

# ULTRASONIC HOMOGENIZER

## KFS-250N



## Operating Instruction

 **WARNING:** Read carefully and understand all **INSTRUCTIONS** before operating. Failure to follow the safety rules and other basic safety precautions may result in serious personal injury.

## Summary

Ultrasonic homogenizers are multi-function and multi-purpose instruments that utilize intense high frequency sound to induce cavitation in liquid. As the cavitation bubbles collapse, high shearing energies disrupt animal and plant tissue, and lyse yeast, bacteria and spores. The ultrasonicator can also be used for non-biological applications such as emulsification, nanoparticle dispersion, intense washing or acceleration of chemical reactions (sonochemistry).

## Technical parameters

Model:	KFS-250N
Frequency range:	20KHz (frequency is auto-tracking)
Output power:	150W (0%-100% continuous adjustable)
Total working timer:	1s . 99 hours with pause function
Ultrasonic output impulse:	Ultrasonic on timer:1s . 99 min Ultrasonic off timer: 1s . 99 min
Duty ratio:	0%-100%
Diameter of ultrasonic probe:	20mm
Sample processing volume:	1mL . 100mL
Packing size:	32X46X42cm
Weight:	Approx. 8~10kg

## Working environment and conditions:

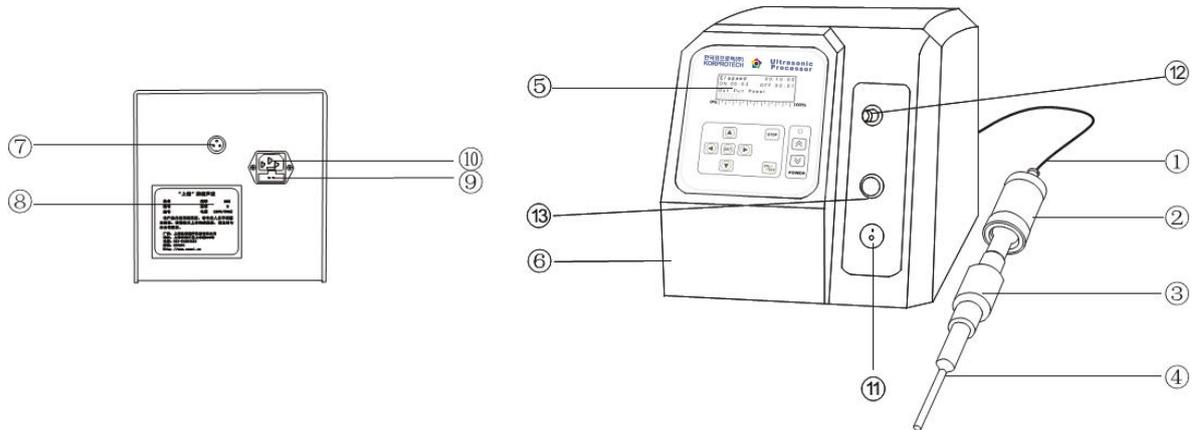
Environment Temp.:	0 ó 40°C
Environment:	Indoor (no corrosive gas)
Relative Humidity:	≤85% (T=20°C)
Power Supply:	220VAC, 60Hz
Energy converter Temp.:	0 ó 120°C
Sample type:	Solutions

## The principle of working

This machine is made up of an ultrasonic power supply and an ultrasonic transducer assembly (generator or probe). The ultrasonic power supply converts the input single-phase electricity of 110VAC, 50Hz into an alternating electrical signal of 20-25 kHz, 600V. The circuitry consists of a power rectifier, power switcher, a frequency conversion system, power amplifier, phase-locked frequency automatic tracking device, power regulator, power detector, power protector device and microcomputer controller.

Driven by the appropriate impedance and power, the transducer subassembly generates mechanical energy through a piezoelectric resonator which is focused and amplified with a tuned, titanium metal horn (probe). When the probe tip is immersed in sample solution, intense, high frequency sound waves coming from the tip of the probe induce cavitation. As the cavitation bubbles collapse, high shear forces break or tear

open the cells. Indeed, cavitation forces are high enough to break covalent bonds and, hence, ultrasonicators can be used to fragment high molecular weight DNA.



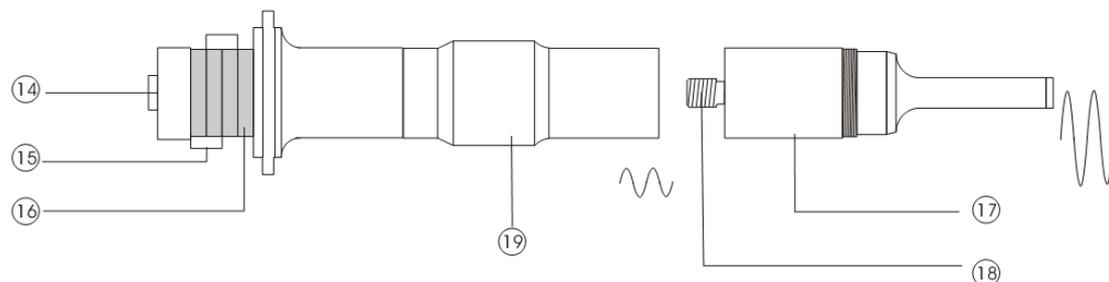
### Machine Structure

Front

- 1. Transducer cable
- 2. **Sleeve** (hand hold position)
- 3. Booster
- 4. Probe
- 5. Control panel
- 6. Housing
- 11. Power switch
- 12. Temp. detector
- 13. Protect knob

Rear

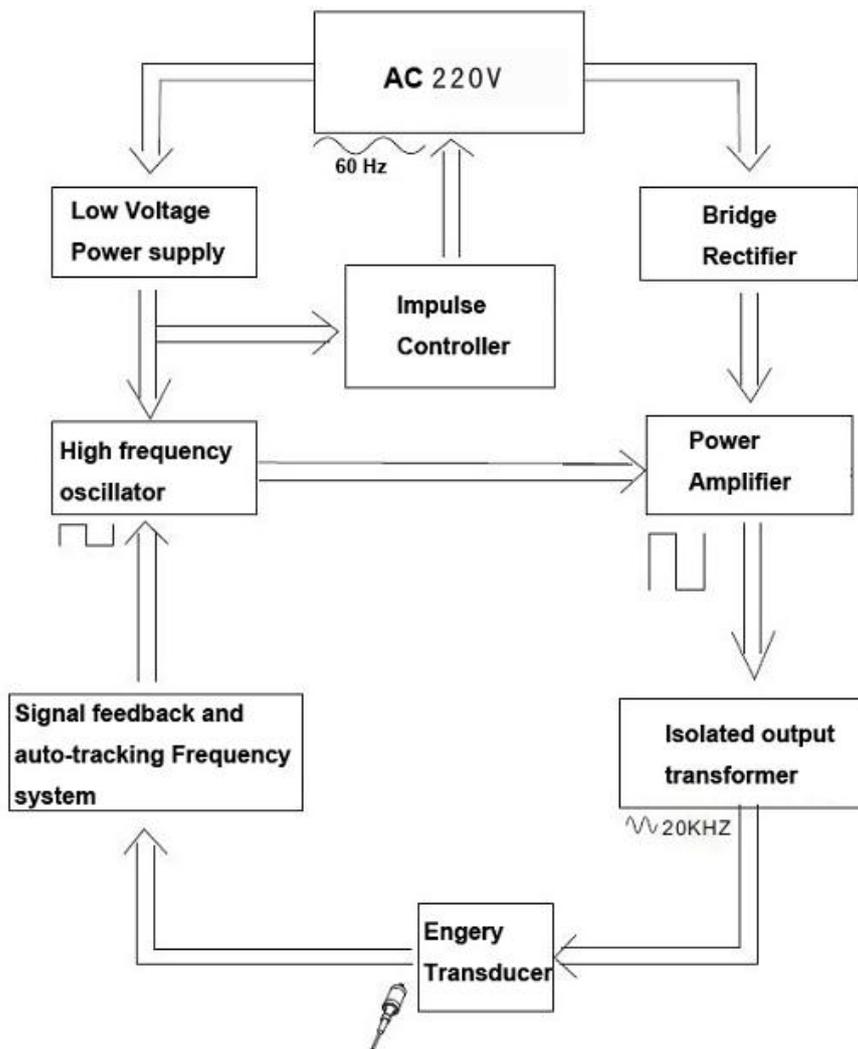
- 7. Ultrasonic output connector
- 8. label
- 9. Fuse holder
- 10. Power socket



### Energy Converter Transducer

- 14. High tensile screw
- 15. electrode plate
- 16. piezoelectric ceramics
- 17. probe
- 18. screw connection
- 19. Booster

## Ultrasound Generator Electric Diagram



### Product Features:

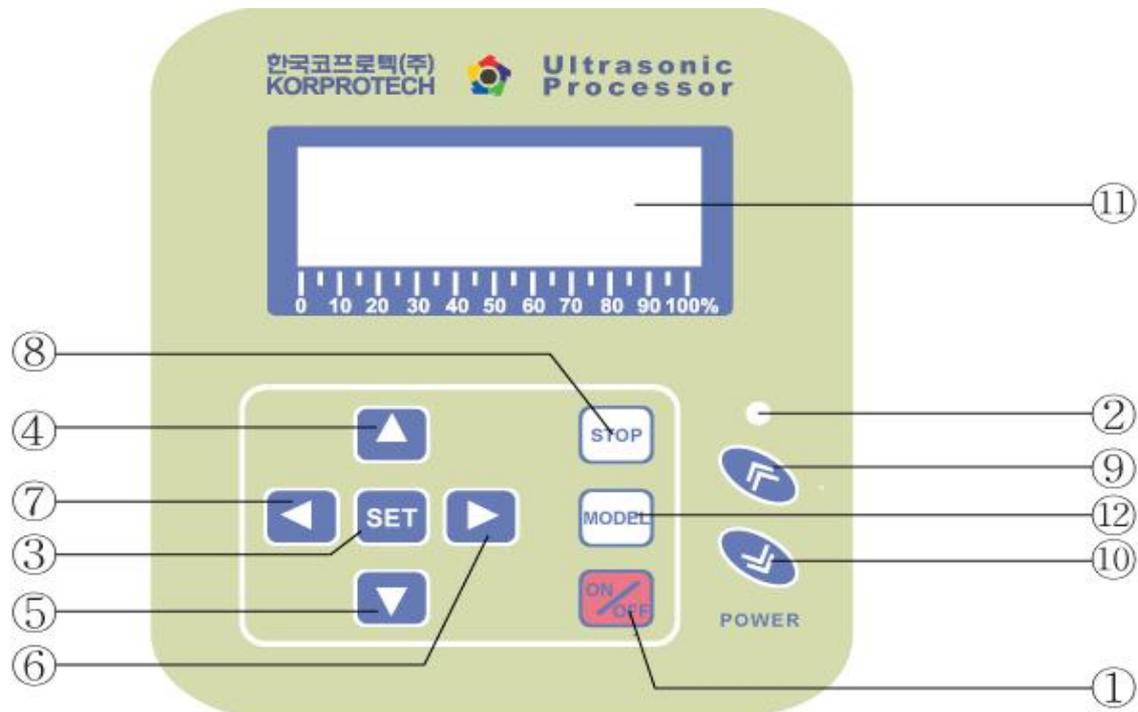
- Novel design, Complete-function, Reliable ability
- Large LCD digital display, Fully microprocessor controlled and completely programmable
- Auto-tuning for convenience of use and optimal processing efficiency
- Temperature indicator and controller
- 99h total working time controller, 1s . 99h, count-down time display
- Automatic amplitude compensation
- Power-emitted display for accuracy and repeatability, Variable power output, 0-1200 watts
- Integrated Sound Abating Chamber to reduce cavitation sound emitted during processing

### Common applications:

- ~ Mixing, blending, emulsifying, and homogenizing solutions
- ~ Reducing particle size of suspensions
- ~ Dispersing suspensions
- ~ Disrupting cells
- ~ Catalyzing chemical reactions

## Install and Operation

### Control panel description



- |                          |                                       |
|--------------------------|---------------------------------------|
| 1. Timer ON/OFF          | 2. Ultrasonic working indicator (LED) |
| 3. Time SET function key | 4. Minus Number key                   |
| 5. Plus Number key       | 6. numeric shift                      |
| 7. numeric shift         | 8. Pause(stop)                        |
| 9. Increase Power        | 10. Decrease Power                    |
| 11. LCD display          | 12. Mode option                       |

### Installation

- 1) Have the bracket and clamp assembled (the holding system for transducer)
- 2) Have the transducer cable and transducer connected, then connect with the main machine (ultrasound generator)
- 3) **Make sure the power switch on OFF position**, connect power cable to power supply and main machine
- 4) Put the transducer unit on the bracket or noise abating chamber. Make sure the ultrasonic probe tip is inserted into the sample liquid surface and in the center of container. **The probe should get into the liquid 5mm to 10mm beneath the liquid surface.** For large sample volumes, the distance between the probe tip and the container's bottom should be bigger than 30mm. (The ultrasonic probe tip can be as close as 10mm from the bottom of the container when processing a small size sample or when using a lower transducer power setting) **If you hold the transducer unit to process the sample, do hold it on SLEEVE position. Other positions are not allowed.**



**It is prohibited to start ultrasonic output when the probe tip is out of the liquid, otherwise the energy converter and ultrasonic wave generator will be damaged.**

### **Operation**

- 1) Turn on the power switch on front panel, power light brighten.
- 2) Press %SET+ to set up total working time, timer range: 1s to 99 hours. press 4, 5, 6, 7 keys to adjust total working time you want
- 3) Press %SET+ to set up ultrasonic on pulse time. press 4, 5, 6, 7 keys to adjust ultrasonic working pulse time you want from 1s to 99min
- 4) Press %SET+ to set up ultrasonic off pulse time. press 4, 5, 6, 7 keys to adjust ultrasonic off pulse time from 1s to 99 min
- 5) Press %SET+ to confirm and memory the data.
- 6) Press 9, 10 keys to adjust power output (0-100%). It can be adjusted during ultrasound working also.
- 7) Press %ON/OFF+ to start, Press it twice to stop. When ultrasound output start, no use to press %SET+ key. Only when it stops, press %SET+ to adjust working time.
- 8) Press %STOP+ to pause. Press twice to continue.
- 9) During the working procedures, do not touch the probe with your hand to avoid thermal burn.
- 10) After use, must turn off the Power Switch and cut off the power supply.

If splashing or aerosol formation occurs during ultrasonic treatment of the sample reduce the power setting on transducer/probe and set the ultrasonic pulse to shorter times. This avoids damaging the ultrasonic probe.

### **WARNINGS & NOTES during use**

- 1. NEVER START ULTRASONIC OUTPUT WHEN THE PROBE TIP EXPOSED IN THE AIR**
2. The apparatus adopts switching power supply without industrial frequency transformer. Don't touch randomly after opening the generator housing to avoid electroshock.
3. The apparatus do not need warm up and should be grounded well when being used.
4. Use it in the environment free from moisture, sunshine and corrosive gases.
5. Be sure the platform is tightly fixed to the rod, the ultrasonic probe is in liquid and not touching the walls of the sample vessel.
6. The liquid temperature will increase rapidly due to the cavitation effect during crushing. The user should pay attention to the temperatures for different cells. It is suggested to adopt multiple short time crushing (not longer than 5s each time) and ice bath cooling.
7. It is proved through practices that multiple short time operations, working time 1~2s and interval time 1~2s, have better effects than continuous long time operations. The long interval time can be set to avoid the heating of liquid. Additionally, continuous long time operations are subject to no load operations to shorten the apparatus service lifetime.

8. The horn end will become rough due to cavitation corrosion after being used for a period of time. Use oil stone or rasper to smooth. Otherwise, it will influence the working effects.
9. In general, the volume of homogenization media should be 3 to 10 times the net volume of the solid sample. Pre-chopping the sample into pieces less than 1 mm in cross-section will significantly decrease the time of homogenization.
10. Heating of the sample occurs with long runs. Gross sample heating can be minimized by:
  - A. nesting the sample vessel in a outer vessel containing ice;
  - B. select longer interval (gap) times;
  - C. using a specially fabricated leptosomatic ultrasonication vessel (available as an accessory).

This is said, the user should keep in mind that transient (millisecond) heating and free radical formation in the immediate vicinity of the ultrasonic probe tip is unavoidable. Please take this into considered when working with samples especially sensitive to heat or free radical damage. To avoid excessive cavitation leading to overload when using smaller ultrasonic probes of 2, 3, and 6 mm tip diameter, the ultrasonic power wheel should be rotated to a lower power setting.

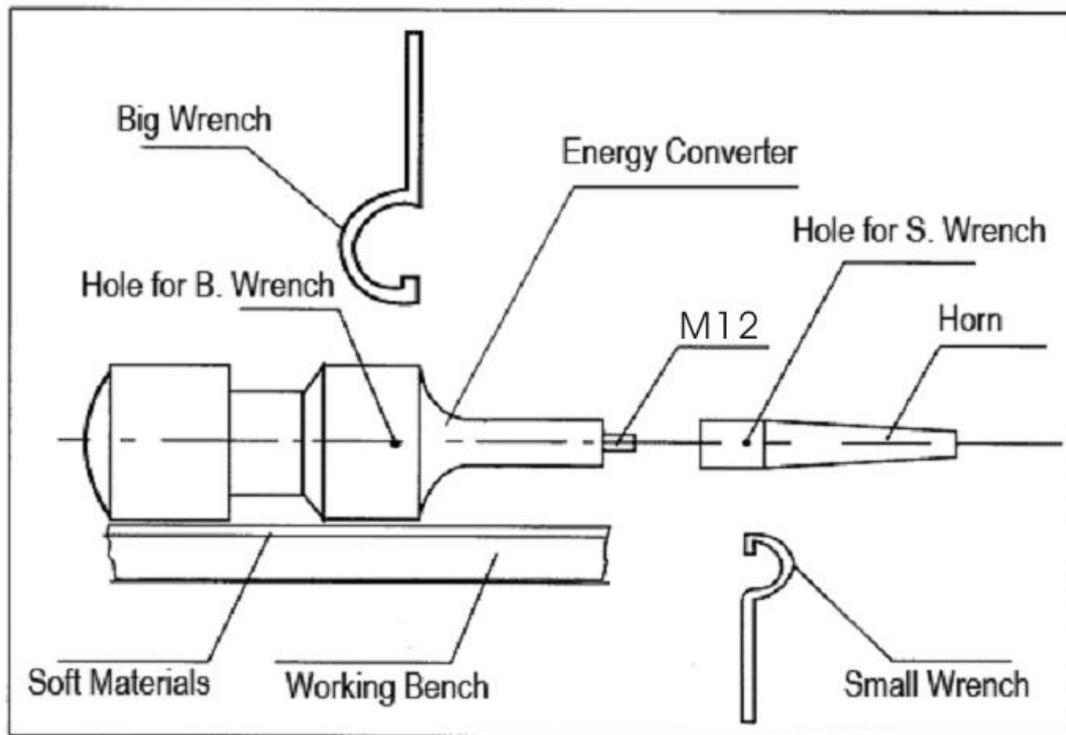
11. If the liquid volume containing the sample is less than 5 ml, choose an ultrasonic probe having a tip diameter of 2 or 3 mm. With smaller probes, the depth the ultrasonic probe inserted into liquid is about 1cm and the distance between the tip of the ultrasonic probe and container bottom will vary to some extent by the power setting selected for the probe, but should not be less than 0.5 cm.

Suggested homogenizing volumes for different sized probes:

Ultrasonic probe tip diameter	2 or 3 mm	13、 16 or 18m	2 0 or 25mm
Crash capacity ( ml)	0.5-50 ml	5-500ml	500-2000ml

Notes: There is no implicit applicable scope of capacity of the ultrasonic probe, just a set of proposing values. Please operate according to the above notes.

## Lever disassembly



Place energy converter on the bench covered by soft materials (e.g. towels). Put small wrench into the wrench hole on the horn and big wrench into the wrench hole on the energy converter. The big wrench should be placed towards left and the small wrench towards right.

Facing the horn with big wrench in left hand and small wrench in right hand, loose by turning downwards with two hands at the same time. Facing the horn with big wrench in left hand and small wrench in right hand, tighten by turning downwards with two hands at the same time. When changing the horn, if M10 screw is attached on the horn, manually screw out the screw from the lever and screw the screw 1/2 into the energy converter, then screw on the required horn. If the screw cannot be manually screwed out from the horn, knock the screw lightly on wooden materials so that the screw can be screwed out manually.



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