installer of the unit must ensure that it is used in such an environment.
- The EMISSIONS characteristics of this equipment make it suitable for use in industrial areas and hospitals (CISPR 11 class A). If it is used in a residential environment (for which CISPR 11 class B is normally required) this equipment might not offer adequate protection to radio-frequency communication services. The user might need to take mitigation measures, such as relocating or re-orienting the equipment.

Declaration - Electromagnetic Emissions		
Emissions test	***Compliance***	***Electromagnetic environment - guidance***
RF emissions CISPR 11	Group 1 Class A	**X-Smart® Go** endo motor uses RF energy only for its internal function. Therefore, its RF emissions are extremely low and are not likely to cause any interference in nearby electronic equipment.

Declaration - Electromagnetic Emissions		
Emissions test	***Compliance***	***Electromagnetic environment - guidance***
Harmonic emissions IEC 61000-3-2	Class A	**X-Smart® Go** endo motor is suitable for use in all establishments other than domestic, and may be used in domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes, provided the following warning is heeded: Warning: This equipment/system is intended for use by healthcare professionals only. This equipment/ system may cause radio interference or may disrupt the operation of nearby equipment. It may be necessary to take mitigation measures, such as re-orienting or relocating the **X-Smart® Go** endo motor or shielding the location.
Voltage Fluctuations and Flicker IEC 61000-3-3:2013	Complies	

Declaration - Electromagnetic Immunity			
Immunity test	***IEC 60601 Test level***	***Compliance level***	***Electromagnetic environment - guidance***
Electrostatic discharge (ESD) IEC 61000-4-2	8 kV contact	8 kV contact	Floors should be wood, concrete, or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
	2, 4, 8, 15 kV air	2, 4, 8, 15 kV air	
Electrical fast transients / bursts IEC 61000-4-4	2 kV for power supply lines	2 kV for power supply lines	Mains quality of power should be that of a typical commercial or hospital environment.
	1 kV for input/output lines	Not Applicable	
Surges IEC 61000-4-5	1 kV Line(s) to line(s)	1 kV Line(s) to line(s)	Mains quality of power should be that of a typical commercial or hospital environment.
	2 kV Line(s) to earth	2 kV Line(s) to earth	
	2kV Signal (input/ output) to earth	N/A	
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	0% UT; 0.5 cycle at 0°, 45°, 90°, 135°,180°, 225°, 270° and 315°	0% UT; 0.5 cycle at 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315°	Mains quality of power should be that of a typical commercial or hospital environment. If the user of the **X-Smart® Go** endo motor requires continued operation during power mains interruptions, it is recommended that the **X-Smart® Go** endo motor be powered from an uninterruptible power supply or a battery.
	0% UT; 1 cycle and 70% UT; 25/30 cycles	0% UT; 1 cycle and 70% UT; 25/30 cycles	
	Single phase at 0° 0% UT; 250/300 cycles	Single phase at 0° 0% UT; 250/300 cycles	
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	30 A/m	30 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.

Declaration - Electromagnetic Immunity			
Immunity test	***IEC 60601 Test level***	***Compliance level***	***Electromagnetic environment - guidance***
	3 V, 6 V	3 Vrms, 6 V	Portable and mobile RF communications equipment should be used no closer to any part of the **X-Smart® Go** endo motor, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance** $d = [\frac{3.5}{V_1}]\sqrt{P}$ $d = [\frac{12}{V_2}]\sqrt{P}$ $d = [\frac{12}{E_1}]\sqrt{P}$ 80 MHz to 800 MHz $d = [\frac{23}{E_1}]\sqrt{P}$ 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, should be less than the compliance level in each frequency range. Interference may occur in the vicinity of equipment marked with the following symbol: 
	3 V/m	3 V/m	
	3 V/m from 0.15 to 80 MHz; 6 V/m from 0.15 to 80 MHz and 80% AM at 1 kHz	3 V/m from 0.15 to 80 MHz; 6 V/m from 0.15 to 80 MHz and 80% AM at 1 kHz	
Conducted RF IEC 61000-4-6 Radiated RF IEC 61000-4-3	3 V/m from 80 MHz to 2.7 GHz	3 V/m from 80 MHz to 2.7 GHz	

Recommended separation distances between portable and mobile RF communications equipment and the X-Smart® Go endo motor				
Rated maximum output power of transmitter (W)	**Separation distance according to frequency of transmitter (m)**			
	150 kHz to 80 MHz outside ISM bands $d = [\frac{3.5}{V_1}]\sqrt{P}$	**150 kHz to 80 MHz in ISM bands** $d = [\frac{12}{V_2}]\sqrt{P}$	**80 MHz to 800 MHz** $d = [\frac{12}{E_1}]\sqrt{P}$	**800 MHz to 2.5 GHz** $d = [\frac{23}{E_1}]\sqrt{P}$
0.01	0.12	0.2	0.4	1
0.1	0.37	0.64	1.3	2.6
1	1.17	2	4	8
10	3.7	6.4	13	26
100	11.7	20	40	80

Test specifications for ENCLOSURE PORT IMMUNITY to RF wireless communications equipment							
Test frequency (MHz)	Band [a] (MHz)	Service [a]	Modulation [b]	Maximum power (W)	Distance (m)	Immunity test level (V/m)	Compliance level (V/m)
385	380 – 390	TETRA 400	Pulse modulation [b] 18 Hz	1.8	0.3	27	27
450	430 – 470	GMRS 460, FRS 460	FM [c] ± 5 kHz deviation 1 kHz sine	2	0.3	28	28
710 745 780	704 – 787	LTE Band 13, 17	Pulse modulation [b] 217 Hz	0.2	0.3	9	9
810 870 930	800 – 960	GSM 800/900, TETRA 800, iDEN 820, CDMA 850, LTE Band 5	Pulse modulation [b] 18 Hz	2	0.3	28	28
1720 1845 1970	1 700 – 1 990	GSM 1800; CDMA 1900; GSM 1900; DECT; LTE Band 1, 3, 4, 25; UMTS	Pulse modulation [b] 217 Hz	2	0.3	28	28
2450	2 400 – 2 570	Bluetooth, WLAN, 802.11 b/g/n, RFID 2450, LTE Band 7	Pulse modulation [b] 217 Hz	2	0.3	28	28
5240 5500 5785	5 100 – 5 800	WLAN 802.11 a/n	Pulse modulation [b] 217 Hz	0.2	0.3	9	9

[a] For some services, only the uplink frequencies are included.

[b] The carrier shall be modulated using a 50% duty cycle square wave signal.

[c] As an alternative to FM modulation, 50% pulse modulation at 18 Hz may be used because while it does not represent actual modulation, it would be worst case.

The latest revision can be accessed through this email: info@forumtec.net

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