Palm-sized Ultrasound

Sonicator® 718 & 719

Instruction Manual

To ensure correct use, please read this manual
carefully before operating the unit.
After reading, store the manual in a safe place for future reference.

Mettler Electronics Corp.

Contents

Symbols

- Symbol for "CAUTION"

- Symbol for "CONSULT INSTRUCTIONS FOR USE"

- Symbol for "Ultrasound radiation warning sign" by Canadian ultrasound therapy devices standard

- Symbol for "Waste Electrical and Electronic Equipment (WEEE), Directive 2002/96/EC"
  * This symbol is only valid in European Union.

- Symbol for "TYPE BF APPLIED PART"

- Symbol for "NON-IONIZING ELECTROMAGNETIC RADIATION"

Shipping Damage and Warranty Registration

Your new Sonicator 718 / 719 is shipped complete in one carton. Upon receipt, please inspect the carton and the unit for visible and hidden damage. If you discover any damage, hold all shipping materials, including the carton, and call the shipping agent who delivered the unit. They are responsible for all damage in transit; therefore, all claims should be filed directly with them. The factory will not be responsible for any damage in shipment, nor allow any adjustments unless proper formal claim has been filed by the receiver against the carrier.

The carton in which your new Sonicator 718 / 719 was received is specially designed to protect the unit during shipping. Please retain all shipping materials in the event that you will need to return your unit for servicing. NOTE: All warranty repairs are to be performed by Mettler Electronics Corp. or an authorized Mettler Electronics warranty repair center.

Once you have verified proper functioning of your Sonicator 718 / 719, please go online to www.mettlerelectronics.com to register your product.

To Ensure Correct and Safe Use

RX Only—This unit should be used by a licensed medical practitioner.

Intended Use

Indications for therapeutic ultrasound can be achieved through thermal effects.

1) Relief of pain
2) Reduction of muscle spasms
3) Localized increase in blood flow
4) Decrease of joint contractures

Contraindications

1) Over the uterus during pregnancy
2) Over thoracic area to patients with cardiac pacemakers
3) Over the site of any implanted electronic devices
4) To eyes
5) Over the heart
6) Area of diagnosed or suspected malignancy
7) To reproductive organs such as testes
8) Regions with thrombophlebitis, deep vein thrombosis, or embolism
9) Over tissues recently treated by deep X-ray or other radiation
10) Over stellate ganglions
11) Over area with impaired circulation
12) Over area with impaired sensation especially when using continuous thermal ultrasound
13) Bone growth centers (active epiphysis) in children until bone growth is complete
14) Patients with cognition or communication impairments not being able to give accurate and timely feedback during treatment
15) Over open wounds
16) Over implants that contain plastic or cement
17) Patients with serious infection such as tuberculosis
18) Over acute inflamed tissue especially when using continuous thermal ultrasound
19) Over active bleeding tissue or patients with untreated hemorrhagic disorders
20) Areas near myositis ossificans
21) Over anterior neck or carotid sinus

Precautions

1) Patients with hemorrhagic diatheses or bleeding disorders
2) Use moving technique of applicator
3) Heating of joint capsules in acute or subacute arthritis should be avoided
4) Electric treatment tables or whirpools which may come in contact with the patient should be adequately grounded.

To Ensure Correct and Safe Use

5) Over healing fracture
Therapeutic ultrasound may delay or prevent callous formation in a healing fracture
6) Spinal cord after laminectomy
7) Superficial peripheral nerves
8) Burns may occur in following application of therapeutic ultrasound
① High intensity
② Stationary technique
③ Moving sound head too slowly
④ Treating area with sensory nerve damage
⑤ Desensitized areas for example in patients with diabetes, neural damage, and etc
⑥ Bony prominences are especially vulnerable

Precautions on Use

1. General precautions

1) Do not use component parts from any other therapeutic devices with this device.
2) Handle the ultrasound head with great care. Mishandling may affect performance characteristics.
3) Follow the instructions given below when installing the device.
① Install the device in a location not subjected to atmospheric pressure, temperature, humidity, ventilation, sunlight, dust, salinity, air containing sulfur or other chemicals.
② Avoid flammable atmospheres, including flammable anesthetic gas mixed with oxygen, nitrous oxide and air, or flammable disinfectant or cleanser mixed with air.
③ Avoid locations where chemicals are stored or where vapors may be present.
④ Avoid installing the device near flames. Doing so may result in accidents due to damage or deformation of the device.
⑤ Note the frequency, voltage and allowable current (or power consumption) of the AC Adaptor.
⑥ Connect the AC Adaptor for the device to an exclusive outlet or battery pack with the charged battery.

2. Precautions before use

1) Carefully review the patient's diagnosis and prescription for contraindications, precautions, and instructions.
2) Make sure the patient gives the operator adequate and timely feedbacks when he or she has unusual sensations (e.g., pain, heat sensation or pressure) or the device doesn't work properly during treatment with this device.
3) If the patient reports abnormal pain or heat, stop treatment and determine whether the sensations goes away. A problem may have occurred or heat may have built up in the patient's body. If so, burns may result if treatment is continued even at reduced output.
4) Use caution when using the device for the following patients or areas of the body.

① Carefully select the output level and duration when treating facial areas.
② When using the device on a child according to a physician's prescription, take great care when treating bony regions that no irritations occur.
③ If the individual has had radiation therapy in recent days, be careful in determining whether the treatment is appropriate for the individual. The inactivated tissue may be activated by the treatment.
④ Make sure the individual to be treated is free of contagious disease or conditions, since these can be transmitted to other individuals via the device.
⑤ Determining treatment intensity can be problematic with babies or infants (aged 6 or under), patients with senile dementia, or other patients who for any other reason are unable to express their preferences. Proceed carefully before deciding whether to use this device on such patients.

5) Check battery status (e.g., remaining charge). Use only the battery specified.
6) Check switches and keys to confirm that the device is working properly.
7) Make sure the cables are correctly connected and safely configured.
8) Make sure that the ultrasound head is clean and free of any cracks.

3. Precautions during use

1) With any complaint of periosteal pain from the patient, intensity should be reduced.
2) Make sure the treatment time and intensity do not exceed the suitable range for treatment purpose.
3) Monitor the device and the patient constantly to ensure no problems arise. In the event of any problem, take appropriate measures (e.g., shutting down the device in a manner safe for the patient) and contact the dealer, manufacturer or distributor.
4) To prevent accidents, make sure the patient does not operate or touch the device.
5) Make sure the ultrasound head is positioned correctly on the treatment area. Incorrect positioning can affect effectiveness and results.
6) Do not leave the device with the output turned on. Buildup of heat may damage the device.
7) If the metal of the ultrasound head or the gel causes any rash, areas of redness, itching, or other such symptoms, or if the patient feels any abnormality, immediately stop using the device and take adequate measures.
8) Never touch the parts of the device other than the Main Unit, such as the Intermediate box, with wet hands.
9) Avoid operating Sonicator 718 or Sonicator 719 adjacent to and simultaneously with any shortwave or microwave devices.

4. Precautions after use

1) Turn off power, and disconnect the power cable from the outlet according to the steps specified.
2) When disconnecting the AC Adaptor from the outlet, make sure power of the device

To Ensure Correct and Safe Use

is off and grasp the adaptor by the plug. Avoid pulling with excessive force when disconnecting cables.

3) Rinse the ultrasound head with lukewarm water lightly and thoroughly wipe dry. Take adequate measures to ensure it remains clean in storage.

4) Keep the device and accessories clean to avoid inconvenience for the next therapy session and store in a safe place.

Storage and Period of service

1. Storage

1) Follow the instructions given below when storing the device to avoid malfunctions.

① Avoid locations where the device will be subject to splashing water.

② Avoid locations where the device may be unduly affected by atmospheric pressure, temperature, humidity, ventilation, sunlight, dust, or airborne salt or sulfur or any other adverse factors.

③ Make sure the device is kept in a stable position. Avoid tilting the device. Avoid vibrations and shock. These warnings also apply during transportation.

④ Avoid locations where chemicals are stored or where gas may be generated.

2) If the device will not be used for an extended period of time, remove battery from the Battery Case and disconnect the AC Adaptor from the outlet.

2. Period of service

Service life: Five years (self-certified) based on our data

Precautions on Handling

1) Do not hit the device against another object, allow it to topple, drop, impose intensive vibration or impact to it. Even though the device may not exhibit abnormality at the time, damage may advance inside, eventually leading to an accident or malfunction.

2) To dispose consumables and residual materials, as well as the device and accessories which end of service life has been reached, follow the rules and regulations in force of the area where the device is installed, in order to minimize impact on the environment.

Maintenance and Checkup

1. Precautions

1) In the event of a malfunction, do not attempt to repair the device yourself. Attach an out-of-order notice to the device and contact the dealer, manufacturer or distributor to obtain repair services.
2) Do not attempt to modify the device.
3) Never open the device.
4) When maintaining the Main Unit and accessories, do not clean them with volatile solvents, such as paint thinner, gasoline, kerosene, or polishing powder, boiling water or chemicals. Such agents could cause discoloration or deterioration. Clean using a cloth impregnated with alcohol, water, lukewarm water or neutral detergent and wrung tightly.
5) The device is waterproof, except for the exception of the intermediate box. Never attempt to disassemble the device; doing so may affect the waterproof properties or transducer characteristics, resulting in malfunctions.

2. Maintenance and checkup by the user

1) Check the device and accessories on a daily basis to make sure they work properly.
2) If any problem (deteriorated insulation of accessories, damage to the cord coverings, cracks, early signs of wire breakage, poor connection of connectors, etc.) is detected in the preparatory checkup, be sure you contact your dealer or the manufacturer or distributor.
3) Refer to the following section on Maintenance and check items for daily checkups.
4) When using the device after an extended period of disuse, check to ensure beforehand that the device works properly and safely.

3. Maintenance and checkup by a contractor

1) To maintain the performance and ensure safe use, request a periodic check from your dealer or the manufacturer or distributor (once a year as a rule of thumb).
2) Replace consumable parts (including accessories) periodically to prevent problems occurring in the accessories or device during use.

To Ensure Correct and Safe Use

4. Maintenance and check items

Perform periodic inspections to ensure safety.
If you have any questions, contact the dealer or manufacturer or distributor.

Item	Description	Method
Appearance and indications	Check the appearance for any signs of damage; whether the display panel is distorted; and whether the indications flicker. Make sure the ultrasound head is clean.	Check visually.
Operation	Turn the POWER switch on and check that the device operates normally and exhibits no problems.	Check by operating.
Output	Place water on the ultrasound head and turn on the output. Examine the water drops to assess the vibrations.	Check by operating.
Ultrasound head	Check for cracks in the ultrasound head or problems with the cable connection that may permit water or gel to enter the device.	Check visually.

The following accessories for Sonicator 718 and Sonicator 719 are replaceable.
Call Mettler Electronics Corp. at 800-854-9305 to place an order.

7181	AC Adaptor (100–240 V)	7189	Unit Stand
7183	Power Cable for AC Adaptor (110–120 V, only U.S.A & CANADA, Type B)	7180	Protective Cap for Sonicator 718 Probe
		7190	Protective Cap for Sonicator 719 Probe
7188	Battery Case	1844	Sonigel (12 X 9.5 oz. tubes)
7185	Battery Charger	1851	Sonigel (12 X 250 ml bottles)
7187	Power Cable for Battery Charger (110–120 V, only U.S.A & CANADA, Type A)	1852	Sonigel (1 X 5 L)
		1853	Sonigel (4 x 1852)
7184	Rechargeable Battery	1863	Sonigel Lotion with Aloe Vera (1 G)
7191	Pouch	1864	Sonigel Lotion / Aloe Vera (4 X 1 G)

Battery

Do not charge the battery in the following locations:

1) Ambient temperature is below 0° C or exceed 40° C. (If ambient temperature is too high or too low, the battery may not charge.)
2) The location is humid, dusty, or subject to vibrations. (The battery may not charge properly.)

Be sure to use the specified battery.

Specifications: Lithium ion battery, 7.4 VDC (Model No.: 2UR18650F <D-0824Li>)
Contact the dealer or manufacturer or distributor to place orders.

Charging

1) The battery is a consumable. If the battery begins to lose power quickly even when charged for a long time, replace with a new battery.
2) The battery will self-discharge. This means a battery will gradually lose its stored charge even when not in use. A brand new battery with low or no charge does not indicate a defect.
3) The battery will not malfunction even if overcharged.
4) Be sure to use the specified Battery Charger. (Model No.: NC-L8C17 <D-0824Chg>)

Handling the battery

Do not attempt to disassemble the battery.

Recycling the battery

1) The device uses a lithium ion battery.
2) Lithium Ion Batteries are recyclable resources. Do not discard used batteries. Take them to a specified location capable of recycling them properly.
3) Avoid discarding used batteries as ordinary waste.
4) Comply with all local rules and regulations to minimize environmental impact.

Notes on recycling

Be careful to avoid short circuits. A battery short circuit may result in fire or electric shock.

Device Configuration

Main Unit and Standard Accessories

Main Unit

Sonicator 718

Sonicator 719

order #	
❶7180	Protective Cap for Sonicator 718 Probe
❷7190	Protective Cap for Sonicator 719 Probe
❸1844	Sonigel tube
❹7181	AC Adaptor (100–240 V)
7183	Power Cable for AC Adaptor (110–120 V, only U.S.A & CANADA, Type B)

Optional Accessories

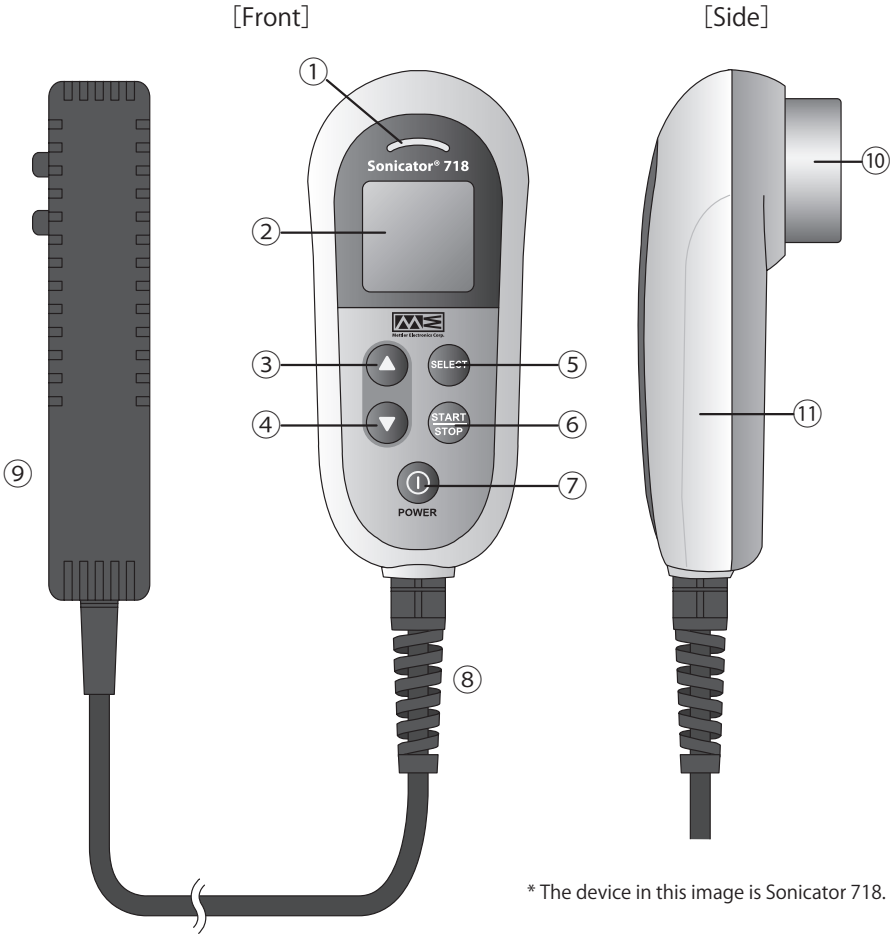
order #	
❺7185	Battery Charger
7187	Power Cable for Battery Charger (110–120 V, only U.S.A & CANADA, Type A)
❻7184	Rechargeable Battery
❼7188	Battery Case
❽7189	Unit Stand
❾7191	Pouch

Caution····In the event that the gel has been accidentally drunk, consult a physician immediately. Should the gel get into the eyes, wash the eyes with copious amounts of water, and consult an ophthalmologist immediately.

Specifications

		Sonicator 718	Sonicator 719
Power supply		AC 100-240 V 50/60 Hz or Rechargeable Battery (optional)	
Power consumption		50 VA	17 VA
Ultrasound frequency		1.0 MHz ± 10%	3.0 MHz ± 10%
Intensity (max)		2.00 W/㎠ ± 20% continuous or 3.00 W/㎠ ± 20% pulsed	
Duty		5%, 10%, 20%, 30%, 40%, 50%, 100%	
Pulse frequency		100Hz ± 5%	
Timer		30 min. ± 1 min.	
ERA			
	FDA	5.5 cm^2 ± 20%	0.9 cm^2 ± 20%
BNR			
	FDA	3.5 ± 30%	3.6 ± 30%
Output stability		Power fluctuation: ± 20% Variability with time: ± 20%	
Classification		Class Ⅰ / Internaly powered equipment, Type BF	
Dimensions		134 (H) × 59 (W) × 55 (D) ㎜	134 (H) × 59 (W) × 60.5 (D) ㎜
Weight		200 g	190 g
Environmental conditions:		Temperature	Humidity	Pressure
	In use	10 to 40℃	30 to 75%	700 to 1060 hPa
	Storage	-10 to 60℃	30 to 95%	700 to 1060 hPa
	Transportation	-10 to 60℃	30 to 95%	700 to 1060 hPa
Authorization in U.S.A. and Canada		INTERTEK LISTED ETL CLASSIFIED C ETL US Intertek 3123653		

Names of Component Parts



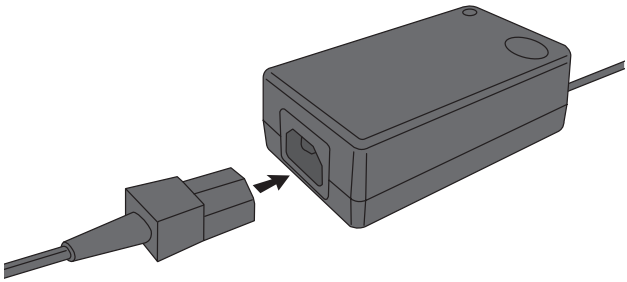
* The device in this image is Sonicator 718.

① Output LED
② Display
③ UP switch
④ DOWN switch
⑤ SELECT switch
⑥ START/STOP switch
⑦ POWER switch
⑧ Connection cable
⑨ Intermediate box
⑩ Ultrasound head
⑪ Device case

Preparations before Use

〈Using AC Adaptor〉

1 Connect the Power Cable for AC Adaptor to the AC Adaptor.



2 Connect the plug for the AC Adaptor to the intermediate box.

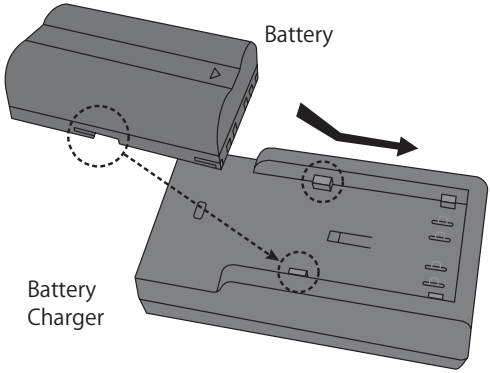
3 Connect the plug of the Power Cable for AC Adaptor to the outlet.

Preparations before Use

〈Battery-powered〉 * Optional Accessaries

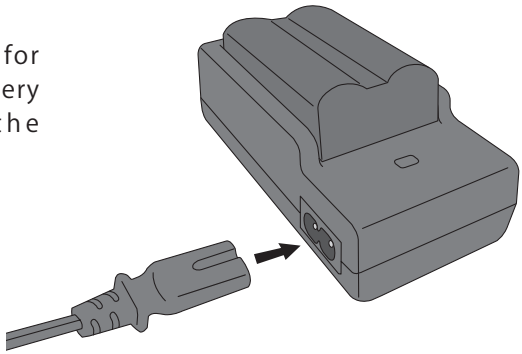
1 Fit the battery into the Battery Charger.

Align the parts of the battery and the charger encircled by a dotted line, snap together, and slide the battery in the direction indicated by the arrow.

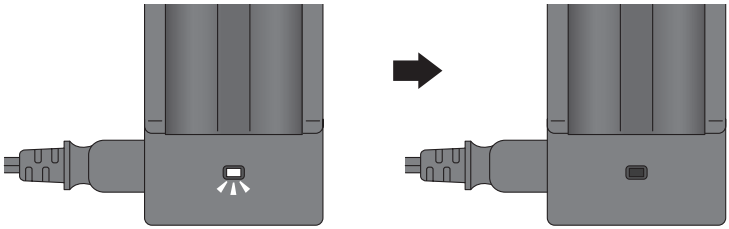


* Charge the battery before using it for the first time.
* Clean the terminals of the battery and the charger from time to time with a dry cotton swab. If the terminals are not clean, contact failures may result, in which case the device may fail to turn on, turn off abruptly, or fail to fully charge the battery.

2 Connect the Power Cable for Battery Charger to the Battery Charger and connect the cable plug to the outlet.



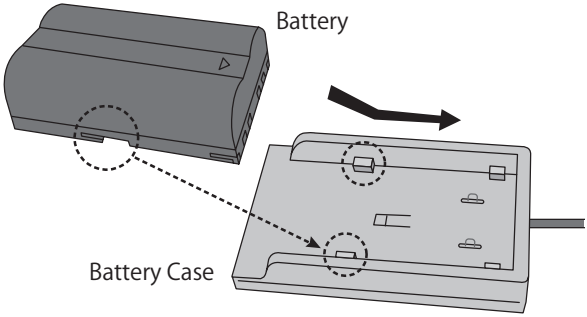
3 The red lamp of the charger will light. This lamp goes out when charging is complete.



[Red lamp ON] [Red lamp OFF]

4 Remove the battery from the charger and fit the battery into the Battery Case.

Align the parts of the battery and the Battery Case encircled by the dotted line, snap together, and slide the battery in the direction indicated by the arrow.



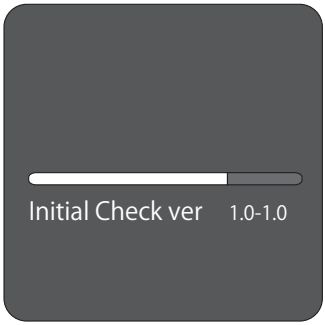
* Charge the battery before using it for the first time.
* Clean the terminals of the battery and the Battery Case from time to time with a dry cotton swab. If the terminals are not clean, contact failures may result, in which case the device may fail to switch on, switch off abruptly.

5 Connect the plug for the Battery Case to the intermediate box.

Operating Procedures

1 Press and hold the POWER switch for approximately one second to turn on power for the device.

2

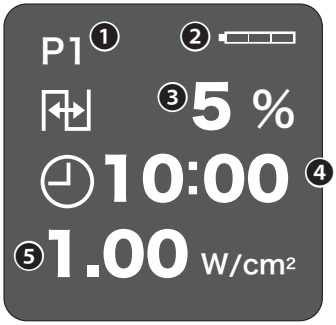


[Initial check screen]

After the initial check is completed, the therapy screen will appear.

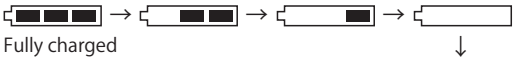
* If "Error" appears on the screen, see "Error screen" on page 24.

3



[Therapy screen]

❶Program No.
❷Battery status

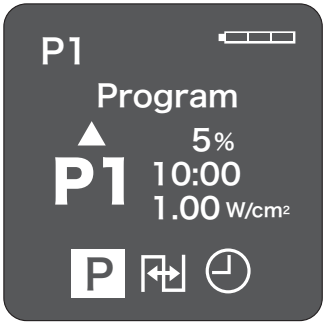


[Battery error]

Once the battery power drops to the lowest level, the battery error screen will appear, and power for the device will shut down automatically. Recharge the battery.

❸Output mode
❹Timer (remaining time)
❺Ultrasound output

4 To change the settings on the therapy screen, press the SELECT switch on the therapy screen while output is off.

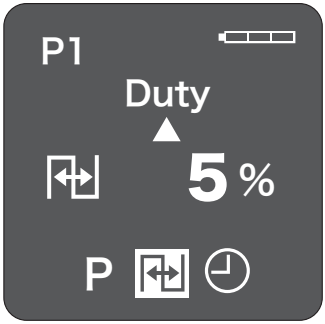


❶ [Program setting screen]

Use the UP and DOWN switches to select a program number.

P1 5% 10:00 1.00 W/cm² ◀▶ P2 20% 10:00 1.00 W/cm² ◀▶ P3 30% 10:00 1.00 W/cm² ◀▶ P4 50% 10:00 1.00 W/cm² ◀▶ P5 100% 10:00 1.00 W/cm²

* The settings for each program can be changed. As changes are saved in the device, the program settings for your device may differ from the settings shown above.
* The program settings are saved at the start and end of output.



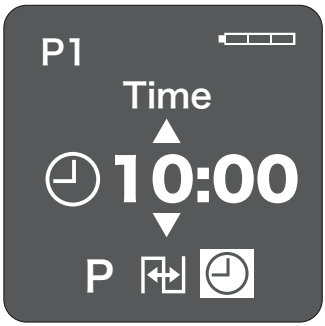
⬇ Press the SELECT switch.

❷ [Output mode setting screen]

Use the UP and DOWN switches to select an output mode.

5% ◀▶ 10% ◀▶ 20% ◀▶ 30% ◀▶ 40% ◀▶ 50% ◀▶ 100%

Operating Procedures



Press the SELECT switch.

❸ [Timer setting screen]

Use the UP and DOWN switches to set the timer.
The time is set between 1:00 and 30:00 in one-minute increments.

5 If you press the SELECT switch on the timer setting screen or if no key is operated for approximately 10 seconds, the display will revert to the therapy screen.

6 Use the UP and DOWN switches to set the ultrasound output level.

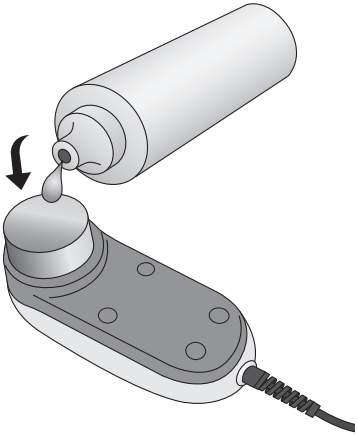
* Ultrasound output levels can be adjusted during output.

Continuous (Duty 100%): 0.10 to 2.00 W/㎠
Pulsed: (Duty 5%, 10%, 20%, 30%, 40%, 50%): 0.10 to 3.00 W/㎠

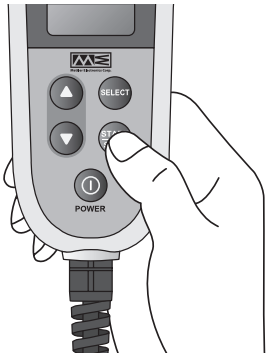
The level is set within the ranges above in an increment of 0.05 W/㎠ when the output unit is set to W/㎠.

* Note that setting details will differ between Sonicator 718 and Sonicator 719 if the output unit is set to W.

7 Apply the Ultrasound Gel to the ultrasound head.

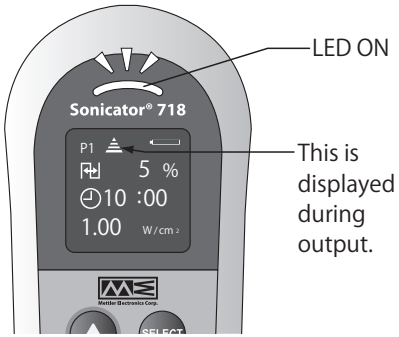


8 Press the START/STOP switch to initiate output.



While ultrasound is being output, as long as the ultrasound head is in proper contact with the body, an audible therapy signal will be emitted and the output LED will remain on.

* Any settings except for the program settings can be edited during output. (See pages 17 to 18.)
* If the ultrasound head is not in proper contact with the body for approximately 3 minutes, the output will shut off automatically.
* The audible therapy signal is turned on and off from the Config. screen. (See page 22.)
* If no key operation occurs for approximately 3 minutes, power for the device will shut off automatically.



Press the START/STOP switch to end output before the timer runs out.

* The timer will revert to the set time.

Operating Procedures

9 When the timer reaches “0:00,” the buzzer will sound and the display screen and output LED will start blinking to indicate that therapy is complete.

Press and hold the POWER switch (approximately one second) to turn off power.

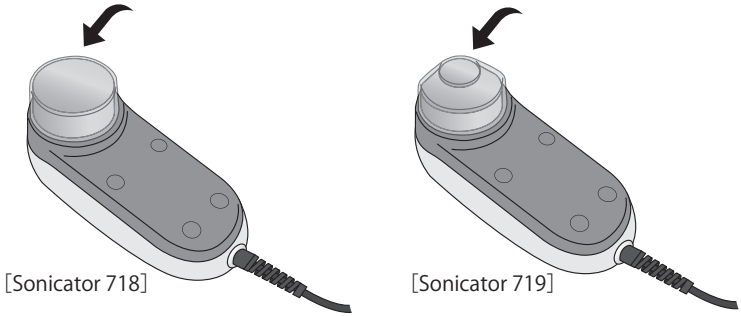
10 Make sure power is off. Wipe to remove the Ultrasound Gel from the ultrasound head.

* Keep the device and accessories clean to avoid inconvenience in the next therapy. Store in good order in a dry location.

Storage

〈Protective Cap〉

Place the cap on the ultrasound head to protect against damage during storage.

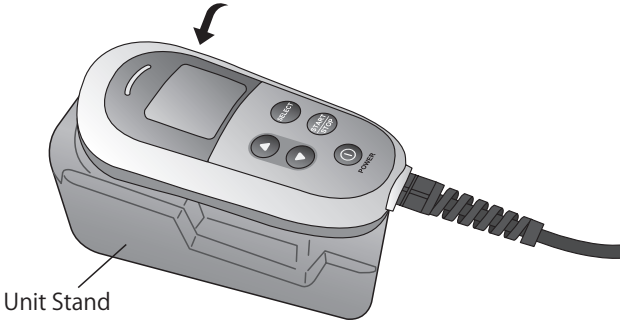


[Sonicator 718] [Sonicator 719]

* Wipe all Ultrasound Gel from the ultrasound head.
* The Sonicator 718 and Sonicator 719 use different caps.

〈Unit Stand〉 *Optional Accessories

Place the device on the stand to store in a stable position.



Unit Stand

Configuration Setting

1 Press and hold the SELECT switch (approximately one second) on the therapy screen while output is off. The Config. screen appears.

❶ [Contrast setting screen]

Use the UP and DOWN switches to set the display screen contrast.

Contrast can be set between 0 and 15.

0 ——————▶15

Bright

⬇ Press the SELECT switch.

❷ [Key sound setting screen]

Use the UP and DOWN switches to turn the key touch sound on or off.

ON ◀ ▶ OFF

Press the SELECT switch.

❸ [Therapy sound setting screen]

Use the UP and DOWN switches to turn the audible therapy signal on or off.

ON ◀ ▶ OFF

Press the SELECT switch.

❹ [Unit setting screen]

Use the UP and DOWN switches to select a unit for output level.

W/cm² ◀ ▶ W

Press the SELECT switch.

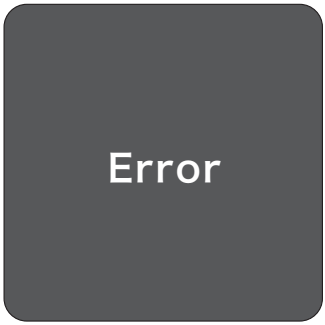
❺ [GEL/OTM setting screen]

Use the UP and DOWN switches to select GEL or OTM.

GEL ◀ ▶ OTM

2 Once configuration settings are completed, press and hold the SELECT switch (approximately one second) to return to the therapy screen.

Error Screen



If the screen displays the “Error” message, power for the device will be automatically shut down in approximately 10 seconds.

Press and hold the POWER switch (approximately one second) to turn power on once again.

* Contact the dealer or manufacturer or distributor if the “Error” message appears repeatedly.
* The “Error” message is likely to appear if the device is used near another device: for instance, a shortwave therapy system or microwave therapy system. In that case, try moving the device away from the other device, then power on once again.

EMC

・Medical electronic devices are designed to ensure electromagnetic compatibility (EMC).

These devices must be installed and used in accordance with the EMC information provided in the attached document.

・Portable and mobile RF communications devices may affect medical electronic devices.

・Cable length (220–240 V model)
1) Main Unit: 1.5m
2) Battery Case: 0.2m
3) AC Adaptor: 1.5m
4) Power Cable for AC Adaptor: 0.5m

・If accessories other than those supplied as spare parts by the manufacturer are used, the emission of this instrument may increase and immunity may be reduced.

・Do not place this instrument next to or on top of another device when using it. If it has to be placed next to or on top of another device, check that this instrument and the device function properly before use.

Guidance and manufacturer's declaration — electromagnetic emissions

The Sonicator 718 and Sonicator 719 are intended for use in the electromagnetic environment specified below.
The customer or the user of the Sonicator 718 / Sonicator 719 should assure that it is used in such an environment.

Emissions test	Compliance	Electromagnetic environment — guidance
RF emissions CISPR 11	Group 1	The Sonicator 718 / Sonicator 719 use RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The Sonicator 718 / Sonicator 719 are suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

EMC

Guidance and manufacturer's declaration — electromagnetic immunity

The Sonicator 718 and Sonicator 719 are intended for use in the electromagnetic environment specified below. The customer or the user of the Sonicator 718 / Sonicator 719 should assure that it is used in such an environment.

Immunity test	IEC 60601-1-2 test level	compliance level	Electromagnetic environment — guidance
Electrostatic discharge (ESD) IEC 61000-4-2	± 6 kV contact ± 8 kV air		Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30 %.
Electrical fast transient/burst IEC 61000-4-4	± 2 kV for power supply lines ± 1 kV for input/ output lines	± 2 kV for power supply lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	± 1 kV line(s) to line(s) ± 2 kV line(s) to earth		Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5%U_T (>95% dip in U_T) for 0.5 cycle 40%U_T (60% dip in U_T) for 5 cycles 70%U_T (30%dip in U_T) for 25 cycles <5%U_T (>95% dip in U_T) for 5 sec		Mains power quality should be that of a typical commercial or hospital environment. If the user of the Sonicator 718 / Sonicator 719 requires continued operation during power mains interruptions, it is recommended that the Sonicator 718 / Sonicator 719 be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 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 and manufacturer's declaration — electromagnetic immunity

The Sonicator 718 and Sonicator 719 are intended for use in the electromagnetic environment specified below. The customer or the user of this unit should assure that it is used in such an environment.

Immunity test	IEC60601-1-2 test level	compliance level	Electromagnetic environment — guidance
Conducted RF IEC 61000-4-6	3Vrms 150kHz ~ 80MHz	3Vrms	Portable and mobile RF communications equipment should be used no closer to any part of this unit. including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance $d = 1.2\sqrt{P}$ 150kHz to 80MHz $d = 1.2\sqrt{P}$ 80MHz to 800MHz $d = 2.3\sqrt{P}$ 800MHz to 2.5GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[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: 
Radiated RF IEC 61000-4-3	3V/m 80MHz ~ 2.5GHz	3V/m	

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 Sonicator 718 / Sonicator 719 should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the Sonicator 718 / Sonicator 719.

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

EMC

Recommended separation distances between portable and mobile RF communications equipment and this unit

The Sonicator 718 and Sonicator 719 are intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the Sonicator 718 / Sonicator 719 can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Sonicator 718 / Sonicator 719 as recommended below, according to the maximum output power of the communications equipment.

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

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

NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.
NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

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