How Does a Sonicator Work?

Generator → **Converter** → **Probe/Horn**

A Sonicator system is comprised of 3 major components: Generator, Converter and Horn (also known as a probe).

The ultrasonic electronic **Generator** transforms AC line power to high frequency electrical energy. The generator features a keypad or buttons which allow the user to control the sonication parameters.

The generator provides high voltage pulses of energy at a frequency of 20 kHz that drives a piezoelectric **Converter**. The converter is a cylindrical device which is connected to the generator by a high voltage cable. The converter transforms electrical energy to mechanical vibration due to the characteristics of the internal piezoelectric crystals.

The vibration is amplified and transmitted down the length of the **Probe/Horn**. Probes have threaded ends and attach to the converter. During operation, the probe's tip longitudinally expands and contracts. Amplitude is the distance the tip travels and is dependent on the amplitude setting selected by the user.

In liquid, the rapid vibration of the tip causes cavitation, the formation and violent collapse of microscopic bubbles. The collapse of thousands of cavitation bubbles releases tremendous energy in the cavitation field. Objects and surfaces within the cavitation field are "processed." By increasing the amplitude setting, cavitation intensity within the sample is also increased.

The probe tip diameter dictates the amount of sample that can be effectively processed. Smaller tip diameters deliver high intensity sonication but the energy is focused within a small, concentrated area. Larger tip diameters can process larger volumes, but offer lower intensity. Boosters can be used to increase the intensity of a larger tip probe to speed up processing times.

To ensure a positive outcome, it is important to select the appropriate generator and probe to match the volume, viscosity and other parameters of each particular application. Please consult with a Sonicator product specialist for help making the optimum choices.

Agence Nord:
ZA Object'Ifs Sud - Lot A3
6 Allée Emilie du Châtelet
14123 Ifs
tél : 02.31.34.50.74
fax : 02.31.34.55.17

Agence Est:
Parc Club des Tanneries
2 Rue de la Faisanderie
67380 Lingolsheim
tél : 03.88.04.01.81
fax : 03.68.93.01.52

Agence Sud:
Bât Le Venango. 392 Rue Jean Dausset
AGROPARC - BP11575
84916 Avignon Cédex 9
tél : 04.90.27.17.95 fax : 04.90.27.17.52

DELTA LABO

www.deltalabo.fr
info@deltalabo.fr

Direct vs. Indirect Sonication Methods

DIRECT Sonication (inserting a probe directly into a sample vessel) is the most common way to process a sample. Energy is transmitted from the probe directly into the sample with high intensity and the sample is processed quickly.

The diameter of the probe's tip dictates the liquid volume that can be effectively processed. Smaller tip diameters (Microtip probes) deliver high intensity sonication and the energy is focused within a small, concentrated area. Larger tip diameters can process larger volumes, but offer lower intensity. Boosters and High Gain horns can be used to increase the output of large diameter probes. Probes are offered with either replaceable or solid tips and are made from titanium.

INDIRECT Sonication eliminates the need for a probe to come in contact with your sample. This technique is often described as a high intensity ultrasonic bath. The ultrasonic energy is transmitted from the horn, up through the water and into a vessel or multiple sample tubes.

Indirect sonication is most effective for very small samples because foaming and sample loss are eliminated. Pathogenic or sterile samples are ideal for this method because aerosols and cross contamination are prevented. The Cup Horn and Microplate Horn deliver indirect sonication and are ideal for many high throughput applications.

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QA40 Atomizer

The QA40 Atomizer uses ultrasonic energy to generate a low-velocity, gentle spray. The sample can be precisely delivered to the target area. Overspray is virtually eliminated resulting in material savings. The atomizer can run continuously or be programmed to pulse on and off.

With water, the average droplet size is 50 microns. The minimum sample volume that can be effectively atomized is 2 µl/sec. To optimize atomization, the liquid product's solid concentration must be below 30% and viscosity below 50 cps. A low pressure metering pump is recommended to deliver the liquid sample to the nozzle. Gravity feed can also be utilized.

FEATURES:
- 50 micron droplet size
- Programmable operation
- Multiple probe options

PART NO. QA40 INCLUDES:

- Generator
- Converter
- Standard probe
- Power cable
- Converter cable
- Wrench set

TECHNICAL SPECIFICATIONS:

Frequency:	40 kHz
Programmable Timer:	10 hours
Adjustable Pulse On/Off:	1 second to 1 minute
Dimensions:	8" W x 13.75" L x 5.75" H
Voltage:	110V, 50/60 Hz