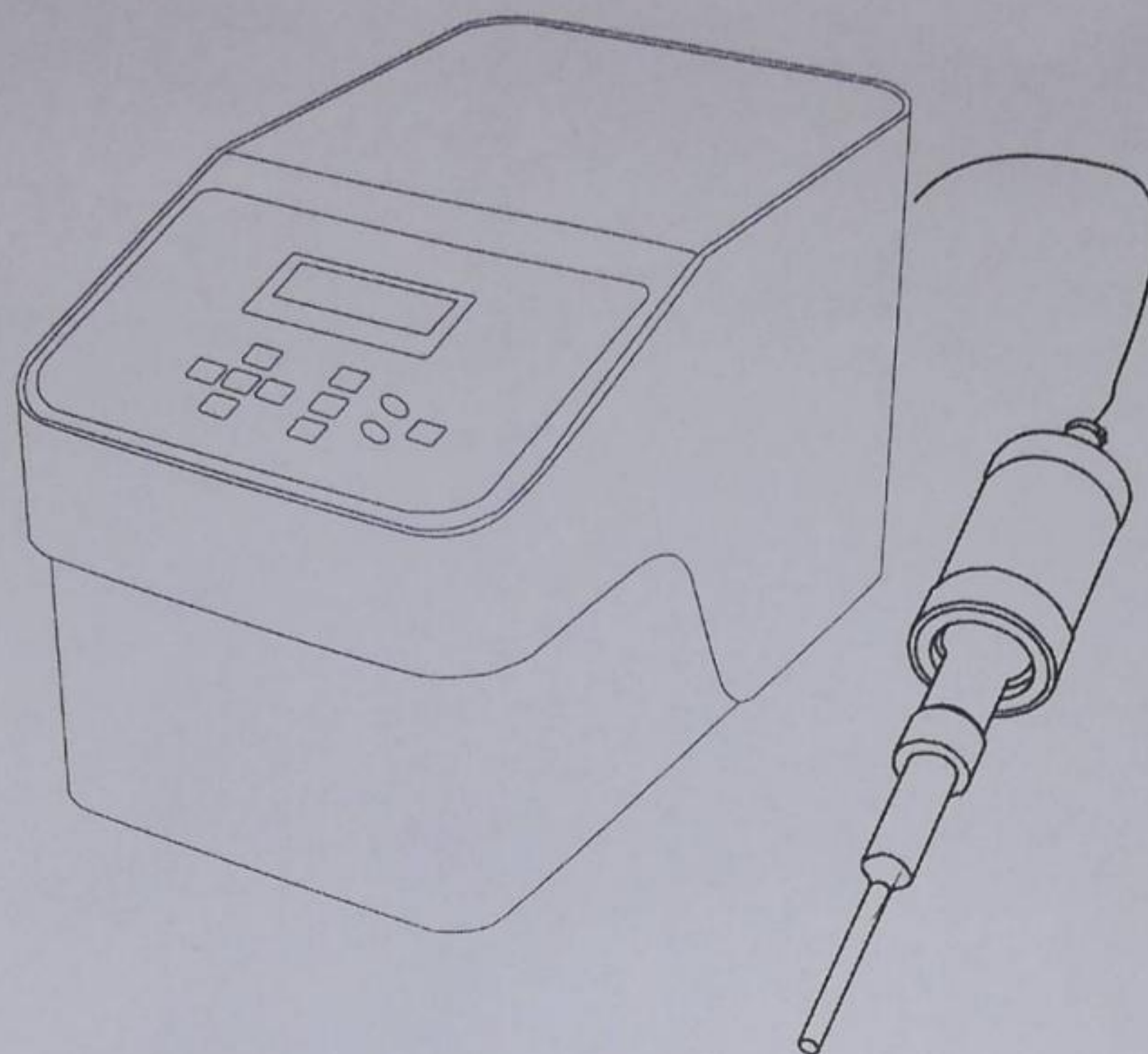



ULTRASONIC PROCESSOR FS-450N



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.

Content

1. Summary
2. The principle of working
3. Machine structure
4. Electrical principle
5. Technical parameters
6. Product features
7. Working environment and conditions
8. Installation and Operation
9. Warnings and Notes
10. Maintenance
11. packing list
12. Lever installation and removal

1. 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. cavitation forces are high enough to break covalent bonds and, hence, ultrasonicators can be used to fragment high molecular weight DNA or Disrupt cells. The ultrasonicators can also be used for non-biological applications such as emulsification, nanoparticle dispersion, intense washing, reducing particle size of suspensions, dispersing suspensions or acceleration of chemical reactions (sonochemistry).

2. The principle of working

When the ultrasonic transducer vibrates to produce ultrasonic waves in the liquid, each bubble bursting in the liquid produces a powerful shock wave that is almost equivalent to producing temperatures of several hundred degrees and pressures of up to several thousand atmospheres. This phenomenon is called "Cavitation effect". Ultrasonic cavitation is a unique physical process caused by ultrasonic in liquid medium, and it has many wonderful phenomena and amazing effect. The basic effect of cavitation is high temperature effect, discharge effect, luminescence effect, impact, pressure effect, etc. And people take advantage of these unique effects and widely use them in medicine, biology, chemistry, physics and other fields.

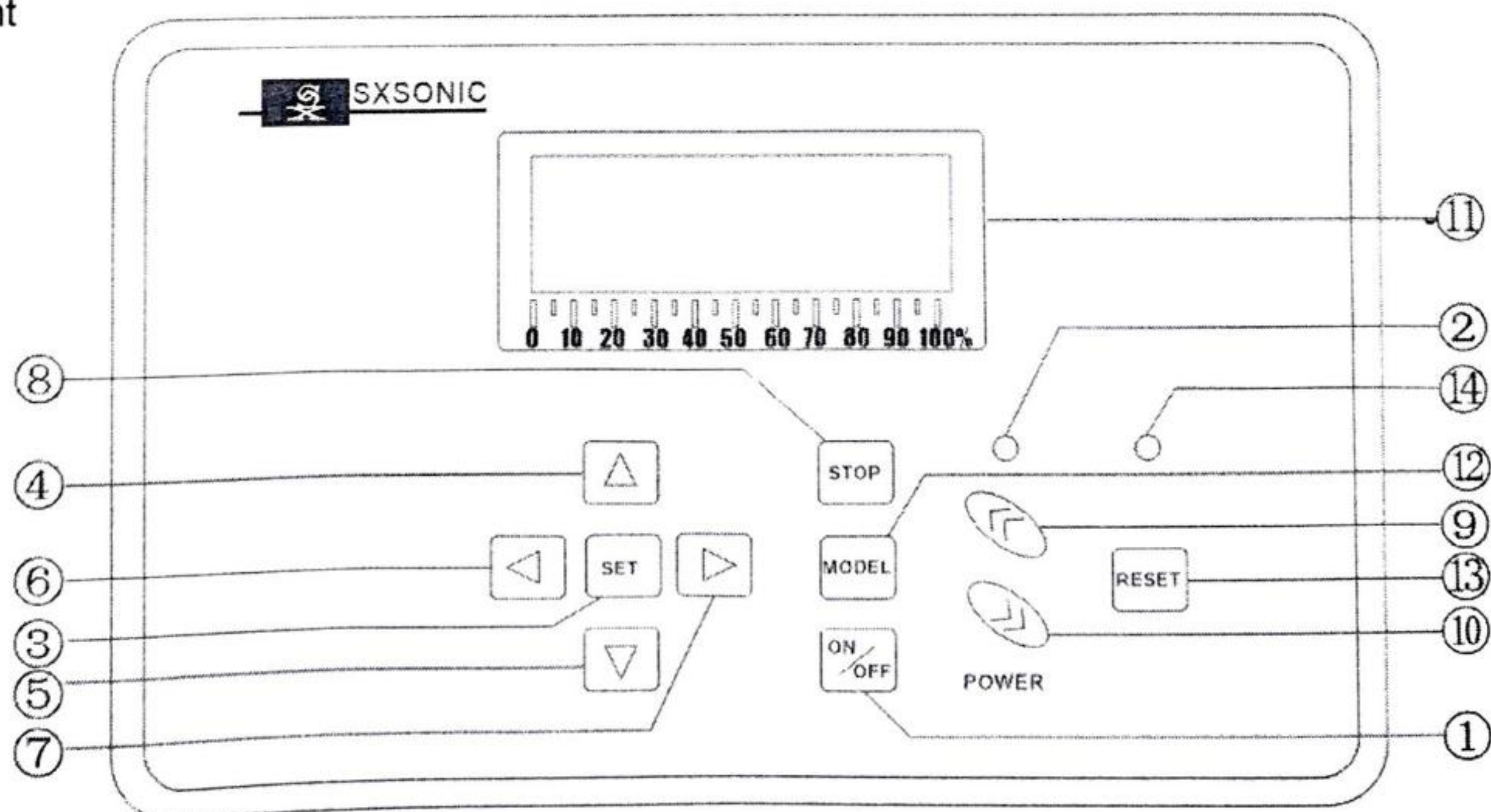
This machine is made up of an ultrasonic power supply and an ultrasonic transducer assembly (generator or probe). The ultrasonic power supply converts the input single-phase electricity of **220VAC, 50Hz** into an alternating electrical signal of 20-25 kHz, **220V**. The circuitry consists of a power 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.

3. Machine Structure

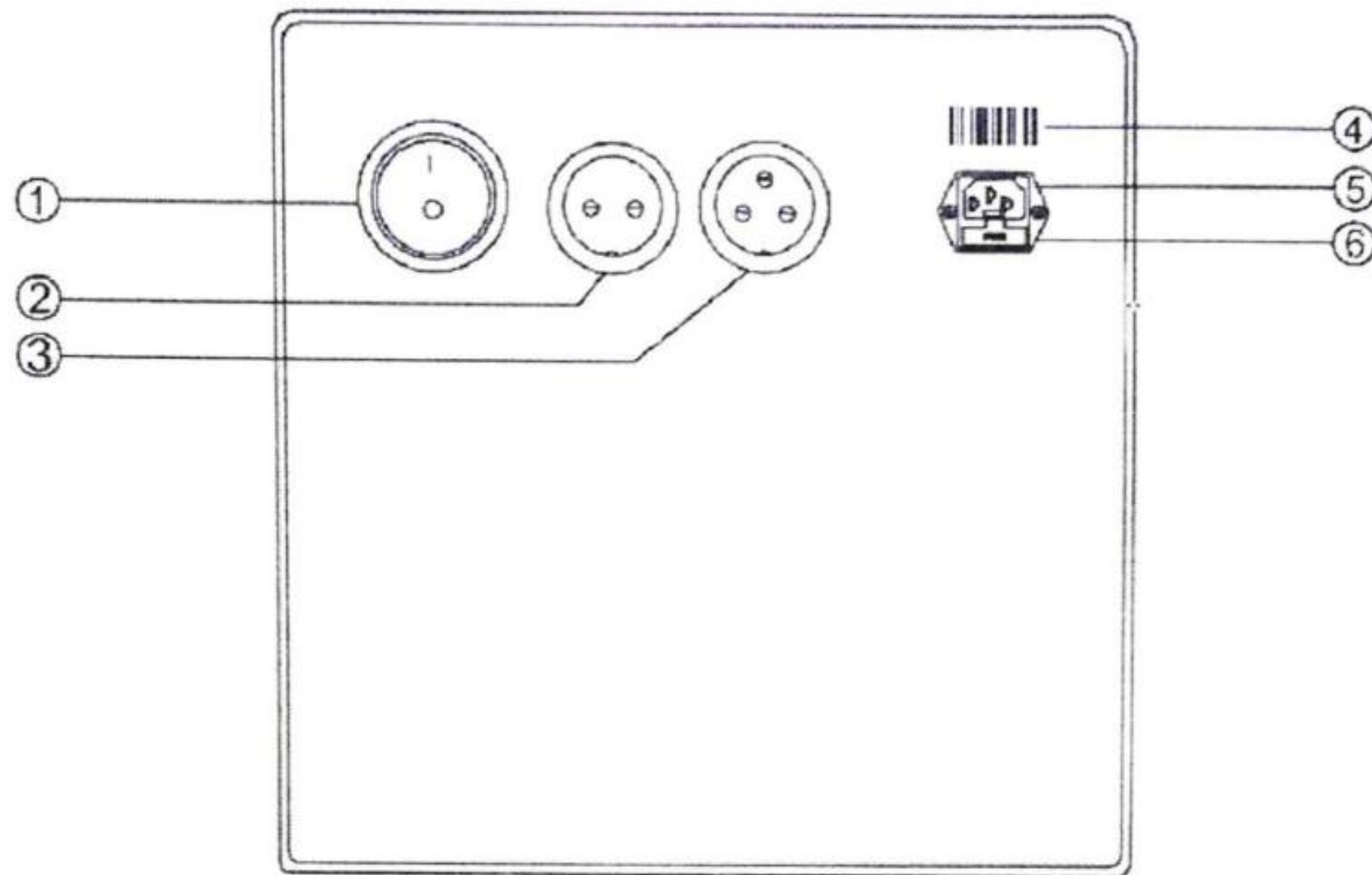
Control panel description

Front



Front

- 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
- ⑬ Reset
- ⑭ Protection lamp

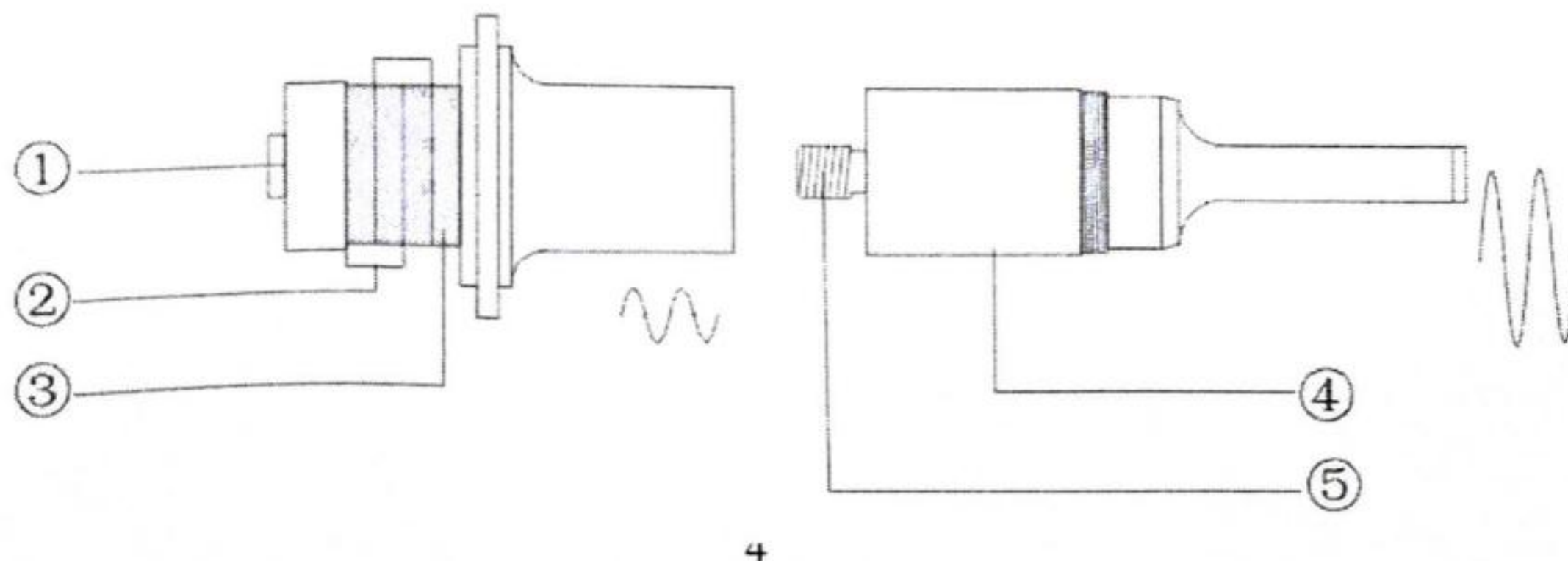


Back

- ① power switch
- ② Input socket(connect to temperature probe)
- ③ Input socket(connect to transducer)
- ④ Coding
- ⑤ Main power socket
- ⑥ Fuse holder

Transducer

The pressure transducer is of sandwich single screw structure, different types and power transducer equipped with different specifications and quantities of voltage ceramic.

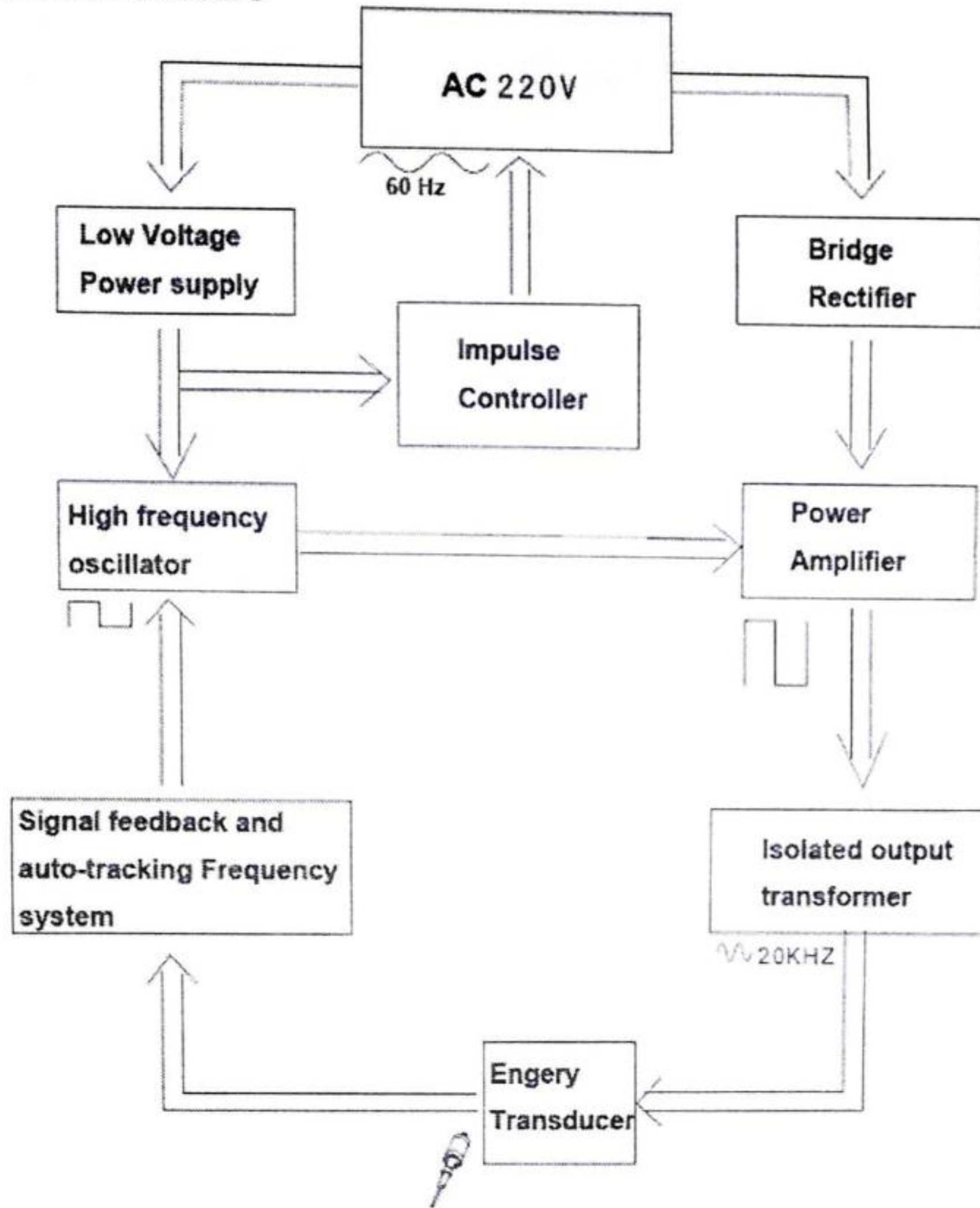


- ① Special fastening screw for high strength transducer
- ② Electrode piece
- ③ Piezoelectric ceramics
- ④ Probe
- ⑤ Connecting screws

4. Electrical Principle

1. Generator: as shown

Ultrasonic circuit structure



5. Technical parameters

Model:	FS-450N
Frequency range:	20KHz (frequency is auto-tracking)
Output power:	450W (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:	Φ13mm
Sample processing volume:	10ml-300ml
Packing size:	490*370*770mm
Weight:	16kg

6. Product Features

- ① Novel design, Complete-function, Reliable ability
- ② Large LCD digital display, Fully microprocessor controlled and completely programmable
- ③ Auto-tuning for convenience of use and optimal processing efficiency
- ④ Temperature indicator and controller
- ⑤ 99h total working time controller, 1s – 99h, count-down time display
- ⑥ Automatic amplitude compensation
- ⑦ Power-emitted display for accuracy and repeatability, Variable power output, 0-600watts
- ⑧ Integrated Sound Abating Chamber to reduce cavitation sound emitted during processing

7. Working environment and conditions

- ① Environmental temperature: 0 ~ 40°C
- ② Humidity: ≤ 85% (T=20°C)
- ③ Power supply: **220V 50HZ** (± no more than 5%)
- ④ Working condition: the longest continuous 10min (ultrasonic working time generally no more than 10 minutes / time)
- ⑤ Transducer temperature: 0 ~ 120°C
- ⑥ Object: solution or mixture of solution

8. Install and Operation

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.

9. Warnings and Notes

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.

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 probe end will become rough due to cavitation corrosion after being used for a period of time. Probe is a consumable, and the machine needs to be replaced if there is any abnormality.**
- 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.

① 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	3 mm	6mm	8mm
Crash capacity	0.5ml-50 ml	2ml-100ml	5ml-200ml

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.

10.Maintenance

- ① The equipment should be placed and used in the clean, dry, ventilated place.
- ② Gently move vibrator to prevent fracture.
- ③ When the vibrator is hot, it should be used for cooling.
- ④ After use the power plug should unplug to cut off power source.
- ⑤ The device must work within **220VAC, 50Hz + 5%** range.
- ⑥ If the equipment fails, you should contact the manufacturer in time rather than fix it by non professional technical personnel.

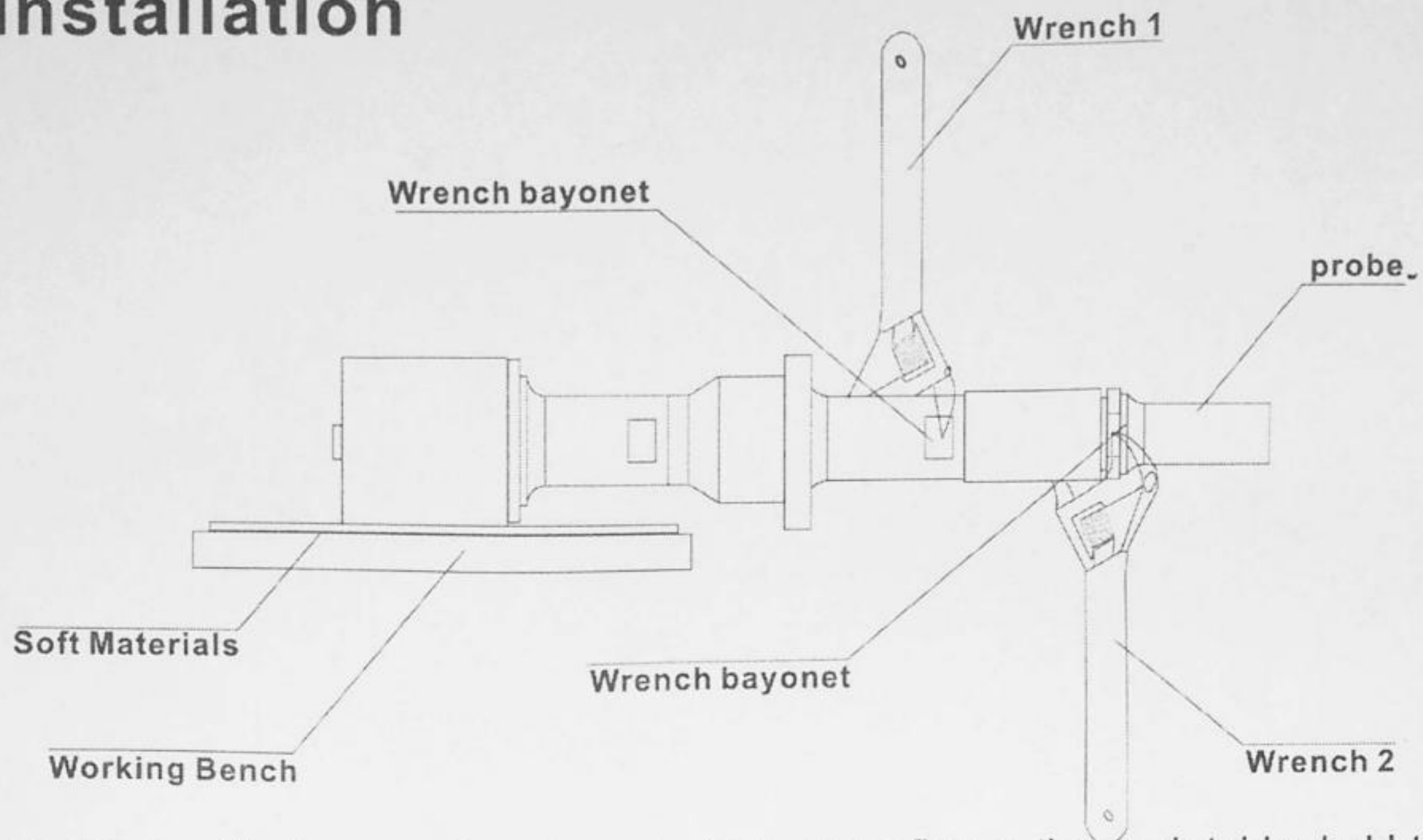
11.Packing list

Host	1
Ultrasonic probe	1
Power cord	1
Cable	1
Fuse	3
Operating user manual	1
Sound box	1
Lifting platform	1

12.Level Installation and Removal

1. Install the transformer, put the transducer flat on the work table, hold the wrench 1 with the left hand and reverse jam the aluminum alloy 1 part of the transducer, hold the wrench 2 with the right hand and front jam the transformer 2 part of the transducer, fasten and fix the transducer with the left hand and exert downward force, and clamp the transducer with the right hand and exert downward force. (soft spacer can be used to protect the surface of the transformer when clamping) as shown in the figure below:

Installation



2. Remove the amplitude converter, place the transducer flat on the work table, hold the wrench 1 with the left hand and reverse jam the aluminum alloy part 1 of the transducer, hold the wrench 2 with the right hand and front jam the transformer 2 with the left hand, fasten and fix the transducer with downward force, and clamp the transducer with the right hand and upward force. (soft spacer can be used to protect the surface of the transformer when clamping) as shown in the figure below:

Removal

