



ULTRASONIC INDUSTRIAL DEVICES



hielscher
Ultrasound Technology

an extensive spectrum of devices for various applications

Hielscher Ultrasonics develops and manufactures compact laboratory devices as well as a wide product range of ultrasonic processors for industry.

Demanding operational conditions and small space at the location make a conventional separation between the generator and the transducer necessary. There are also economical advantages, if only the transducer is designed for the specific conditions of the application e.g. for food industry standard or with explosion proof, and to house the generator separately in a cabinet.

For industrial applications we offer devices ranging from 250 to 16,000 watts per device. With that spectrum most application cases can be achieved.

In addition to that, our standard product range can be enlarged with application-specific designs.



The power of up to 250 watts is sufficient to homogenize or to nebulize small samples.

Higher power of approx. 500 watts is used for cutting, welding and sieving and in particular for the treatment of liquids as well as for special cleaning tasks.

Large-scale liquid volumes or big surfaces to be cleaned demand accordingly higher ultrasonic power. It is more cost effective to use one powerful industrial processor instead of a large number of small devices. That led to the development of our big ultrasonic processors, that are the most powerful continuous processors worldwide, which are incited by piezo ceramics, with a power of up to 16kW per unit.

This opens the way to a rational industrial use of high-efficiency ultrasound in various application fields e.g. in the chemical industry, the food industry, the paint and coating production as well as in the processing of nano-materials.

survey of our ultrasonic processors

type	power (Watt)	frequency (kHz)	amplitude adjustment	pulse	application	
LAB	VialTweeter	250	24	20-100%	yes	lab, very small sample sizes (see brochure on lab equipment)
	UP50H / UP100H	50/100	30	20-100%	yes	lab, small sample sizes (see brochure on lab equipment)
	UP200H / UP200S	200	24	20-100%	yes	lab, medium sample sizes (see brochure on lab equipment)
	UP400S	400	24	20-100%	yes	lab, large samples (see brochure on lab equipment)
	UIS250Dmini	250	24	20-100%	no	contamination-free flow cell
INDUSTRY	UIP500(D)	500	20	50-100%	no	homogenizing, emulsifying, dispersing, wet-milling, cleaning
	UIP1000(D)	1,000	20	50-100%	no	homogenizing, emulsifying, dispersing, wet-milling, cleaning
	UIP2000(D)	2,000	20	50-100%	no	homogenizing, emulsifying, dispersing, wet-milling, cleaning
	UIP4000	4,000	20	50-100%	no	homogenizing, emulsifying, dispersing, wet-milling
	UIP10000	10,000	20	50-100%	no	homogenizing, emulsifying, dispersing, wet-milling
UIP16000	16,000	20	50-100%	no	homogenizing, emulsifying, dispersing, wet-milling	
SPECIAL	UIS250(I/L)	250	24	20-100%	*	special applications, sieving, sensor cleaning, OEM integration
	UIC100	100	20	20-100%	no	cutting (plastics, paper, cardboard, food, etc.)
	UIC400	400	20	50-100%	no	cutting (plastics, paper, cardboard, food, etc.)
	UIC500	500	20	50-100%	no	cutting (plastics, paper, cardboard, food, etc.)
	UIC1000	1,000	20	50-100%	no	cutting (plastics, paper, cardboard, food, etc.)

* on request, (D) special version for wire cleaning, e.g. UIP1000D, (L) special version for lab use, e.g. UIS250L

UIS250I versatile ultrasonic device for special applications



ultrasonic processor UIS250I



UIS250I generator in top hat rail case

The ultrasonic processor UIS250I (250 watts, 24kHz) is an ultrasonic device for special applications. It can be used to drive special flow cells (right picture), to agitate screens or other structures, to clean sensors, or as an integrated ultrasonic probe in various systems.

The compact stainless steel housing of the transducer in IP64 grade withstands dust, dirt, higher temperatures and humidity. Hence, the transducer can be installed in demanding environments. It is available in explosion-proof (dust, gas) design, too. The generator, supplied in a standard housing or as top hat rail unit for an electrical cabinet, can be located outside the hazardous area. The oscillation decoupling flange of the transducer permits accurate positioning when used in machines or robot arms. For the sonication of liquids at higher temperatures of up to 300°C and pressures of up to 300 atm we offer longer sonotrodes with pressure-tight flange connections.



contamination free flow cell Dmini

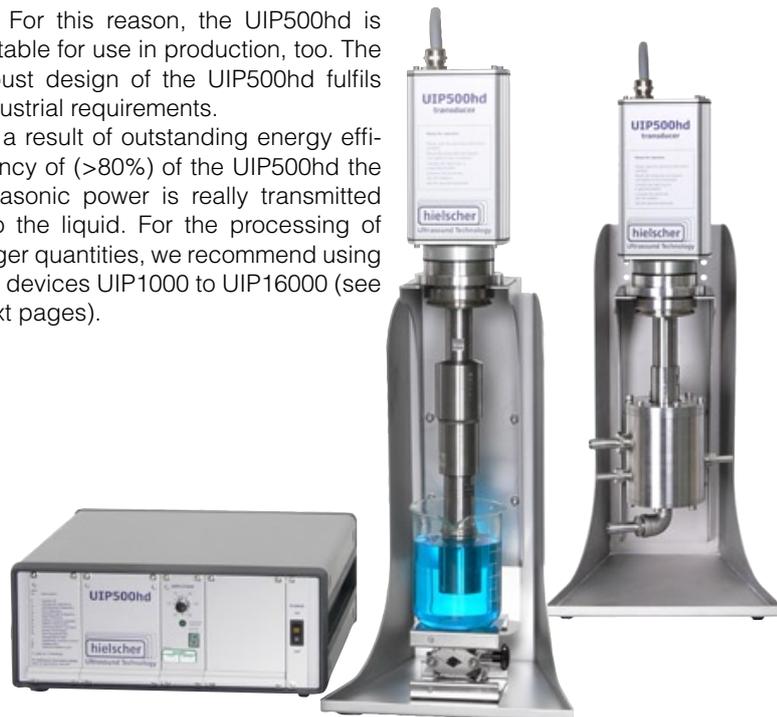
UIP500hd processing in small scale

The ultrasonic processor UIP500hd (500 watts, 20kHz) is an industrial grade device that is being used mainly for process development and for the bench-top scale processing of liquids. When applied to liquids, low frequency, high power ultrasound generates intense cavitation. The cavitation effects can be used for various processes, such as: emulsifying, dispersing, homogenizing, cell disintegration and extraction as well as for the degassing of liquids.

The UIP500hd can be used with a lot of accessories, such as various sonotrodes, booster horns, and flow cells. For the processing of batches larger than 5 liters, we generally recommend to sonicate using a flow cell reactor (flow mode) to achieve a higher processing consistency. The UIP500hd allows for the processing of approx. 0.25 to 2.0 liters per minute. Like all devices made by Hielscher, the UIP500hd can be operated continuously (24h/7d) under load as well as in

air. For this reason, the UIP500hd is suitable for use in production, too. The robust design of the UIP500hd fulfills industrial requirements.

As a result of outstanding energy efficiency of (>80%) of the UIP500hd the ultrasonic power is really transmitted into the liquid. For the processing of larger quantities, we recommend using the devices UIP1000 to UIP16000 (see next pages).



UIP500hd at stand for batch sonication (left) or with flow cell reactor (right)

UIP1000hd versatile and powerful ultrasonic device



UIP1000hd with accessories

The UIP1000hd (1,000 watts, 20kHz) is a powerful and adaptable ultrasonic device for lab testing and industrial processing of liquids. Its is used for applications, such as emulsifying, dispersing & particle fine milling, extraction & lysis or homogenizing.

The UIP1000hd is the powerful link between laboratory testing and the industrial processing of liquids. It combines the flexibility and easy handling required in the research and development with an outstanding performance in heavy-duty operation. For this reason, this single device is used for lab scale feasibility testing, process optimization, and process demonstration for ultrasonic liquid processes.

The flexibility of the UIP1000hd results from an extensive list of various accessories, such as sonotrodes, boosters and flow cells. In combination with a sonotrode and the stand, you can sonicate sample beakers to test various liquid formulations for their response to sonication. For the processing of batches larger than 5 liters, we generally recommend to use a flow cell reactor in order to obtain a better processing quality. When used with a flow cell you can run larger samples in recirculation to establish the correlation between parameters, such as amplitude, pressure and liquid composition, and the process results and efficiency. The pictures to the right show alternative setups for the processing of liquids using a flow cell. For most applications, the UIP1000hd can process approx. 0.5 to 4.0 liters per minute. As the UIP1000hd is full industrial grade, it can be operated continuously (24h/7d). Hence, a UIP1000hd can process approx. 1 to 5m³ per day.

Using only one device for lab testing, bench-top optimization and process demonstration saves time and is more cost effective. In addition to that, this single unit covers the widest range of possible ultrasonic configurations, e.g. in terms of amplitude and pressure. The standard accessories allow for:

- sonotrode amplitudes of up to 170 micron
- liquid pressures of up to 10 bars
- liquid flow rates of up to 10L/min (depending on the process)
- liquid temperatures of up to 80°C (other temperatures on request)
- material viscosity of up to 100,000cP

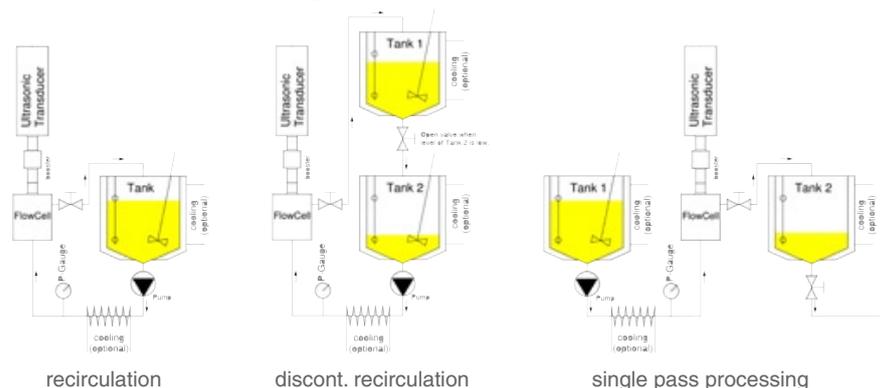
The input of ultrasonic power at such parameter configurations creates intense cavitation effects. It is its versatility, why the same UIP1000hd can be used in the process development for: Nanomaterials, paint & ink, coatings, food & beverage, cosmetics as well as chemical and biological processes. The adaptability benefits in particular interdisciplinary R&D. Hence, much research done in universities in the field of ultrasonics is conducted with this versatile ultrasonic device. Another reason is the exact reproducibility and linear scalability of the obtained results. After testing various setups, the configuration found to be best can be used to run larger quantities under production conditions. The UIP1000hd does not only give you full control of all sonication parameters; the PC-Control (optional software interface) also facilitates the recording of the individual trials. The UIP1000hd is designed and built for commercial production. It proves its solid, durable design in more than thousand commercial installations worldwide where it is being used in

everyday production. This ultrasonic processor requires little maintenance, is easy to setup and simple to clean and to sanitize. All items are available in food-grade or pharma-grade, too. The transducer of the UIP1000hd is IP65 grade, so that it can be installed in demanding environments (dirt, dust, moisture, outside operation etc.), while the generator can be placed remotely in another area.



UIP1000hd and sonotrode with flange

A very high efficiency in the conversion of electrical energy into mechanical oscillations of the sonotrode makes a closed transducer case without louvers possible. As the energy loss, which would cause a heat-up of the transducer is kept very low, no forced cooling, such as compressed air or water is needed. This means, that more energy is transmitted into the liquid, resulting in a better sonication. The overall energy efficiency of the UIP1000hd is approx. 80-90% from the power plug into the liquid. You are welcome to put it to a test!



UIP2000 proven high-efficiency



UIP2000 with flow cell/sound protection

Despite the enormous power of the ultrasonic processor UIP2000 (2000 watts, 20kHz), the device does not need any additional cooling by water or compressed air. The device works continuously in air. The robust design of the transducer, made of stainless steel and titanium, enables use under extreme conditions of dust, dirt, higher temperatures and humidity. The transducer and in special cases also the generator can be designed as ex-proof versions. According to the



UIP2000 and sonotrode with flange

operating needs the generator is located in a housing or in a cabinet and is equipped with control displays as well as with electrical interfaces.

Important applications for the UIP2000 are the intensive cleaning of continuous material such as wires, tapes and profiles, of single components or bigger bores. Sonotrodes are chosen to match to the application.

The treatment of sewage sludge for a better gas yield, the production of very fine emulsions and suspensions, the extracting and homogenizing as well as the reducing of germs are applications with this device in large scale. Corresponding sonotrodes e.g. the cascade sonotrode provide the required intensity of ultrasonic treatment of the liquid. Corresponding flow cells are offered for continuous operation. Sound protection casings complete the ultrasonic system based on UIP2000.

UIP4000 industrial power in compact design

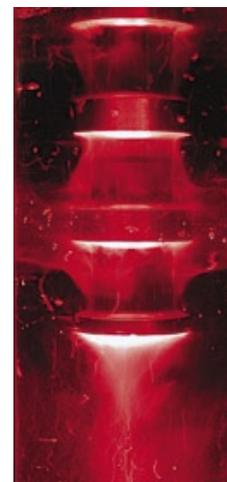


UIP4000 with flow cell/sound protection

The UIP4000 (4,000 watts, 20kHz) is used mainly for the industrial processing of liquids such as homogenizing, dispersing, disintegrating or deagglomerating.

The new modular concept of the UIP4000 provides you with a powerful and yet very space-saving system. This self-contained design reduces the work required for installation, operation and maintenance to a minimum level. Furthermore, multiple UIP4000 modules can be easily combined to form more powerful clusters. The flow cell as well as the ultrasonic transducer are located in a double-walled stainless steel cabinet that comes with a very effective sound insulation. In addition to that, it protects the ultrasonic unit against external forces such as dust, heat, or aggressive gases.

If required, the UIP4000 can be used for the sonication of liquids in custom-specific reactors.



cavitation at cascade sonotrode

UIP10000 and UIP16000 giants for challenging tasks

The UIP10000 and UIP16000 are the by far most powerful ultrasonic processor world-wide providing a continuous power of 10 and 16 kilowatts at an efficiency of more than 80%.

The development of such powerful systems stems from the demand for the ultrasonic treatment of liquids in larger scale. Whether emulsifying oil in water, disintegrating sewage sludge, deagglomerating nanoparticles or reducing germs, the needed ultrasound power usually raises proportionally to the liquid, which is to be treated in a certain time.

It is more cost-effective to compose a large ultrasonic system for example a system of 80kW with a flow rate of ten cubic metres per hour of 5 ultrasonic processors with a power of 16kW each than with 40 ultrasonic processors with a power of 2kW each.

The robust design of the transducer allows the use under heavy duty industrial conditions. The processor can

also be delivered as explosion proof design. The generator as the transducer and the flow cell are housed in two connected compact stainless steel cabinets. This makes the UIP10000 as well as the UIP16000 a self contained, robust and easy to install equipment. The standard footprint of such a 10 or 16kW unit is just 600mm x 1200mm.

If required, the generator cabinet can be located remotely in a max. distance of 10m from the transducer with the flow cell.

The system includes an independent cooling system that completely avoids the contact between aggressive air or dust in the production site and the electric components of the ultrasonic processor. The operation of the ultrasonic processor can be controlled and monitored by means of power meters and status displays as well as remotely via electric interfaces.



ultrasonic flow systems unlimited potential

The ultrasonic effect in liquids is based mainly on the phenomenon cavitation. A huge amount of small vacuum bubbles are created, that implode immediately after they arose, which act upon the surrounding droplets or particles by means of shock waves and liquid jets. This kind of ultrasonic treatment can be realized in batch or in flow. In the end it is important, that a homogeneous sonication of the liquid is guaranteed. The very high power of the ultrasonic processors allows for amplitudes of 100 micron and therewith a high energy density even for large volume streams. The ultrasound can be transmitted in closed vessels by means of an oscillating-free flange, which is fixed at the sonotrode, and also under higher temperatures or pressures. Flow systems have been proven to be the right technique for the sonication of liquid volumes in large-scale. Such a flow system consists of modular components i.e. of the necessary number of ultrasonic processors,

tube-shaped flow cells and cascade-shaped sonotrodes with oscillating-free flanges. The cabinets for the generator and the sound protection casings for the flow cells are supplied customized according to the respective operating conditions.

Please ask for more information.



48kW flow system (24 x UIP2000)



10kW ultrasonic flow system/sound protection (5 x UIP2000)

UIS250I / UIS250L

sieving in laboratories and production



UIS250I at sieve frame

Besides the classical low frequency vibrators, the use of ultrasonics has proven particularly efficient for the sieving. This technique accelerates the process or, in cases of difficult material, renders it possible at all.

The ultrasonic processor UIS250L (250 watts, 24 kHz) is suited for laboratory sieves. The industrial version excites industrial sieves of up to 0.4m².

Hielscher Ultrasonics has developed the world-wide unique ring sonotrodes for the excitation of laboratory devices, with which the adjoining sieves and by means of the clamping device even more sieves are excited horizontally. If the material is particularly difficult to sieve there is the possibility of an additional sieving pump with which vertical movements are created. The ring sonotrode and the clamp are adjusted to the commercial diameters of laboratory sieves as for example the diameter of 200mm. Similar to the construction of the laboratory sieving

tower, the transducer is also installed outside the industrial sieves. Therewith a contact between the material to be sieved and the transducer is avoided, which is an advantage, in particular decisive regarding thermosensitive powder. The transducer can also be supplied as ex-proof version.

Please ask for our detailed sieving information for laboratories or industries.



UIS250L at lab sieve tower

UIC100 to UIC1000

ultrasonic cutting



UIC1000LB with long blade (800mm)



ultrasonic cutting system (8 blades)

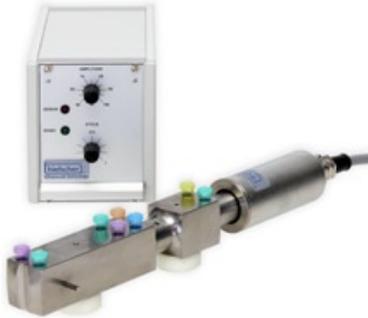
The ultrasonic processors UIC100, UIC400, UIC500 and UIC1000 with a power of 100, 400, 500 or 1000 watts, respectively, are designed especially for cutting tasks. This cutting method is nowadays a proven technique, in particular for cutting plastic sheets, textiles, cardboards, rubber, plastics and food. In general ultrasonic cutting means the excitation of a cutting tool or of the counter-bearing. The main advantage is the significant better cutting quality. Lower feed force permit higher cutting speed. Sludge cakings at the blades are removed by the ultrasonic oscillations. The lower wear of the tools and the resulting longer durability have a cost-saving effect.

Exchangeable blades, which are selected to the cutting criteria of the respective application case such as the material, shape and length, are used as tools. The ultrasonic processors can also be constructed for the use in the food industry.



UIC400 with short blade

our product and application spectrum



sonication of closed vials



ultrasonic laboratory processors



ultrasonic industry processors



ultrasonic sieving in the laboratory



industrial ultrasonic sieving



cutting and welding



ultrasonic dispersing systems



wire-, tape- and profile cleaning



intensive cleaning

Please visit our website at www.hielscher.com, ask for the respective information or contact us. We will be pleased to advise you.



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