100.00 mm

160.00 mm

REV: PF03-IFUE-04

ENDO MOTOR

INSTRUCTION MANUAL

ZR-RAP

Please read this manual
before operation.

Version: 01
PF03-IFU-CE
Issued:Sep. 22,2022
Copyright: Shenzhen Perfect Medical Instruments Co., Ltd.

200.00 mm

CONGRATULATIONS!

- Thank you for your purchase

  For optimum safety and performance, read this manual carefully and pay close attention to warnings and precautions before using the instrument.
- Please keep this manual in a convenient place for quick and easy reference.
- HOTLINE : (86) 0755-28540953
- E-mail: sales@dental-perfect.com

Shenzhen Perfect Medical Instruments Co., Ltd.
Add : Room 103, Building 3, No. 2, Weiqun Road, 4th Community, Henggang Street, Longgang District, Shenzhen, 518115 Guangdong P.R.China

DIRECTORY

1 Equipment introduction

"ZR-Rap" is used in Endodontic treatment. It can be used as a endo motor for preparation and enlargement of root canals, or device for measuring canal length.

1.1 Scope of application

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

2 Contraindications

a.Doctors with pacemakers are not allowed to use this device.

b.Patients with pacemakers (or other electrical equipment) and warned not to use small appliances (such as electric shavers, hair dryers, etc.) are not allowed to use this device.

c.Hemophilia patients are not allowed to use this device.

d.Use with caution in heart disease patients, pregnant women and young children.

3 Warning

- Please read the instruction manual carefully before using this device for the first time.
- This equipment must be used in hospitals or dental clinic by qualified dentists.
- The patient shall not be an intended operator.
- This device can only be used with the accessories , such as the adapter, contra angle, lithium battery.
- There is an unacceptable risk of improper replacement lithium batteries. please use the lithium battery provided by the original factory and replace the lithium batteries according to the correct steps in the instructions.
- Do not disassemble or repair the equipment yourself, and any self-disassembly repair may violate safety regulations and cause injury to patients. Any self-disassembling repairs will not be guaranteed by any commitment.

- Do not remove the contra angle or press the pushbutton before the motor stops turning, otherwise it may damage the contra angle.
- Do not remove the file before the motor stops turning, as this may damage the operator.
- Before starting the motor, make sure that the file is in place and locked.
- Set the speed and torque of the motor output according to the parameters recommended by the file manufacturer.
- Prolonged use of the reciprocating mode may cause the motor handle to overheat, at this point should be left to cool before use. If the motor handle frequently overheats, contact your local dealer.
- Do not place the device near flammable items. Do not operate the equipment in the presence of flammable anesthetic mixtures of air, oxygen or nitrogen oxides.
- Portable and mobile RF communication devices may affect the performance of this device, and avoid strong electromagnetic interference when used, such as close to mobile phones, microwave ovens, etc.
- Do not place the device near a heat source. The equipment must be operated and stored in a reliable environment.
- The equipment is usually operated at + 10 ° Cto + 40 ° C, relative air humidity 30% - 75%, and atmospheric pressure (70 ~ 106) kPa
- This equipment should be sterilized and disinfected after first use and after use by the patient to avoid cross-infection.
- The motor handpiece can not be sterilized by high temperature and high pressure, only neutral disinfectant or alcohol can be used to wipe the surface.

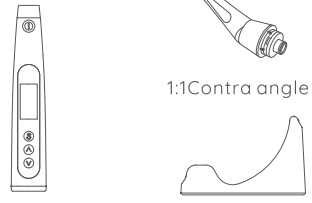
4 Product introduction

4.1 Product overview

4.1.1 Model specifications

ZR-Rap

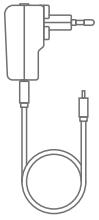
4.2 Components listed



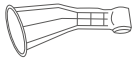
Motor handpiece

1:1Contra angle

Base



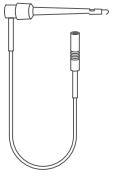
Adapter



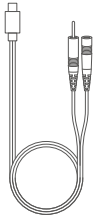
Protective silicon cover

Oil injectors

Lip hook



File Clip



Measuring wire

4.3 Description of technical parameters

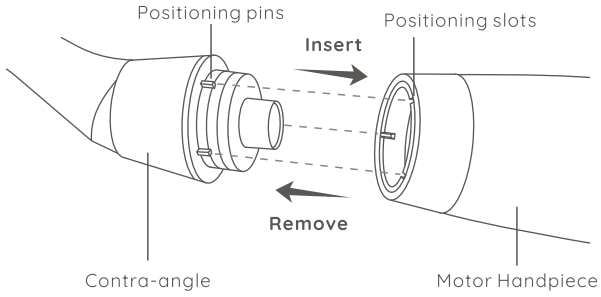
Manufacturer	Shenzhen Perfect Medical Instruments Co., Ltd.
Model	ZR-Rap
Form factor	276mm*184mm*58mm
Weight	162g motor handpiece and contra angle
Contra angle	transmission ratio 1:1
Power supply	3.7V/1500mAh Lithium Battery
The adapter output	5V DC, 2A
The adapter input	AC100-240~50/60Hz
Electrical safety classification	Class II devices with internal power
Applied part	Type B: Contra angle Application part contact time:1 to 10 minutes Part of the application surface temperature may reach 41℃
Apply part of the material	contra angle: copper, stainless steel
Speed range	150rpm-1000rpm
Torque range	0.2N.cm-5N.cm
Operating conditions	Temperature: +10°C to +40°C Humidity: 30% - 75% Pressure: 70kPa to 106kPa
Storage conditions	Temperature: -10°C to +50°C Humidity: 10% to 85% Pressure: 70kPa to 106kPa

5 Device install

5.1 Installation of contra angle

5.1.1 Install

The contra-angle can be connected at 3 adjustable head positions. Align the positioning pins of the contra-angle with the positioning slots of the contra-angle and insert the head until it clicks.



5.1.2 Uninstall

When removing the contra-angle, pull it straight out

⚠ Warning!

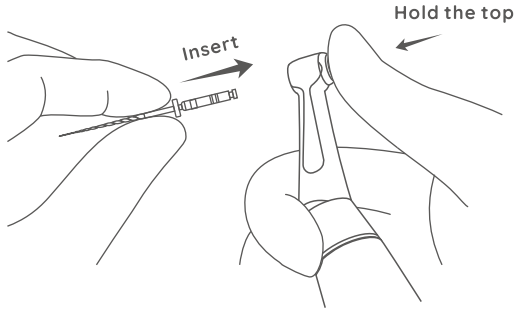
When install the contra-angle, turn off the deviece.

Check that the contra-angle is securely assembled to the contra-angle.

5.2 Inserting and Removing the File

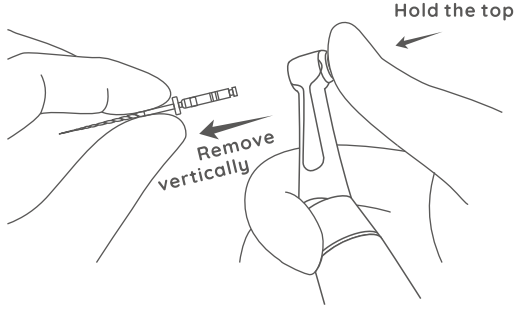
5.2.1 File insertion

Press the top cover of the contra-angle and insert the file until the file tail is loaded into the inner lock slot of the contra-angle. Release the contra-angle top cover and gently pull the file out to confirm that the file is locked.



5.2.2 File removal

Press the top cover of the contra-angle and pull out the file.



⚠ Warning!

1)When attaching and detaching the file, turn the power off beforehand.

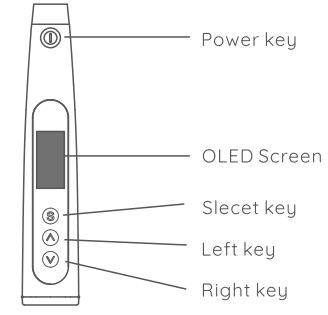
2)After the file is locked in place, lightly pull out the file to make sure the file is locked.

3)Always clean the shank of the file to be installed. Allowing dirt to enter the chuck could cause deterioration of chucking force.

4)Please use a file with an ISO standard file handle. (ISO standards: Φ2.334-2.350mm)

6 The function and use of the device

6.1 Key definition and settings



6.2 Power on and off

6.2.1 Power on

Press the power key" ⏻ " to turn on device.

6.2.2 Power off

Keep pressing the "Ⓢ" key, then press the power key " ⏻ " and turn off the device.

The device automatically shuts down after 5 minutes without any action.

6.3 Motor start and stop

When the device is on, select the appropriate mode, press the power key" ⏻ " to start the motor, press the main button " ⏻ " again to stop the motor.

6.4 Terms and definitions

EMR	Electric root measurment
Speed	file rotation speed
Torque	Torque limit setting.
Direction: CW	Clockwise rotation
Direction: CCW	Counterclockwise rotation

Rec	Reciprocating rotation
Apical Action	Root canal length feedback setting, when the depth of the file in the root canal reaches a preset value: STOP: file stop Reserve: file reverse OFF: turn off this function
Auto Start	The file enters the root canal and the motor automatically start ON: turn on this function OFF: turn off this function
Auto Stop	The file exits the root canal and the motor automatically stop ON: turn on this function OFF: turn off this function
Reference Point	The root canal length preset work value, the preset value range 00-18, Number “00” indicate that the file has reached the apical foramen. Digital numbers 00-18 do not represent the actual length from the apical foramen. It simply indicates the file progression towards the apex
ATR	Adaptive mode, the motor automatically enters Reciprocating rotation when the motor load reaches a preset value. Detailed parameter settings can be found in the 6.5 mode introduction
RP	Reference Point root canal length preset value
AP	Root tip

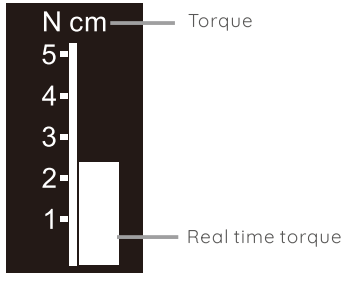
6.5 Mode introduction

Serial number.	Mode.	Mode function
EMR	Electric root measurements	Root canal length measurement, in which the motor does not rotate.
cw	Clockwise rotation	Rotate in one direction, select a direction clockwise and counterclockwise. Speed range 150-1000rpm Torque range:0.2-5.0N.cm, step value 0.1N.cm
CCW	Counterclockwise rotation	Rotate in one direction, select a direction clockwise and counterclockwise. Speed range 150-1000rpm Torque range:0.2-5.0N.cm, step value 0.1N.cm
REC	Reciprocating rotation	Reciprocating rotation, speed range:300rpm Angle range: 30°foreward,150° reversal 50°foreward,170° reversal 170°foreward,50° reversal Torque is not adjustable
ATR	Adaptive rotation	Adaptive clockwise rotation Speed range:150,200,250,300,350,400,450,500rpm Angle range: 240°foreward,120° reversal 180°foreward,90° reversal Torque range:0.2-3.0N.cm, step value 0.1N.cm

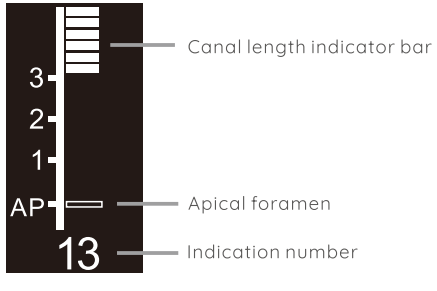
6.6 Display icon definition

6.6.1 Torque display

Start the motor and the display shows the real-time torque value.



6.6.2 Root canal measurements displayed

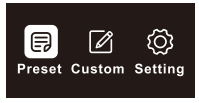
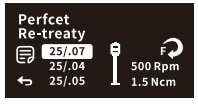


6.7 Parameter setting

Mode **CW**	Mode selection, press adjust key "⌃" "⌄" select different model, this device has five model, EMRCW、CCW、REC、ATR.
Speed **300rpm**	Speed setting, press the selection key "Ⓢ", enter the speed adjustment interface, press the adjustment key"⌃""⌄" adjust speed, press "ⓘ"to confirm the selection

Torque **1.6Ncm**	Torque setting, press the selection key "Ⓢ", enter the torque adjustment interface, press the adjustment key "⌃" "⌄" select required torque, press "ⓘ" to confirm the selection
Apical Action **Off**	Apical feedback setting, and when the pin reaches a pre-set root canal length value, the motor has three feedback options, "Reserve" reverses, "Stop" stop, "OFF" turns off this function press the adjustment key "⌃""⌄" to select the feedback function. Press the "Ⓢ" to confirm the selection
Auto Start **Off**	Motor self-start function, when the device detects that the file has entered the root canal, the motor starts automatically without pressing the main button. "ON" turns this function on, "OFF" turns this function off. press the adjustment key "⌃" "⌄"to select ON/OFF This function needs to be used in conjunction with the Measuring wire. press "ⓘ" to confirm the selection
◆M4 REC 30°cw 150°ccw	Reciprocating mode angle setting, press the adjustment key "⌃" "⌄" to select the required reciprocating angle value. Press the key to confirm the selection
Reference Point 05 AP 1 2 3	Root canal working length value setting, press the adjustment key "⌃""⌄" to select the required root canal length value. Press the key to confirm the selection. The preset number is not the true distance value. 05 indicates that it is very close to the root stop 00.

6.8 Preset file program selection

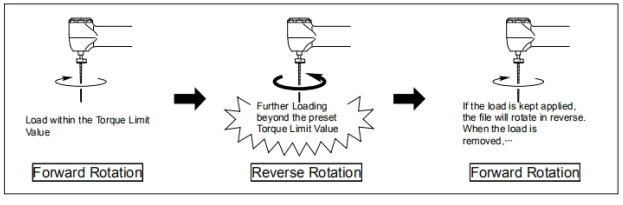
	For convenience, this device is equipped with file procedures of different manufacturers and models, speed and torque are set to the manufacturer's recommended range values. press the"⌃" "⌄" or keep pressing the "Ⓢ" key to a different file program
	Select the file manufacturer: Keep pressing "Ⓢ" key to enter the selection program interface, press the "⌄""⌃" to select the different file manufacturer
	Select Directory: Press the "Ⓢ" key to select the corresponding file manufacturer, and press the "⌄""⌃" key to select the different file program.
	Select file needle type: press the "Ⓢ" key to select the corresponding type of file needle, press the adjustment key "⌄""⌃" to select the different file program. press "ⓘ" to confirm the selection

6.9 motor handpiece function setting

Auto Power OFF	After 3 seconds, enter the Auto Power OFF adjustment interface. Press the buttons "⌄""⌃" to select 3-30min. Press the main button "ⓘ"to confirm the selection.
Dominant Hand	Press the " " button again to enter the dominant hand adjustment interface. Press the adjustment button "⌄""⌃" to select Right or Left. Then press the main button "ⓘ" to confirm the selection.
Calibration	Press the "Ⓢ" button again to enter the calibration interface. Press the adjustment button "⌄""⌃" to select ON or OFF. Press the main button "ⓘ" to confirm. When the setting is ON enter Calibration. In order to ensure the accuracy of calibration, the original contra angle should be equipped during calibration.
Beeper Volume	Press the "Ⓢ" button again to enter the volume adjustment interface. Press the button "⌄" "⌃" to select Vol.0, Vol.1, Vol.2, Vol.3. Then press the main button "ⓘ" to confirm the selection.

6.10 Protective function of automatic reverse

In M2 and M3 modes, the motor operates in one direction and automatically reverses when the motor load torque reaches a preset value, and the motor returns to its original rotation direction when the motor load returns to half of the preset torque value again.



⚠ Warning!

1.The torque trigger automatic reverse protection function only works in M2,M3 (one-way rotation) modes.

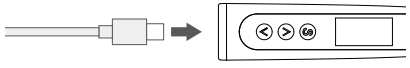
2.This function does not take effect in REC mode and ATR mode.

3.When the equipment is low in power, it is not enough to support the motor to reach the maximum torque value of 4Ncm, that is, the reverse function does not work properly at this point, please charge in time.

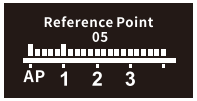
6.11 Root canal length measurement

6.11.1 Single root canal measurement function

The M1 of this device is a separate root canal length measurement mode, Insert the test cable USB end into the USB port at the bottom of the device.



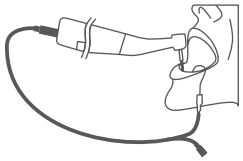
6.11.2 Preset the root canal length value,
press the "Ⓢ" key in M1 mode to enter the settings interface.



Preset a root canal length value, when the root canal length is tested and the probe approaches the set value, the buzzer will "di" the sound warning, as the closer to the preset value, the more urgent the warning tone!

6.12 Edge expansion measurement function

When using this function, the test wire is connected to the handle, the test line lip hook is attached at one end to the patient's lip, and the measurement function can be performed when the needle enters the root bone of the tooth.



⚠ **Warning!**

Before using the edge expansion measurement function, you need to connection testing, the test method is as follows:

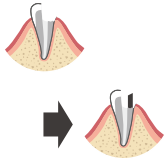
Contact the lip hook with the needle and when the measure value is -2, it indicates good connection.

⚠

Root canal measurements are not suitable for the following situations:

Root canal with large apical foramen
Root canal with a large apical foramen root canal that has an exceptionally large apical foramen due to a lesion or incomplete development cannot be accurately measured. The results may show shorter measurement than the actual length

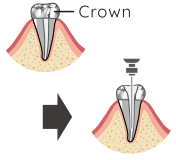
Root canal with blood overflowing from the opening
Blood overflows from the opening of the root canal and contacts the gums, this will result in electrical leakage and an accurate measurement cannot be obtained. Wait for bleeding to stop completely. Clean the inside and opening of the canal through to get rid of all blood, and then make a measurement



Broken crown
the crown is broken and a section of the gingival tissue intrudes into the cavity surrounding the canal opening, contact between the gingival tissue and the file will result in electrical leakage and an accurate measurement cannot be obtained. In this case, build up the tooth with a suitable material to insulate the gingival tissue.

Fractured tooth
Leakage through a branch canal fractured tooth will cause electrical leakage and an accurate measurement
cannot be obtained.

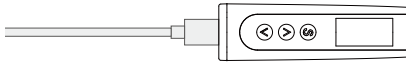
Re-treatment of a root filled with gutta-percha
The gutta-percha must be completely removed to eliminate its insulating effect. After removing the gutta-percha, pass a small file all the way through the apical foramen and then put a little saline in the canal, but do not let it overflow the canal opening.



Crown or metal prosthesis touching gingival tissue.Accurate measurement cannot be obtained if the file touches a metal prosthesis that is touching gingival tissue. In this case, widen the opening at the top of the crown so that the file will not touch the metal prosthesis before taking a measurement.

6.13 Charge the device

The product has a built-in rechargeable lithium battery, Plug the power adapter into the USB port at the bottom of the handle, and when it enters the charging state, the screen displays the dynamic charging screen of a single battery.



⚠ Warning!

Keep away from heat sources when charging.
The device cannot be operated while charging.

7 Maintenance

7.1 Replace the battery

Replacement batteries should use lithium batteries supplied by the original manufacturer, please contact your local dealer or manufacturer for replacement.

Replacement procedure:

1)Make sure the device is turned off
2)Remove the silicone plug from the battery cover with a tweezer and remove the fixing screw with a screwdriver
3)Remove the battery cover and remove the old battery
4)Put the new battery in the battery compartment and turn it on to confirm that the battery is OK
5)Install the battery cover and lock it with screws, then plug the silicone into the screw hole.

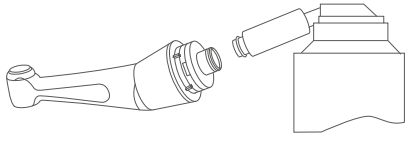
⚠ Warning!

Do not remove parts that are not related to replacing the battery.
Do not replace the battery with wet hands, as this may cause a short circuit in the battery to damage the device.
Do not use lithium batteries other than the original factory, or the equipment may be damaged.
If the device is not suitable for a long time, remove the lithium battery.

7.2 Contra-angle lubrication

To extend the use of the Contra-angle, moisten the Contra-angle each time it is used or before sterilization.

1)Rotate the injector into the nozzle of the filling bottle



2)Insert the oil injector into the tail of the Contra-angle and then fill for 2 to 3 seconds until the oil is flowing out of the Contra-angle.
3)Place the tail of the Contra-angle upright for more than 30 minutes and use gravity to drain excess lubricant.

⚠ Warning!

The motor handpiece cannot be filled with oil.

⚠ Note!

When filling oil, hold the Contra-angle tightly to prevent the Contra-angle from leaving the oil injector due to the oil injection pressure.

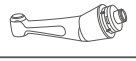
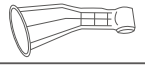
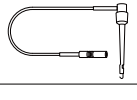
8 Troubleshooting

The fault status	Possible causes	How to handle it
Motor calibration failed	The battery is low The Contra-angle has too much resistance	Charge the device to full charge Lubricate the Contra-angle
The motor handle is hot	Used for too long under load The re-rotation takes too long	Stop using until the handle temperature returns to normal
When the battery is fully charged, the length of use is shorter	The battery capacity is smaller	Contact your local dealer or manufacturer to replace the battery
OVER LOAD	Over load	Stop the motor, exit the root tube and start again

If you have not found the necessary information, You may consult the manufacturer on the hotline phone: +86-755-28540953 , E-mail: sales@dental-perfect.com or address to the service department.

9 Cleaning, disinfection and sterilization

For hygiene and sanitary safety purposes, the components must be cleaned, disinfected and sterilized before each usage to prevent any contamination. This concerns the first use, as well as all subsequent uses.

Steam sterilization of parts at 135°C is required	
Contra Angle 	Proctive silicon cover 
Lip hook 	File clip 

⚠ The above components can be sterilized by high temperature steam!

Device	Contra-angle, File clip, lip hook, Protective silicon cover and Motor Handpiece
Advice	Reprocessing procedures have only limited implications to this dental instrument. The limitation of the numbers of reprocessing procedures is therefore determined by the function/wear of the device. From the processing side there is no maximum number of allowable reprocessing. The device should no longer be reused in case of signs of material degradation. In case of damage the device should be reprocessed before sending back to the manufacturer for repair.
Reprocessing Instructions	
Preparation at the Point of Use:	Disconnect the Contra-angle, File clip, lip hook, Protective silicon cover from the motor handpiece. Remove gross soiling of the instrument with cold water(<40°C)immediately after use.Don't use a fixating detergent or hot water(>40°C) as this can cause the fixation of residuals which may influence the result of the reprocessing process. Store the instruments in a humid surrounding.
Transportation:	Safe storage and transportation to the reprocessing area to avoid any damage and contamination to the environment.

Preparation for Decontamination:	The devices must be reprocessed in a disassembled state. Contra-angle,File clip, lip hook and Protective silicon cover can be cleaned and disinfected with automated methods and sterilized with steam sterilization process. Do not sterilize the Motor Handpiece, adapter . The Motor Handpiece, adapter cannot be cleaned and disinfected in a washer/disinfector. For these parts, only a general wipe decontamination is possible!
Decontamination of other parts than Contra-angle:	After operation, take out the Motor Handpiece, adapter and base on the workbench. Soak a soft cloth completely with distilled water or deionized water, and wipe all the surfaces of these components, until the surface of the components is visually clean. For decontamination, soak a dry soft cloth with 75% alcohol or other disinfects which are approved for its eficacy by VAH/DGHM-listing, CE marking, FDA and Health Canada Approval. Wipe all surfaces of Motor Handpiece,adapter, base and other components with the wet soft cloth for about 3 minutes. Please follow the instructions of manufacturer of disinfectants. Wipe the surface of the component with a dry sof lint-free cloth.
Pre-Cleaning of Contra-angle:	Following instructions are only relevant for Contra-angle, File clip, lip hook and Protective silicon cover!Not use automated cleaning, disinfection and sterilisation for other parts than Contra-angle in this system! Do a manual pre-cleaning, until the instruments are visually clean. Submerge the instruments in a cleaning solution and flush the lumens with a water jet pistol with cold tap water for at least 10 seconds. Clean the surfaces with a soft bristol brush.

Cleaning:	Regarding cleaning/disinfection, rinsing and drying, it is to distinguish between manual and automated reprocessing methods. Preference is to be given to automated reprocessing methods, especially due to the better standardizing potential and industrial safety. Automated Cleaning: Use a washer-disinfector meeting the requirements of the ISO 15883 series. Put the instrument into the machine on a tray. Connect the instrument with the WD by using suitable adapter and start the program: • 4 min pre-washing with cold water(<40°C); • emptying •5 min washing with a mild alkaline cleaner at 55°C •emptying •3 min neutralising with warm water(>40C); •emptying •5 min intermediate rinsing with warm water(>40°C) • Emptying The automated cleaning processes have been validated by using 0.5% neodisher MediClean forte(Dr. Weigert). Note Acc. to EN ISO17664 no manual reprocessing methods are required for these devices. If a manual reprocessing method has to be used, please validate it prior to use.
Disinfection	Automated Thermal Disinfection in washer/disinfector under consideration of national requirements in regards to A0 value(see EN 15883). A disinfection cycle of 5 min disinfection at 93°C has been validated for the device to achieve an A0 value of 3000.

Drying	Automated Drying: Drying of outside of instrument through drying cycle of washer/disinfector. If needed, additional manual drying can be performed through lint free towel. Insufflate cavities of instruments by using sterile compressed air.
Functional Testing, Maintenance	Visual inspection for cleanliness of the instruments and reassembling. Functional testing according to instructions of use. If necessary, perform reprocessing process again until nstrument is visibly clean. Before packaging and autoclaving, make sure that the Contra-angle has been lubricated with an adequate spray.
Packing	Pack the instruments in an appropriate packaging material for sterilization.The packaging material and system refer to EN ISO 11607.
Sterilization	Sterilization of instruments by applying a fractionated pre-vacuum steam sterilization process(according to EN 285/EN 13060/EN ISO 17665) under consideration of the respective country requirements. Minimum requirements:3 min at 134°C(in EU:5 min at 134°C)Maximum sterilization temperature: 137°C Flash steilization is not allowed on lumen instruments!
Storge	Storage of sterilized instruments in a dry, clean and dust free environment at modest temperatures, refer to label and instructions for use.

10 Waste disposal of products

! Do not throw the equipment into the household garbage system. Dispose of waste according to local laws and regulations.

11 Statement

ZR-Rap warranty for 12 months from the date of purchase by the user. The company does not provide technical data (such as circuit principles, component lists, etc.) to other organizations.
If you have any questions, please contact your local dealer or manufacturer.

The manufacturer is not responsible for:
1.Use ZR-Rap for purposes and purposes that violate the specific provisions in this instruction manual.
2.Use methods that are contrary to those stated in this manual for cleaning, disinfection and sterilization operations.
3.Disassembly and repair by unauthorized personnel.

12 EMC Declaration

Guidance and manufacturer's declaration - electromagnetic emissions		
The model ZR-Rap is intended for use in the electromagnetic environment specified below. The customer or the user of the model ZR-Rap should assure that it is used in such an environment.		
Emissions test	**Compliance**	**Electromagnetic environment - guidance**
RF emissions CISPR 11	Group 1	The model ZR-Rap uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment
RF emissions CISPR11	Class B	The model ZR-Rap is suitable for used in domestic establishment and in establishment directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations / flicker emissions IEC 61000-3-3	Complies	

Guidance & Declaration — electromagnetic immunity			
The model ZR-Rap is intended for use in the electromagnetic environment specified below. The customer or the user of the model ZR-Rap should assure that It is used in such anenvironment			
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, ±8kV, ±15 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30 %.
Electrical fast transient/burst IEC 61000-4-4	±2kV for power supply lines ±1 kV for Input /output lines	±2kV for power supply lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±0.5 kV, ±1 kV line to line ±0.5 kV, ±1 kV, ±2 kV line to ground	±0.5 kV, ±1 kV line to line	Mains power quality should be that of a typical commercial or hospital environment.

Voltage dips, shortinterruptions and voltage variations on power supply input lines IEC 61000-4-11.	<5 % U T (>95% dip in U T .) for 0.5 cycle <5 % U T (>95% dip in U T) for 1 cycle 70% U T (30% dip in U T) for 25/30 cycles <5% U T (>95 % dip in U T) for 5/6 sec	<5 % U T (>95% dip in U T .) for 0.5 cycle <5 % U T (>95% dip in U T) for 1 cycle 70% U T (30% dip in U T) for 25/30 cycles <5% U T (>95 % dip in U T) for 5/6 sec	Mains power quality should be that of a typical commercial or hospital environment. If the user of the model ZR-Rap requires continued operation during power mains interruptions, it is recommended that the model ZR-Rap be powered from an uninterruptible power supply or a battery
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m, 30 A/m	3 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.
NOTE U T is the a.c. mains voltage prior to application of the test level.			

Guidance & Declaration - Electromagnetic immunity			
The model ZR-Rap is intended for use in the electromagnetic environment specified below. The customer or the user of the model ZR-Rap should assure that it is used in such an environment			
Immunity test	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment -guidance**
Conducted RF IEC 61000-4-6 Radiated RF IEC 61000-4-3	3 Vrms 150 kHz to 80 MHz 6 Vrms in ISM and amateur radio bands 3 V/m, 10 V/m 80 MHz to 2.7 GHz 385MHz-5785MHz Test specifications for ENCLOSURE PORT IMMUNITY to RF wireless communication equipment (Refer to table 9 of IEC 60601-1-2:2014)	3 Vrms 150 kHz to 80 MHz 6 Vrms in ISM and amateur radio bands 3 V/m, 10 V/m 80 MHz to 2.7 GHz 385MHz-5785MHz Test specifications for ENCLOSURE PORT IMMUNITY to RF wireless communication equipment (Refer to table 9 of IEC 60601-1-2:2014)	Portable and mobile RF communications equipment should be used no closer to any part of the models ZR-Rap, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance d=[3,5/V 1]×P 1/2 d=1.2×P 1/2 80 MHz to 800 MHz d=2.3×P 1/2 800 MHz to 2.7 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: At 80 MHz and 800 MHz. the higher frequency range applies.

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

a. Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land 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 model ZR-Rap is used exceeds the applicable RF compliance level above, the model ZR-Rap should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the model ZR-Rap.

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

Recommended separation distances between portable and mobile RF communications equipment and the model ZR-Rap

The model ZR-Rap is intended for use in electromagnetic environment in which radiated RF disturbances is controlled. The customer or the user of the model ZR-Rap can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the model ZR-Rap is 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 transmitterm		
	150 kHz ~80 MHz d = 1.2×P 1/2	80MHz to 800MHz d=1.2×P 1/2	800MHz to 2,5GHz d=2.3×P1/2
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

13 The symbol description

	Power on/off.	SN	Serial number
	Manufacturer		Dry storage
	Date of manufacture		Class II equipment
	Direct current		Refer to Instructions for use
	Alternating current	CE 0197	Conformity European, Notified body number
	Type B applied part		Caution
	Do not dispose of with normal household waste.	EC REP	Authorized representative in the European Community

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