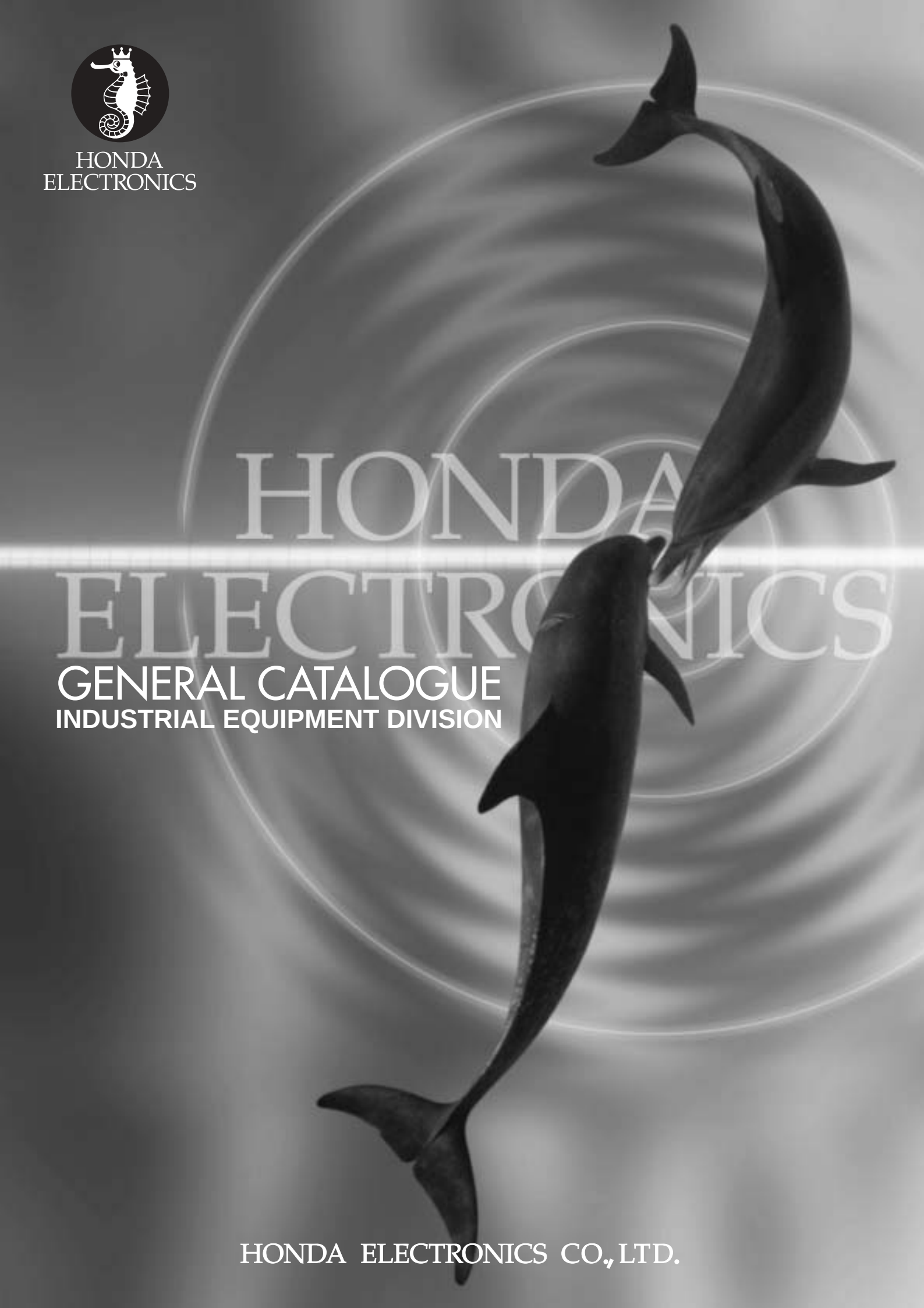
HONDA
ELECTRONICS



GENERAL CATALOGUE

INDUSTRIAL EQUIPMENT DIVISION

HONDA ELECTRONICS CO., LTD.

Expanding Ultrasonic Technology for the Future

Honda Electronics is the only one company in the world to manufacture wide range of ultrasonic products from development of piezo electric ceramics through product development and manufacturing.

What is ultrasonic wave ?

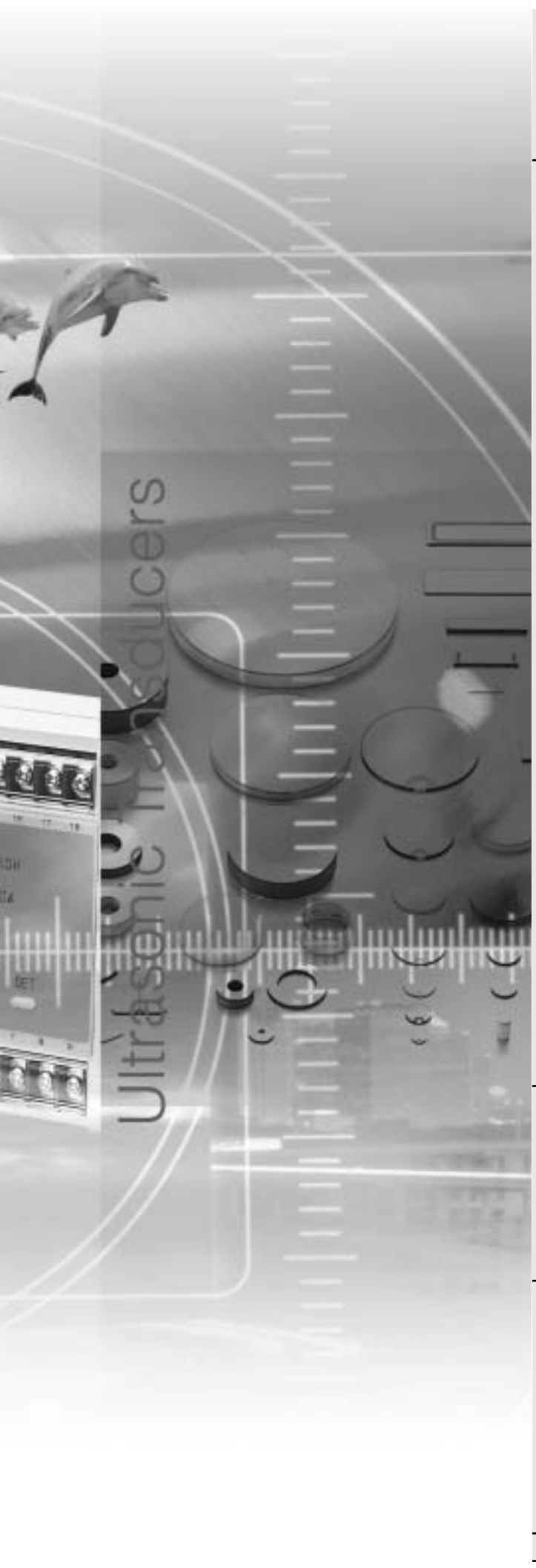
We are able to hear sound level around 20Hz through 20kHz and living to do every day life as well as listening music in this field. There are a lot of sound ranges. We are living in narrow frequency sound range that is small part of acoustic world. Animals are also living and using skillful in much wide range of this sound circumstance than human. It is well known that dolphins and whales communicate each other in same comrade.

According to one account, dolphin has a high performance sonar. It is said that dolphin would be watching wide information using ultrasonic signal in the water more than we can see with eye sight.

Ultrasonic application is roughly classified positive utilize of sound vibration energy as dynamic application and utilize of sound transference as informative application.

Dynamic application is used for ultrasonic cleaner, welder, humidifier and e.t.c. Echo sounder, diagnostic scanner, microscope and other products are used as signal. Those information of ultrasonic technology is very remarkable and it is widely used in our life more closely and in the various fields.

There are still unknown part in ultrasonic application and a lot of technical possibilities. This ultrasonic application has very wide fields. According to rapid electronics evolution, this future development is desired for one of key technology to construct high-tech system.



Products Line-up

	LCD, semiconductors	Precision machinery	Mechanical parts, industrial products	Research & development	Foods, chemicals	Facilities	General applications			
Ultrasonic cleaning	●	●			●			Component type	W-338	03
	●	●			●				W-115 / 118	04
		●	●						WS Series	05
		●	●						WD Series	05
				●			●	Bench-top type	W-15ST	06
				●			●		W-170ST	06
				●					W-200 Series	07
				●			●		W-103T	07
			●				●	Cleaning liquid	HC-2000	07
		●	●	●			●	Bench-top type	W-113	08
		●	●	●					W-113MK Ⅱ	08
		●		●	●				W-113P	08
		●	●				●		WT-600-40 / WT-1200-40	09
	●	●	●	●	●	●	●	Portable ultrasonic sound pressure meter	HUS-5 / HUS-7	09
	●							Running water type cleaner	W-357LS-580	11
	●								W-357LS-380	11
	●								W-357LS-160	11
	●								W-357LS-80	11
	●	●							W-357P-25	12
	●	●							W-357P-20	12
	●	●							W-357P-25CG	12
	●	●							W-357P-25AHPF	12
	●	●							W-357P-50	12
	●	●							W-357P-25 With an output monitor	12
	●	●							W-357-3MP	13
	●	●							W-357-1.5MP	13
	●	●	●		●			High frequency	W-100HFMK Ⅱ / 200HFMK Ⅱ	14
	●								W-357HP	14
	●							Upper radiation type	W-357-LH	14
			●					Modular aqueous cleaning system	HU-5100	15
					●			Ultrasonic cleaner for medical tools	HC-8100	15
			●	●				Vacuum ultrasonic cleaning machine	HC-4100	15
			●					Hydrocarbon ultrasonic cleaning system	HC-9100	15
High power ultrasonic tools			●	●	●	●		Plastic welder	SONAC-150	17
					●		●		SONAC-35 / 55	18
			●	●			●	Miniature ultrasonic cutter	USW-333	18
			●	●			●		USW-335	18
			●		●		●	Immersible ultrasonic atomizer	HM-303N	19
					●	●		Ultrasonic atomizing deodorizer	HM-300	19
	●			●	●	●		Ultrasonic atomizing unit	HM-2412 / HM-1630	19
Ultrasonic measurement	●				●	●		Airborne ultrasonic level meter	HD500-C / HD500-D	21
					●	●			HD700-A / HD700-B	21
					●	●			HD801 / HD802	22
						●		Ultrasonic depth sounder	HFD700	22
						●		Interface level meter	HL2000	23
	●				●			Flowmeter	USF100A	23
	●	●		●				Ultrasonic flaw detecting and imaging system	HA-701W / HA-701	24
	●	●		●					HA-501	24
	●	●		●				Ultrasonic microscope	AMS-7000 / AMS-5000	25
									Ultrasonic transducer	26

Precision cleaning technology supports the manuf acture of high-tech products.

Ultrasonic Cleaners

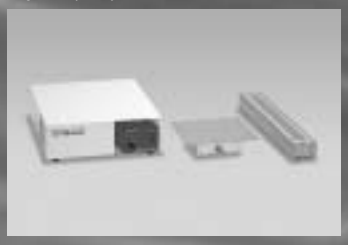
Ultrasonic Cleaner W-338

Bench-top type ultrasonic cleaner W-170ST

Water f low type high-f requency ultrasonic cleaner W-357LS-580

Portab le ultrasonic sound pressure meter HUS-7

High-f requency ultrasonic cleaner W-100/ 200HFMK2



High-f requency ultrasonic cleaner W-357HP

Modular cleaning system HU-5100 Series

Cleaning

Accelerating

Degassing

Principle of ultrasonic cleaning

●**Cavitation: Generation of vacuum bubbles that burst on the work surface**

An ultrasonic cleaner continuously generates acoustic pressure that alternates between positive and negative levels in the cleaning liquid. After being compressed by the positive pressure, the liquid expands violently under the negative pressure. The expansion creates numerous near-vacuum bubbles in the liquid — a phenomenon called cavitation. In the next phase of positive pressure, the bubbles burst and disappear. The energy of cavitation breaks the dirt off the material being cleaned.

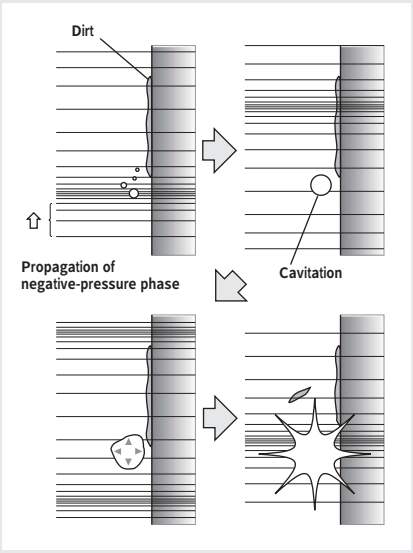
●High-speed vib ration of liquid molecules

The ultrasonic vibration propagating through the liquid causes high acceleration of the liquid molecules. The energy of the vibrating molecules is imparted to the grime clinging to the material, thereby removing it.

●Ultrasonic waves can reach all inaccessib le areas.

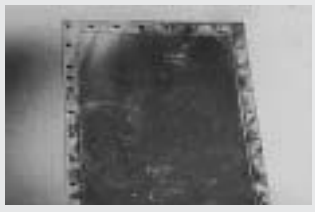
Ultrasonic waves can get around obstacles and reach into every tiny recess, thereby achieving a perfect cleaning effect. Thus, hard-to-handle mechanical components such as precision gear and delicate, complicated electronic components can be cleaned without sustaining damage.

●**Cleaning process (cavitation)**



Comparison of erosion by ultrasonic cleaning

Single-f requency operation (28 kHz)



BAKUSEN operation

The unif ormly powerf ull Dyna Shock system achieves precision cleaning. Suited f or precision cleaning of ex tremely intricate conf igurations and the inside of f ine tub es.

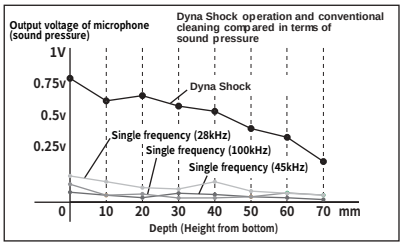
W- 338 BAKUSEN

Patented

How the Dyna Shock (BAKUSEN) system work s

The ultrasonic waves used in cleaning systems have different effects depending on their frequency. And, when cleaning with single-frequency oscillation, the sound field has fixed positions of higher and lower vibration energy. This uneven energy distribution is caused by standing waves. When the frequency changes, these positions also change.

In the Dyna Shock operation, ultrasonic oscillation is rapidly switched between three different frequencies (28 kHz, 45 kHz and 100kHz) in order to utilize the different effects of these waves. At the same time, the standing waves are caused to move, thereby shifting the positions of high vibration energy, resulting in a uniform cleaning effect. This powerful cleaning effect is achieved with absolute minimal damage to the work, and less erosion for longer service life of the cleaning tank.

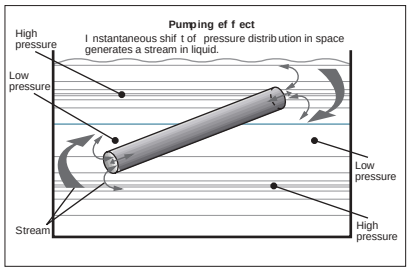


Bub b le b ursting & b ub b le dispersing ef f ects

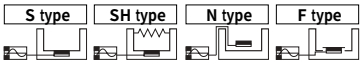
Ultrasonic waves of 100 kHz have the effects of removing large bubbles and dispersing the small bubbles which trigger cavitation over the entire space of the tank. These effects mitigate the damping of ultrasonic waves and maintain the cleaning effect at positions near the surface of the cleaning liquid.

Pumping ef f ect

When standing waves move, a stream is generated in the liquid. This is repeated rapidly to generate a pulsating flow like that generated by a pump, making it possible to clean the inside of syringe needles and the through holes of printed circuit boards, both of which have posed considerable cleaning difficulties in the past.



The ultrasonic waves generated in Dyna Shock operation take the form of burst waves due to high-speed switching of frequencies. This results in vibrations with numerous harmonics that reach and clean every corner of complicated configurations and dead end areas.



	Ultrasonic generator
Model code	W-338T
Max. power cutput	600W(adjustable)
Oscilation frequency	28, 45, 100kHz
Power supply	200VAC/1200VA
Power cable	3.5m
Timer	Total cleaning time: From 1 sec. to 60 min, or continuous
Overall size (mm)	300×400×265 (W) (D) (H)
Weight	15.4kg
External control cable	3.0m

	Cleaning tank S type	Cleaning tank SH type
Model code	W-338S	W-338SH
Heater		2kW
Max. power input	600W	
Transducer	Special bolt clamped Langevin transducer	
Max. liquid temperature	100 ℃	
Tank inner dimensions (mm)	370×250×250 (23 liters) (W) (D) (H)	
Overall size (mm)	440×320×380 (W) (D) (H)	585×320×380 (W) (D) (H)
Weight	21.6kg	24.0kg
Transducer cable	3.5m	

	Immersible transducer N type	Immersible transducer F type
Model code	W-338N	W-338F
Max. power input	600W	
Transducer	Special bolt clamped Langevin transducer	
Max. liquid temperature	80 ℃	100 ℃
Cabinet material	SUS304	
Overall size (mm)	330×200×130 (W) (D) (H)	305×255 (W) (D)
Weight	7.3kg	7.0kg
Transducer cable	3.5m output cable	1m+3.5m outoput cable

※Optional cleaning basket available.

Cleaning operation tailored to the work condition with programmed multiple oscillation at three frequencies gives the best cleaning performance for stubborn grime and delicate work.

W-115 / W-118 SANPA

Patented

Effects of multiple oscillation (SANPA)

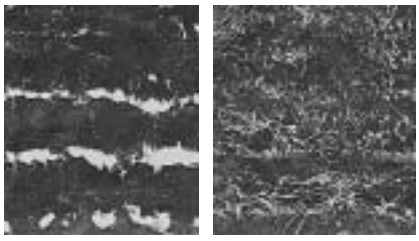
The system uses three frequencies with different effects (28 kHz for removing stubborn contaminants, 45 kHz for reaching narrow recesses, and 100 kHz for delicate cleaning with minimum damage). Switching the ultrasonic oscillation among these frequencies eliminates the uneven cleaning pattern due to standing waves and minimizes damage (erosion) to the work as well as to the cleaning tank (erosion).

Duration of vibration at each of the three frequencies can be set independently to match the state of contamination, type of work, and required level of cleaning precision. Single-frequency cleaning can also be selected at any of the three frequencies: 28 kHz, 45 kHz and 100 kHz. Thus, cleaning operations can be controlled for the best efficiency with minimum damage.

Ability to oscillate at three frequencies with a single transducer is advantageous when repeating experiments or tests under the same conditions.

Cleaning operation can be programmed simply. The program is stored in memory after the machine is shut down, for repeated use.

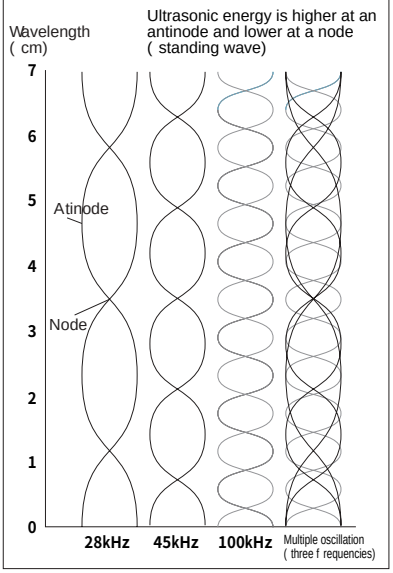
Standing waves transferred onto aluminum foils



Single-frequency oscillation at 28kHz

SANPA

Schematic of 3-frequency vibration



S type | SH type | N type | F type

	Ultrasonic generator	
Model code	W-115T	W-118T
Max. power output	300W(adjustable)	600W(adjustable)
Oscillation frequency	28, 45, 100kHz	
Overall size (mm)	300×430×140 (W) (D) (H)	
Timer	Total cleaning time: From 1 to 60 min., or continuous *Preset duration of each frequency for multiple oscillation: From 1 to 99 sec. (Independently set for each frequency)	
Operation mode	Single-frequency operation or multiple frequency operation	
External control cable	3m	
Power supply	100VAC/6A∗	200VAC/6A
Weight	6.5kg	8.5kg
Power cable	3.5m	

	Cleaning tank			
Model code	W-115S	W-115SH	W-118S	W-118SH
Heater		1kW		2kW
Max. power input	300W		600W	
Tank inner dimensions (mm)	300×200×250 (15L) (W) (D) (H)		370×250×250 (23L) (W) (D) (H)	
Overall size (mm)	352×252×380 (W) (D) (H)		422×302×380 (W) (D) (H)	
	510×260×380 (W) (D) (H)		580×310×380 (W) (D) (H)	
Max. liquid temperature	100 ℃			
Transducer	Special bolt clamped Langevin transducer			
Weight	13.4kg	18.5kg	18.2kg	24.0kg
Transducer cable	3.5m			

	Immersible transducer N type		Vibrator-plate type transducer F type	
Model code	W-115N	W-118N	W-115F	W-118F
Max. power input	300W	600W	300W	600W
Overall size (mm)	220×200×130 (W) (D) (H)	330×200×130 (W) (D) (H)	255×255 (W) (D)	305×255 (W) (D)
Max. liquid temperature	80 ℃		100 ℃	
Transducer	Bolt clamped Langevin transducer			
Cabinet material	SUS304			
Weight	5.0kg	7.3kg	4.5kg	7.0kg
Transducer cable	2.5m (braided portion: 2m) + 3.5m output cable		1m + 3.5m output cable	

∗W-115T also available with a 200 VAC/3 A power input specifications. ※Optional cleaning basket available.

Equipped with advanced functions to achieve stable cleaning performance.
WS Series

- Auto-tracking of oscillation frequency and set output power maintains stable cleaning effect.
- The adoption of an abnormal operation detection circuit stops oscillation automatically when an abnormal operation occurs. (The abnormal state can be output and monitored externally.)
- Special vibrator plate sizes will also be available upon customer request.

Ultrasonic generator

Model code	WS-600-28T	WS-600-40T	WS-1200-28T	WS-1200-40T
Max. power output	600W (adjustable)		1200W (adjustable)	
Oscillation frequency	28kHz	40kHz	28kHz	40kHz
Power supply	100V, 200V, 225V or 240V selectable (fixed at factory shipping)		200V, 225V or 240V selectable (fixed at factory shipping)	
Power consumption	1200VA		2400VA	
Overall size (mm)	300 (W) × 345 (D) × 110 (H)		360 (W) × 400 (D) × 110 (H)	
Weight	Approx. 10kg		Approx. 12kg	
Output indication	LED bar level indicator			
Power cable	3.5m			

Immersible transducer (N type)

Model code	WS-600-28N	WS-600-40N	WS-1200-28N	WS-1200-40N
Max. power input	600W		1200W	
Oscillation frequency	28kHz	40kHz	28kHz	40kHz
Transducer	Bolt clamped Langevin transducer			
Max. liquid temperature	80°C			
Cabinet material	SUS304 (SUS316L available by customized order)			
Overall size (mm)	350×200×100 (W) (D) (H)	350×200×75 (W) (D) (H)	420×300×100 (W) (D) (H)	420×300×75 (W) (D) (H)
Weight	Approx. 14kg	Approx. 10.5kg	Approx. 18kg	Approx. 14kg
Transducer cable	2.5m (braided portion: 2m) + 3.5m output cable			

Vibrator-plate type transducer (F type)

Model code	WS-600-28F	WS-600-40F	WS-1200-28F	WS-1200-40F
Max. power input	600W		1200W	
Oscillation frequency	28kHz	40kHz	28kHz	40kHz
Transducer	Bolt clamped Langevin transducer			
Max. liquid temperature	100°C			
Plate material	SUS304 (SUS316L, Hastelloy available by customized order)			
Overall size (mm)	390×240×2^t		460×340×2^t	
Weight	Approx. 10kg	Approx. 8kg	Approx. 16kg	Approx. 12.5kg
Transducer cable	1m + 3.5m output cable			
Packing material	EPTM t=3mm			

* Cleaning basket is optionally available.

Reduces uneven cleaning with two-frequency oscillation.
WD Series (Soon to be released)

Patent pending

- This series is capable of higher sound pressure compared to mono-frequency ultrasonic cleaners, which greatly improves the cleaning efficiency.
- The pumping effect enables cleaning of the inside of thin tubes and through-holes in the printed circuit board, which was impossible with mono-frequency type cleaners.

Ultrasonic generator

Model code	WD-600-28T	WD-600-40T	WD-1200-28T	WD-1200-40T
Max. power output	600W (adjustable)		1200W (adjustable)	
Oscillation frequency	28kHz (switching adjacent two frequencies)	40kHz (switching adjacent two frequencies)	28kHz (switching adjacent two frequencies)	40kHz (switching adjacent two frequencies)
Power supply	100V, 200V, 225V or 240V selectable (fixed at factory shipping)		200V, 225V or 240V selectable (fixed at factory shipping)	
Power consumption	1200VA		2400VA	
Overall size (mm)	300 (W) × 400 (D) × 110 (H)		360 (W) × 400 (D) × 110 (H)	
Weight	Approx. 10kg		Approx. 12kg	
Output indication	LED bar level indicator			
Power cable	3.5m			

An identical type of transducer is used for the WS and WD series.

Immersible transducer

Vibrator-plate type transducer

Standard cleaning tank

Standard cleaning tank (with a heater)

Standard cleaning tank type (S type)

Model code	WS-600-28S	WS-600-40S	WS-1200-28S	WS-1200-40S
Max. power input	600W		1200W	
Oscillation frequency	28kHz	40kHz	28kHz	40kHz
Transducer	Bolt clamped Langevin transducer			
Max. liquid temperature	100°C			
Tank material	SUS304 (SUS316L available by customized order)			
Tank inner dimensions	370 (W) × 250 (D) × 250 (H)		500 (W) × 300 (D) × 250 (H)	
Overall size (mm)	420 (W) × 300 (D) × 380 (H)		550 (W) × 350 (D) × 380 (H)	
Weight	Approx. 22kg	Approx. 19kg	Approx. 39kg	Approx. 34kg
Transducer cable	3.5m			

Standard cleaning tank (with a heater) type (SH type)

Model code	WS-600-28SH	WS-600-40SH	WS-1200-28SH	WS-1200-40SH
Heater	2kW		3kW	
Max. power input	600W		1200W	
Oscillation frequency	28kHz	40kHz	28kHz	40kHz
Transducer	Bolt clamped Langevin transducer			
Max. liquid temperature	100°C			
Plate material	SUS304 (SUS316L available by customized order)			
Tank inner dimensions	370 (W) × 250 (D) × 250 (H)		500 (W) × 300 (D) × 250 (H)	
Overall size (mm)	580 (W) × 310 (D) × 380 (H)		710 (W) × 360 (D) × 380 (H)	
Weight	Approx. 28kg	Approx. 25kg	Approx. 46kg	Approx. 40kg
Transducer cable	3.5m			

This vertical space-saving type enables quiet operation exhibiting visible cleaning effect.

Ultrasonic Eyeglass Cleaner W-15ST (with an adapter)

- A compact space-saving design.
- The transparent cleaning tank makes cleaning performance visible.
- The cleaning operation automatically stops after 3 minutes from switch ON to prevent excessive cleaning.
- The vertical oscillation generated by the bolt clamped Langevin transducer achieves high cleaning performance with small output power.
- A high-frequency oscillation produces small vibration, which makes quiet cleaning possible.
- The overheat prevention device automatically shut down the power when the cleaner temperature rises abnormally.
- Artificial teeth and other small articles can also be cleaned by using the attached cleaning adapter.

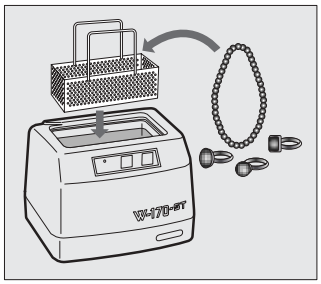
Model code	**W-15ST**
Power output	**15W**
Oscillation frequency	**67kHz**
Transducer	**Bolt clamped Langevin transducer**
Overall size (mm)	**92(W)×106(D)×230(H)**
Weight	**410g**
Power supply	**100VAC 21VA**
Accessory	**Cleaning adapter for artificial tooth/small articles**
Objects to be cleaned	**Metal/plastic frame eyeglasses, artificial tooth, jewelry, precious metals (except tortoiseshell, pearl, coral)**

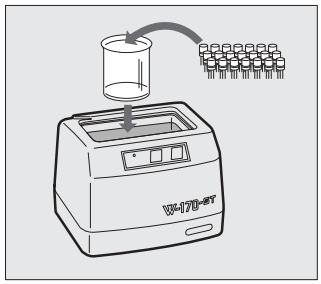
※**Glass cleaning liquid (500ml) is optionally available.**

A compact body and high-power cleaning

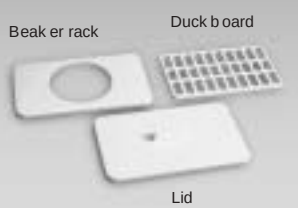
Bench-top type Ultrasonic Cleaner W-170ST

- A compact, lightweight space-saving design.
- Easy to use (5 or 10 minute operation time selectable)
- A variety of options such as beaker rack, duckboard, and cleaning basket widen the application range of this model.





Accessories



Options

Model code	**W-170ST**
Power output	**70W**
Oscillation frequency	**40kHz**
Transducer	**Bolt clamped Langevin transducer**
Overall size (mm)	**243(W)×192(D)×170(H)**
Tank inner dimensions (mm)	**170(W)×100(D)×81(H) (1.3L)**
Weight	**2kg**
Power supply	**100VAC 100VA**
Protective circuit	**Thermostat**
Tank material	**SUS304**
Body/lid material	**Polypropylene**
Tank packing material	**Neoprene rubber**

Wide lineup of fers the best choice for the size and configuration of the work.

W-200 Series

- You can find the best solution for the conditions of power output, work size and heater (to keep liquid warm).
- Splash-proof switches, drain cock and timer are provided on all models.
- A heater keeps the liquid temperature from 50 to 70℃

Power output	100W				200W				300W			
Model code	W-211	W-211H	W-212	W-212H	W-221	W-221H	W-222	W-222H	W-231	W-231H	W-232	W-232H
Heater		125W		150W		150W		250W		250W		600W
Tank inner dimensions (mm)	240×140×150 (W) (D) (H) (5L)		298×149×150 (W) (D) (H) (6.5L)				298×238×150 (W) (D) (H) (10.5L)				500×298×200 (W) (D) (H) (29.5L)	
Overall size (mm)	265×162×260 (W) (D) (H)		325×176×290 (W) (D) (H)				325×265×290 (W) (D) (H)				523×327×350 (W) (D) (H)	
Power consumption	1.4A	2.7A	1.4A	2.9A	4.0A	5.5A	4.0A	6.5A	6.0A	8.5A	6.0A	12.0A
Weight	4.5kg		5kg		6kg		7.5kg		8.5kg		12kg	
Transducer	40kHz bolt clamped Langevin transducer											
Power supply	100 VAC through 2-meter 3-wire cable with ground pin (2-pin converter provided), with recess-fitting plug											
Timer	From 0 to 30 min., or continuous											

Lid is provided. Cleaning basket and rack for 500 ml beakers are optional.

Operate-anywhere, compact construction.

W-103T

Patented

- Thanks to our patented cordless switching system, the cleaning tank is not connected with the transducer, and so can be easily detached to change the cleaning liquid.
- Use of beakers allows cleaning with various detergents. With a 500-ml-tall beaker, eyeglasses or the like can be cleaned.

Model code	W-103T
Max. power output	30W
Oscillation frequency	45kHz
Tank inner dimensions (mm)	φ98×52
Timer	From 30 sec. to 20 min.
Transducer	Bolt clamped Langevin transducer
Power supply	100VAC / 0.4A
Weight	1.5kg

Lid is provided. Beakers, cleaning basket and basket rack are optional.

Multi-purpose cleaning liquid for environmental protection

Cleaning Liquid HC-2000

■Physical and chemical characteristics

State : Liquid
Boiling point : 98℃
Solubility : Water-soluble
ph : 10.5 at 20℃
Color : Red
Density : 1.04g/cm³
Flammability : Non-flammable
Volatility : Non-volatile

- Composed of natural components, this cleaning liquid excels in permeability, decomposability, wettability, and absorbability compared with conventional synthetic detergents.
- Since this safe liquid causes no effect on any materials and painted surfaces, it can be used for multi-purpose ranging from industrial use to household use.
- Can be thinned by up to 50 times according to its applications. It can also be used repeatedly until the cleaning effect is completely lost. The multi-purpose cleaning liquid is much cost-effective.

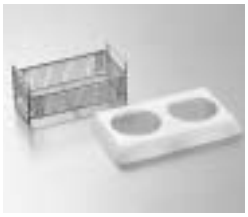
A desired f requency is selectab le f rom 28k Hz, 45k Hz or 100k Hz.

W- 113 SANPA

Patented

Model code	W-113
Oscillation frequency	28、45、100kHz
Power output	100W
Tank inner dimensions (mm)	240 (W) ×140 (D) ×100 (H) (3L)
Overall size (mm)	290 (W) ×208 (D) ×245 (H)
Drain port	Inner dia. 6 mm, outer dia. 12.5 mm
Timer	Total cleaning time: From 1 to 30 min. *Preset duration of each frequency for multiple oscillation: From 1 to 99 sec. (Independently set for each frequency)
Operation mode	Single-frequency operation or multiple frequency operation
Transducer	Special bolt clamped Langevin transducer
Material	Casing PP, tank SUS304
Power supply	100VAC 2A
Power cable	2 m with recess-fitting plug

Lid is provided. Cleaning basket and beaker rack are optional.



●Multiple oscillation eliminates the uneven cleaning patterns generated by standing waves.
●Duration of vibration at each of the three frequencies can be set independently. Single-frequency cleaning can also be selected at any of the three frequencies: 28 kHz, 45 kHz and 100 kHz. Thus, the best cleaning time for the object to be cleaned can be selected.
●Splash-proof membrane keypad allows trouble-free operation and easy selection of the cleaning mode and setting of the cleaning time.
●Cleaning operation can be programmed simply. The program is stored in memory after the machine is shut down, for repeated use.
●Power cable with a recess-fitting plug and a drain port make it easy to move the unit and change the liquid.

High-speed switching of two frequencies in the cleaning liquid eliminates uneven cleaning.

W- 113 MK-Ⅱ

Patented

●Operating in BAKUSEN mode causes instantaneous release of large energy and harmonics vibrations, thereby providing highly efficient cleaning.
●As the standing waves move, uneven cleaning pattern is eliminated, while minimizing damage to the piece being cleaned.
●Capable of cleaning the inside of fine tubes and the through holes of printed circuit boards that to now have been difficult to clean with a single-frequency ultrasonic cleaner.

Model code	W-113MK-Ⅱ
Oscillation f requency	24、31kHz
Max . power output	110W
Tank inner dimensions (mm)	240 (W) ×140 (D) ×100 (H) (3 liters)
Overall size (mm)	290 (W) ×208 (D) ×245 (H)
Power supply	100VAC 2A

Lid is provided. Cleaning basket and beaker rack are optional.

A resin polypropylene cleaning basket is employed.

W- 113- P

Patented

●The cleaning tank is made solely of polypropylene, which safely accommodates various detergents, acid or alkali.
●BAKUSEN operation at two frequencies achieves uniform cleaning.
●Used liquid can be easily discharged through a drain port.
●Compact construction means this cleaner takes up lottle bench-top space, making it handy for use in laboratories.

Model code	W-113-P
Oscillation f requency	28、45kHz
Max . power output	55W
Tank inner dimensions (mm)	240 (W) ×140 (D) ×100 (H) (3 liters)
Overall size (mm)	290 (W) ×208 (D) ×245 (H)
Power supply	100VAC 1A

The large bench-top type ultrasonic cleaner is much cost-effective.

WT-600-40 / WT-1200-40

Patented

Option

- These high-power (600W/1200W) models enable cleaning of large devices and mechanical parts.
- Photoelectric sensors and voice guidance used in the operation unit makes it unnecessary to touch switches with a wet or dirty hand.
- Automatic frequency tracking with the oscillation frequency and set power output allows stable cleaning. An alarm is indicated in the event of an abnormal oscillation.
- Provided with overflow drain mounting holes in addition to the waste drain cock, it can facilitate expansion to a circulation system.

Model code	WT-600-40	WT-1200-40
Max. power output	600W (adjustable)	1200W (adjustable)
Oscillation frequency	40kHz	
Transducer	Bolt clamped Langevin transducer	
Tank inner dimensions (mm)	400(W)×350(D)×300(H) (SUS304) 36L	600(W)×400(D)×300(H) (SUS304) 63L
Overall size (mm)	600(W)×410(D)×450(H) (except the handles and rubber feet)	800(W)×460(D)×450(H) (except the handles and rubber feet)
Weight	Approx. 40kg	Approx. 55kg
Power supply	AC100V 1200VA	AC200V 2400VA
Power cable	3.5m	
Max. liquid temperature	80°C	
Timer	Digital switching (10min, 20min, 30min or continuous)	
Operation switch	ON/OFF by the photoelectric sensor	
Drain	20A(3/4B) valve	25A(1B) valve

A must for cleaning quality control. Allows monitoring and control of the ultrasonic power output that might fluctuate under varying operating conditions.

HUS-5 / HUS-7 Portable Ultrasonic Sound Pressure Meter

- Replaces the conventional visual inspection of cleaning with automatic operation giving monitor data and alarm outputs.
- A powerful tool for use in adjustment, testing and quality control operations of cleaners of all manufacturers. Can be installed in existing cleaning lines or used in laboratories.
- HUS-5 can measure a wide range of sound pressures from 10 kHz (low frequency) to 5 MHz (high frequency).
- Sound pressure is measured by simply putting the tip of the probe into the liquid. A straight probe and L-shaped probe are available.
- HUS-5 can be connected to a recorder to record measured data, and sound an alarm when the ultrasonic power output drops, to identify problems.
- Liquid-contact portion of the probe is made of quartz glass, which can be used in most types of detergent.
- Applicable to any type of ultrasonic cleaner, including those employing immersible cleaning and running-water cleaning.

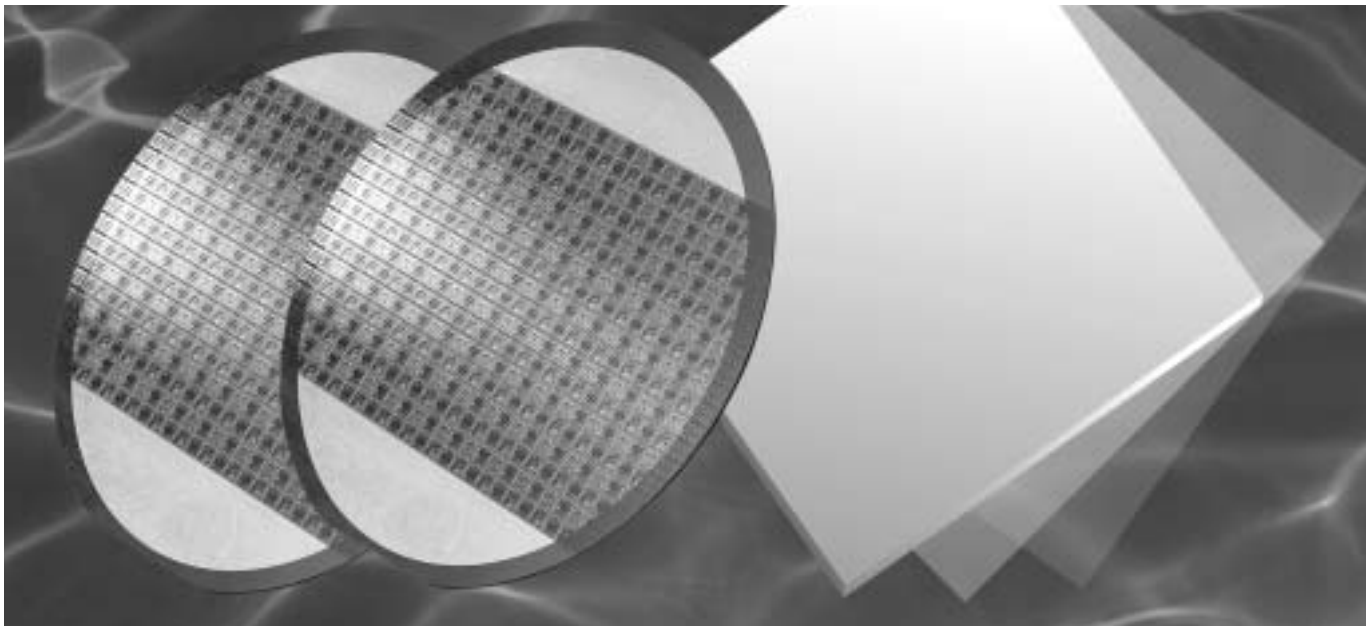
Main unit		
Model code	HUS-5	HUS-7
Frequency range	10kHz～5MHz	20kHz～2MHz
Power supply	100VAC Approx. 2 VA	
Signal input	One probe	Two probes
Measurement range	0～10mV, 0～50mV, 0～100mV, 0～500mV	223(W)×305(D)×129(H)
Overall size (mm)	143(W)×224(D)×87(H)	Alarm output
External output	Monitor, recorder and alarm outputs	1.8kg
Weight	1.3kg	% (Digital readout)
Measurement readout	AC VOLT rms	

Probe (also used for HUS-5 / HUS-7)		
Model code	HUS-5-SPS	HUS-5-SPL
Shape	Straight	L-shaped
Probe tip material	Quartz glass (SUS316L : option)	
Operating temperature	0～70°C	
Total length	340mm	340mm (L-shaped 80mm)
Cable length	1.5m	
Weight	65g	
Unmeasurable liquid	Heated strong alkali, hot phosphoric acid, hydrofluoric acid	

Ultra-precision cleaner based on running water excited by high-frequency ultrasound

Pulse Jet Running-water High-frequency Ultrasonic Cleaner W-357 Series

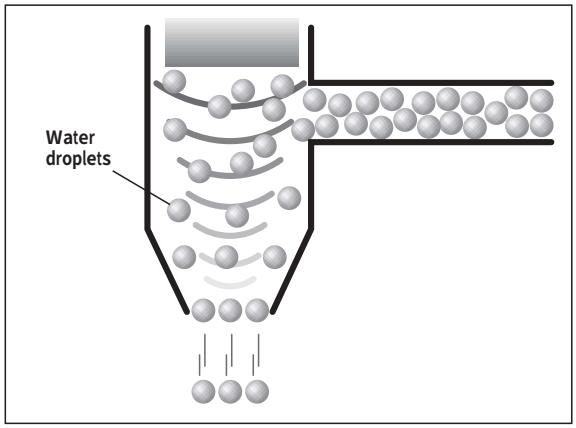
Patented



High-frequency ultrasound applied to running water produces accelerated water droplets that remove contaminant particles on the sub-micrometer order.

Best solution for cleaning after polishing of CMP, hard disks, silicon wafers, gallium arsenide substrate and master optical disks, cleaning after rubbing of glass substrate for liquid crystal, and cleaning before forming film and vapor depositions.

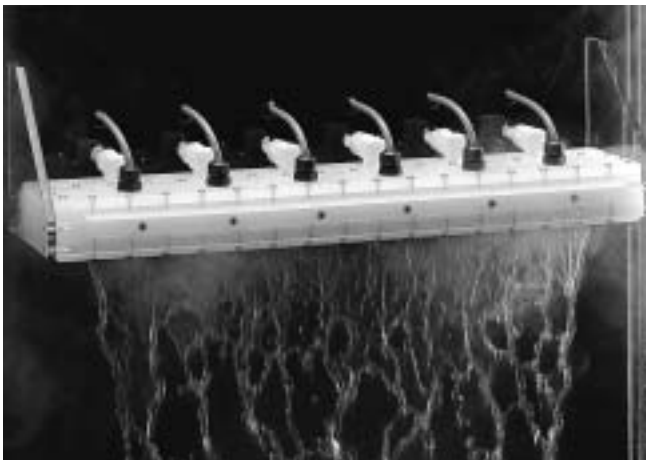
- ●Continuous supply of clean running water eliminates the possibility of recontamination by detached dirt.
- ●With the ability to process piece-by-piece, the cleaner can be readily integrated into an existing production line.
- ●High-frequency vibration removes microscopic contamination in an instant without damaging wafers.
- ●Power output can be controlled to safely clean brittle or delicate parts such as magnetic heads.
- ●Transducers of special specifications can be manufactured upon order.



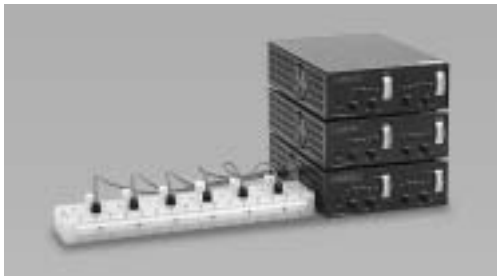
Model code		W-357LS-580	W-357LS-380	W-357LS-280	W-357LS-160	W-357LS-80
High-frequency power output		720W (adjustable)	480W (adjustable)	360W (adjustable)	240W (adjustable)	120W (adjustable)
Oscillation frequency		1MHz (with fine adjustment)				
Power supply		AC200V/3A×3	AC200V/3A×2	AC100V/3A×3	AC200V/3A	AC100V/3A
Liquid temperature range		20～40°C				
Effective cleaning width (mm)		580×2 (W) (D)	380×2 (W) (D)	280×2 (W) (D)	180×2 (W) (D)	80×2 (W) (D)
Water flowrate		45 liter / min	30 liter / min	20 liter / min	18 liter / min	8 liter/min
Dimensions (mm)	Generator	358×475×137×3 units (W) (D) (H)	358×475×137×2 units (W) (D) (H)	232×342×138×3 units (W) (D) (H)	358×475×137 (W) (D) (H)	232×342×138 (W) (D) (H)
	Horn	682×182×105 (W) (D) (H)	482×182×105 (W) (D) (H)	340×74×50 (W) (D) (H)	282×182×105 (W) (D) (H)	210×85×102 (W) (D) (H)
Weight	Generator	15kg×3台	15kg×2台	7kg×3台	15kg	7kg
	Horn	6kg	4.5kg	2.7kg	2.7kg	2kg
Water inlet		1/2 inch elbow Applicable tube size: Inner dia. 11 mm, outerdia. 13 mm				1/2 inch socket
Output cable		5m				
Power cable		5m with connector		2m (recess-fitting plug)	5m with connector	2m (recess-fitting plug)
Protection circuit		Dry operation prevention signal terminal, Dry operation prevention cable (5m)				Dry operation prevention flowrate sensor (Alarm circuit activates below 7 liters/min.)
Liquid-contact portion material		Polypropylene, tantalum, silicon rubber				SUS304, tantalum, silicon rubber

※Optional branching block available. ■Interconnection cable 5 m for external terminal, alarm output cable 5 m. ■Frequency fine-adjustable.

W-357LS-580



- Capable of covering precision glass for LCDs of up to 580 mm with a single unit. (Effective cleaning width 580 mm.)
- Near-zero generation of metallic ions from the horn made of PP.



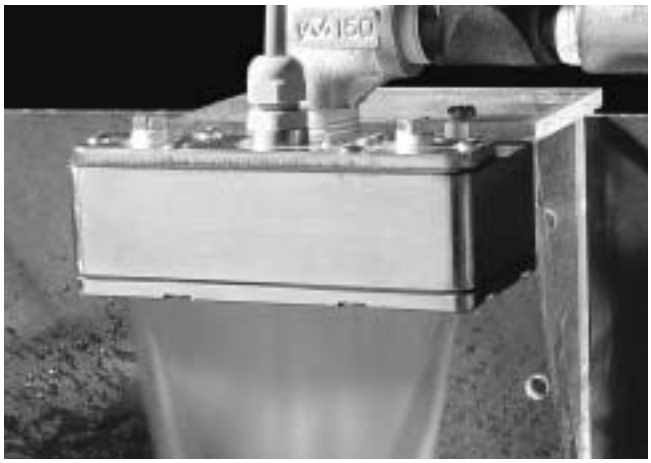
W-357LS-380

- Capable of covering precision glass for LCDs of up to 380 mm with a single unit. (Effective cleaning width 380 mm.)
- Near-zero generation of metallic ions from the horn made of PP.

W-357LS-160

- Capable of convering a 7" wafer with a single unit. (Effective cleaning width 180 mm.)
- Near-zero generation of metallic ions from the horn made of PP.

W-357LS-80



- Capable of cleaning small liquid crystal glasses. (Effective cleaning width 80 mm.)

W-357P-25
Plastic nozzle

- The 25-mm-diameter horn allows easy installation in an existing facility. The best solution for point-of-operation cleaning needs.
- The horn allows generation of virtually no metallic ions.
- Specifications in conformity with CE are available.

W-357P-20
Kow-f lowrate nozzle

- Compact construction (20 mm dia.) with low flowrate.
- Can be installed in a tight space.

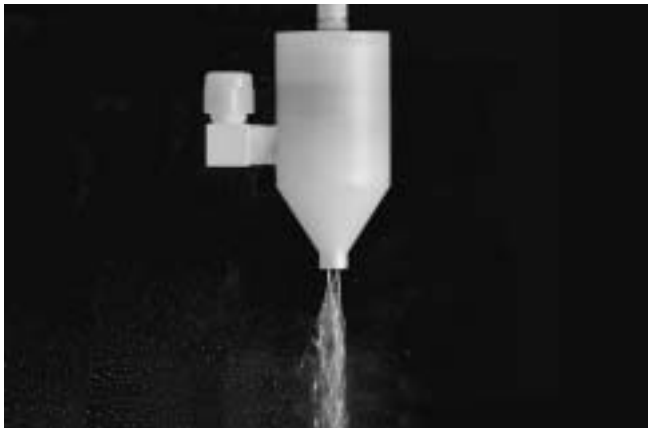
W-357P-25CG
Chemical-resistant nozzle

- With all parts exposed to liquid made of quartz, this nozzle can handle various chemicals.
- The horn does not allow generation of metallic ions.

W-357P-25AHPF
Hydrof luoric acid-resistant nozzle

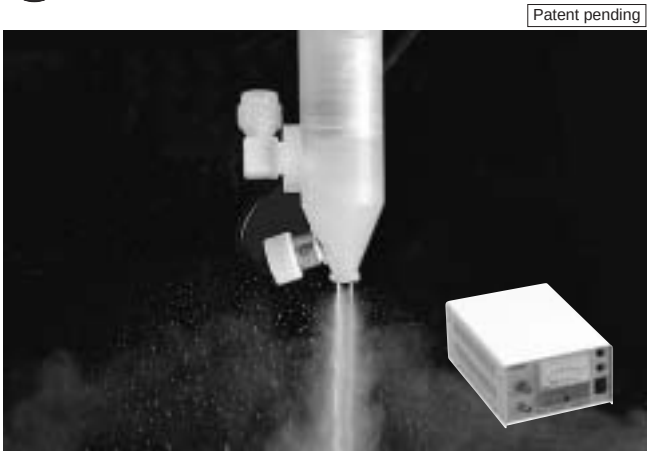
- Made of AHPF that stands up against hydrofluoric acid.
- The horn does not allow generation of metallic ions.

W-357P-50
Large-aperture nozzle f or 400 k Hz oscillation



- Provides an increased cleaning area and enhanced cleaning power with high-power (100W) low frequency (400 kHz) vibration.
- Near-zero generation of metallic ions from the horn made of PP.

W-357P-25 with Output Monitor
Patent pending



- Model W-357P-25 equipped with sensor from HUS-5.
- Provides the means to control ultrasonic power output.
- Allows realtime monitoring of decreases in ultrasonic power output due to aged transducer.
- Accommodates all nozzles except for W-357P-25CG (quartz).

W-357-3MP

Plastic nozzle f or 3 MHz oscillation

●Vibration at 3 MHz is capable of removing more microscopic particles, while minimizing damage.
●The horn does not allow generation of metallic ions.

W-357-1.5MP

Plastic nozzle f or 1．5 MHz oscillation

●The 1.5kHz high-frequency ultrasonic cleaning removes microscopic stains and smudges.
●Remotely controlled by an external device using the RS-422A interface.

Model code		W-357P-25	W-357P-20	W-357P-25CG	W-357P-25AHPF	W-357P-50
High-f requency power output		60W(adjustable)				100W(adjustable)
Oscillation f requency		1MHz(with fine adjustment)				400kHz
Power supply		AC100V / 2A				AC100V 3A
Operating liquid temperature range		20～50℃				
Ef f ective cleaning width (mm)		φ4.2	φ2.0	φ4.2	φ4.0	φ8.0
Water f lowrate		1.5L / min	0.7 liter / min	1.2 liter / min	0.9 liter / min	3.5 liter / min
Dimensions (mm)	Generator	232(W)×342(D)×138(H)				
	Horn	φ25×95	φ20×81	φ34×87	29×35×92	φ60×135
Weight	Generator	8kg				
	Horn	110g			100g	720g
Water inlet		Applicable tube size: Inner dia. 4 mm, outer dia. 6 mm				Applicable tube size: Inner dia. 11 mm, outer dia. 13 mm
Output cab le		5m				
Power cab le		2m (recess-fitting plug)				
Protection circuit		Dry operation prevention signal terminal				Polypropylene, ceramics
Liquid contact portion material		PCTFE, tantalum silicon rubber	SUS303, tantalum silicon rubber	Quartz glass	PCTFE, AHPF viton	silicon rubber

Model code		W-357-3MP	W-357-1.5MP
High-f requency power output		60W (adjustable)	
Oscillation f requency		3MHz	1.5MHz
Power supply		AC100V 2A	AC100/110/220/240V 200VA
Operating liquid temperature range		20～40℃	20～50℃
Ef f ective cleaning width (mm)		φ4.0	
Water f lowrate		0.9 liter / min	
Dimensions (mm)	Generator	232(W)×342(D)×138(H)	180(W)×250(D)×100(H)
	Horn	29(W)×35(D)×92(H) mm	
Weight	Generator	8kg	5kg
	Horn	100g	
Water inlet		Applicable tube size: Inner dia. 4 mm, outer dia. 6 mm	
Output cab le		5m	
Power cab le		2m (recess-fitting plug)	
Protection circuit		Dry operation prevention terminals Dry operation prevention cable (5m)	
Liquid contact portion material		PCTFE, tantalum silicon rubber	

■External control cable (5m) / Alarm output cable (5m)

※Transducers of custom specifications can be manufactured upon order.

Best suited for cleaning objects that need high cleaning performance with least damage Patented.

W-100-HFMK2 / W-200-HFMK2

Patented

- These high-power models are capable of cleaning delicate objects without damaging them.
- Removes microscopic particles adhering to semiconductor devices.
- Exhibits effective performance in color coating or degassing of magnetic heads, lenses, etc. and dissolving/stirring chemicals.
- High-frequency ultrasonic oscillation gives no damage to articles during cleaning.
- Extremely less uneven cleaning and unpleasant noise compared with low-frequency cleaning.

	Ultrasonic generator	
Model code	W-100HFMKⅡ	W-200HFMKⅡ
Max. power output	300W(adjustable)	200W(adjustable)
Oscillation frequency	100kHz	200kHz
Overall size (mm)	300(W)×345(D)×129(H)	
Output indication	LED level indicator	
Power supply	AC100V, AC200V 600VA	
Weight	Approx. 5.5kg	

	Immersible transducer (N type)				Vibrator-plate type transducer (F type)			
Model code	W-100HFMKⅡ		W-200HFMKⅡ		W-100HFMKⅡ		W-200HFMKⅡ	
Max. power input	300W	600W	200W	400W	300W	600W	200W	400W
Number of generators	1	2	1	2	1	2	1	2
Overall size (mm)	230(W)×180(D)×90(H) (300W/200W) 280(W)×280(D)×90(H) (600W/400W)				270(W)×210(D)×2t (300W/200W) 300(W)×300(D)×2t (600W/400W)			
Max. liquid temperature	50°C				50°C			
Liquid-contact portion material	SUS316L				SUS316L, EPDM packing			
Weight	5kg(300W/200W)／10kg(600W/400W)				3.5kg(300W/200W)／7kg(600W/400W)			

The size of the N-type transducer is standard. If you need a particular size, please consult us. In case you wish to use these models with the liquid temperature of 50#! or above, please consult us.

Removes sub micron contaminants.

W-357HP

- Automatic tracking of the oscillation frequency eliminates the need to adjust the frequency.
- High-frequency vibration of 1 MHz removes contaminant particles only sub-micrometers in size from precision parts without damaging the work.
- Eliminates unevenness in cleaning and operation noise.
- In addition to cleaning of precision parts such as magnetic heads, the W-357HP is the best choice for extremely demanding precision cleaning applications involving hard disk and semiconductor devices, as well as final cleaning of semiconductor wafers.
- Oscillation and output power can be controlled from an external controller.

Ultrasonic generator	
Model code	W-357HPT
Max. power output	600W(adjustable)
Oscillation frequency	1MHz
Overall size (mm)	360×400×128 (W) (D) (H)
Output indication	LED level indicator
Power supply	AC200V 1200VA
Weight	約4kg

Vibrator-plate type transducer, F type	
Model code	W-357HPF
Max. power input	600W
Transducer	Piezoelectric ceramic
Dimensions (mm)	310×250×61 (W) (D) (H)
Max. liquid temperature	85℃
Liquid-contact portion material	SUS316L
Weight	Approx. 3.5kg

※An immersible quartz transducer will soon be introduced.
※Cleaning units fitted with tank made upon order.
※The 1200W and 1800W types are also available by customized order.

New water-flow type cleaner requiring small quantity of running water Patent pending.

W-357-LH

Patent pending

■**Usage examples**

- Achieves excellent cleaning effect using only about one-tenth water of the volume of water used by the conventional water-flow type cleaners
- The cleaning unit can be set according to the size of wafers to be cleaned, which makes transducer scanning unnecessary.
- The quarts liquid-contact portion can accept various chemicals.

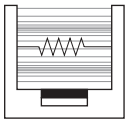
Model code	W-357-LH
Oscillation frequency	1MHz
Max. power output	120W
Effective cleaning width	50～380mm
Power supply	AC100V 500VA

A custom cleaning system best suited to the application can be built by combining modular units.

Modular Aqueous Cleaning System HU-5100 Series

- Construct a custom cleaning system by selecting from six base units with defferent functions.
- Compactly constructed with casters, the units can be easily moved around.
- Ultrasonic generator can be selected from among models WN Series.
- We manufacture an automatic work transfer machine for any cleaning system consisting of two or more units.

Unit A
HU-5101

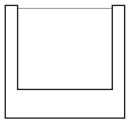


Ultrasonic cleaning tank
A heating ultrasonic cleaning unit equipped with an ultrasonic generator & transducer, a heater, a float switch to prevent dry operation, a circulation filter, liquid supply/ drain valves and an overflow orifice.

Unit B
HU-5102

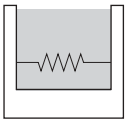
Ultrasonic cleaning tank
An ultrasonic rinsing unit equipped with an ultrasonic generator & transducer, a float switch to prevent dry operation, a circulation filter, liquid supply/ drain valves and an overflow orifice.

Unit C
HU-5103



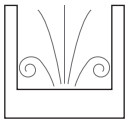
Cleaning tank with overflow
A rinsing cleaning unit equipped with liquid supply/ drain vaives and an overflow orifice.

Unit D
HU-5104



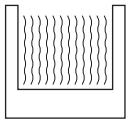
Warm bath cleaning tank
A warm bath cleaning unit equipped with a heater, liquid supply/ drain valves and an overflow orifice.

Unit E
HU-5105



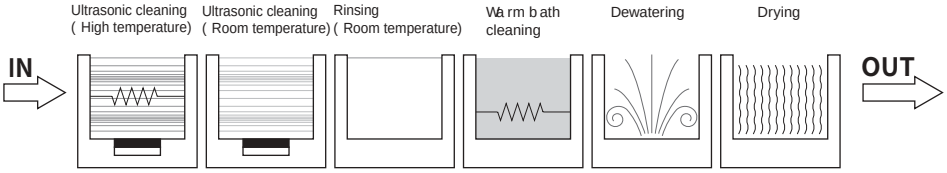
Air-blow tank
A dewatering unit to blow water of f cleaned articles. Equipped with an air filter.

Unit F
HU-5106



Warm air dryer
A dryer unit for drying cleaned articles. Equipped with a warm air generator and an air filter.

Combination of modular units
Desired modules can be chosen from among units A through F, and combined to form a cleaning system best suited for the work to be cleaned and theoperating environment.



We manufacture an automatic work transfer machine for any cleaning system consisting of two or more units.

Perfect for Pharmaceutical development research and chemical experiments. Vacuum Ultrasonic Cleaning Machine HC-4100

- Any inaccessible area can be cleaned with the powerful ultrasonic effect, as the cleaning liquid contains only a very small amount of gas.
- Undesirable oxidation is prevented because no reaction occurs with the dissolved gas (carbon dioxide, nitrogen, oxygen, etc.)
- Transparent lid allows observation of the ongoing cleaning operation.

Operating a single button safely cleans medical tools such as surgical knives and pallets. Ultrasonic Cleaner for Medical Tools (for experiments) HC-8100

- Design incorporating an overflow orifice, a circulation pump and a filter cuts down on the running cost.
- Tank lid allows safe operation. The status of the cleaning operation can be observed through the transparent acrylic resin lid.
- The stainless steel cabinet remains clean and clear at all times.

Specified for various cleaning quality levels. Hydrocarbon Ultrasonic Cleaner HC-9100

Model code	HC-9100
Basket size (mm)	400(W)×300(D)×200(H)
Performance	5 minutes/basket
Ultrasonic cleaner	One tank, 1200W
Degassing unit	One tank, power unit (10L/min)
Vacuum distiller	Re-distillation capability: 100L/h
Steam generator	Re-distillation capability: 300L/h
Utility	Power supply: 3-phase 200VAC, 20-30kW
	Air: 500-600NL/min.
	Cooling water: 15-20#!, 20-30L/min.
Steam generation	Electric, steam: 25kW/40kg/h

***Specifications vary from order to order.**

Innovative thinking has expanded the applications of ultrasonic vibratory energy: ultrasonic welders, ultrasonic cutters, ultrasonic atomizing deodorizers, and more.

High Power Ultrasonic

Ultrasonic Plastic Welder SONAC-150

Miniature ultrasonic welder SONAC-35

Miniature ultrasonic cutter USW-333

Immersible Ultrasonic Atomizer HM-303N

Ultrasonic atomizing deodorizer HM-300

Ultrasonic atomizer HM-2412

Atomize

Cut

Weld

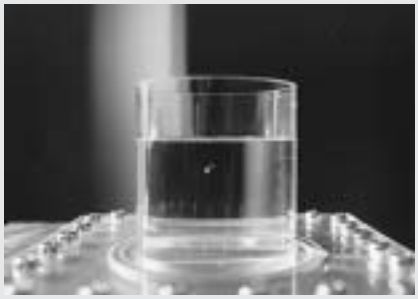
Modify

Ultrasonic welder

- A transducer generates vibratory energy that is focused by a horn onto members to be joined. The ultrasonic vibration then generates friction between the materials and heats them to fuse with each other.
- Ultrasonic welding requires no adhesive or solvent at all. The mating surfaces of the members simply fuse with each other, with no significant change in shape and properties. Even transparent molded articles can be welded with a fine finish.
- Welding process is complete in just about one second, with no need for a drying or cooling period.
- Welding is done under controlled conditions, so that even an inexperienced operator can achieve uniform results.

- Sono-reactor

Ultrasonic energy accelerates chemical reactions. The field of technologies that make use of this phenomenon is called sonochemistry, and is a promising field of chemistry. Potential applications include synthesis of new substances and disposal of hard-to-decompose materials.



Reactor

- Ultrasonic modification (maturing) equipment

It is known that applying ultrasonic vibrations of various intensities to a liquid or food accelerates chemical reactions or maturation. When applied to the fermentation of bread dough and alcohol, it has been confirmed that ultrasonic vibration reduces the fermentation period by 20 to 50% while increasing the flavor constituents and improving the taste. Ultrasonic vibration also causes changes at the molecular level in water and other drinks that are produced without fermentation, thereby improving the taste and quality.

- Ultrasonic cutter

Cutting tools cut remarkably better when subject to ultrasonic vibrations that reduce the friction between the blade and the material being cut.

- Ultrasonic atomizer

Exciting a liquid with ultrasonic vibration causes a part of the liquid to overcome the pull of surface tension and scatter into the air in the form of fine particles (ultrasonic streaming). Ultrasonic atomization has the advantage of ease in controlling the size and quantity of the particles. In addition to the humidifier and aroma generator, research is now under way into new applications.

A versatile tool for broad applications including welding of plastics and riveting.

Plastic Welder SONAC-150

- Powered by a bolt-clamped Langevin transducer of high output power and high durability, which has been specially developed for the ultrasonic welding.
- May be used in bonding, riveting and metal insertion for plastic products.
- Powerful tool for a range of industries, including electrical, mechanical and automotive parts, toy, stationary and daily necessities.

※Special horns will be designed and manufactured to meet your particular applications and specifications.

Bonding compatibility of thermoplastic materials

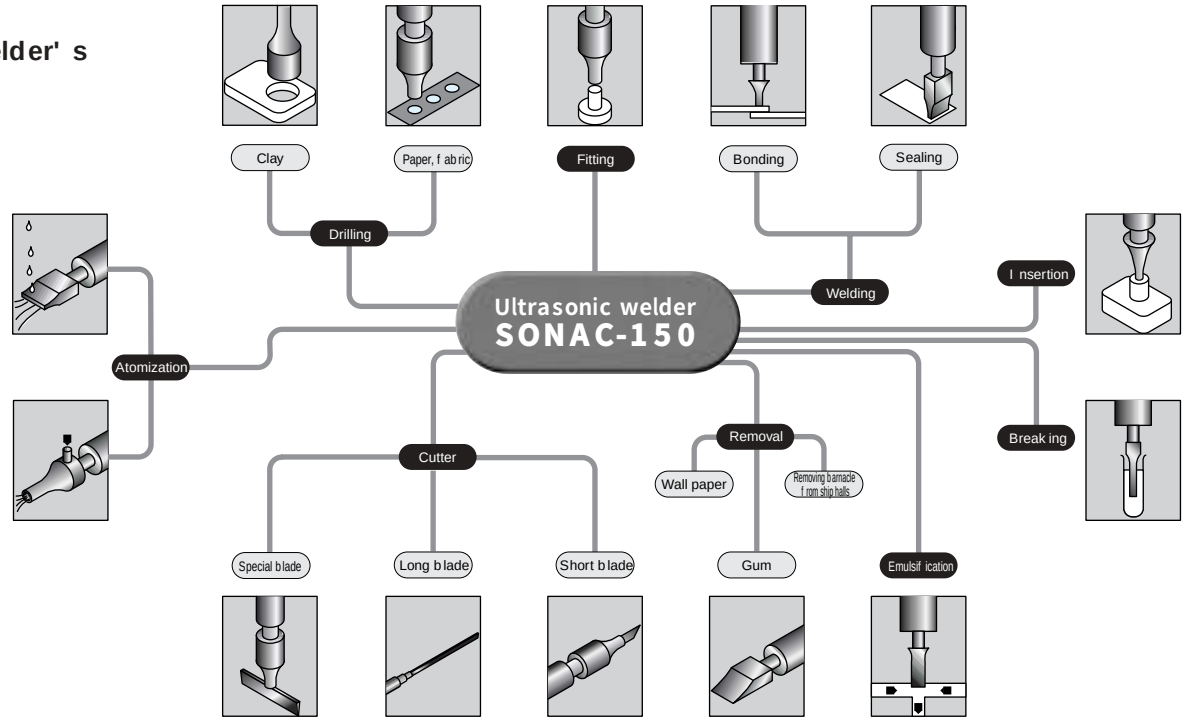
Highly compatible / Compatible	P.S	A.S	A.B.S	P.P.O	P.O.M	P.M.M.A	C.A	P.A	P.C	U.P	P.E	P.P	P.V.C
P.S (Polystyrene)	■			■		■							
A.S		■	■			■							
A.B.S			■			■			■				■
Reformed P.P.O (Noryl)	■			■									
P.O.M					■								
P.M.M.A (Acryl)		■	■			■			■				■
C.A (Cellulose acetate)							■						
P.A (Nylon)								■					
P.C (Polycarbonate)			■			■			■				■
U.P (Polyester)										■			
P.E (Polyethylene)											■		
P.P (Polypropylene)												■	
P.V.C (Vinyl chloride)			■			■			■				■

	Ultrasonic generator
Max. power output	150W
Oscillation frequency	28kHz
Power supply	100VAC 3A
Oscillation mode	Self-exciting oscillation
Oscillation timer	0.01sec～
protective device	With a built-in thermostat
Dimensions (mm)	259 (W) ×238 (D) ×102 (H)
Output indication	Tuning level meter
Weight	Approx. 2.8kg

	Hand piece
Transducer	Bolt clamped Langevin transducer
Control	Snap switch
Dimensions (mm)	φ42×226 (L) except for horn
Standard horn size (mm)	φ5.8 (tip) ×90.5
Weight	Approx. 850g

Optional foot-operated switch, hand piece rest, and special horns available.
※A model with a 220 VAC power supply also available.

Evolution of Ultrasonic Welder's application



Application Horns

Some applications of optional horns

Insertion of screws or metal parts, cutting of sheets, rubber, or fabric, gate cutting of plastic products, drilling or opening apertures in plastic products, flash removal and chamfering of plastic products, more.

Special horns can be designed and manufactured to meet your particular applivcations and specifications.


Sonotrode for spot welding


Cytoclasis tool


Metal inserting tool


Cutting blade


Welding tool for sealing (3×16mm)


Welding tool for sealing (8×55mm)

Best suited for welding small food packs and large packages for farm produce, etc.

Miniature Ultrasonic Welder SONAC-35 / SONAC-55

Patent pending

- Ultrasonic energy partially bonds the material safely, as no metal staples or heater are used.
- Timer-controlled energy application allows anyone to perform superb bonding operations.
- Best suited to packaging of foods and agricultural products.
- Simply turn on the switch, then hold the package with the hand piece, and it's done. Compact and light-weight, the SONAC-35 can be operated by any inexperienced person.
- Foot-operated switch allows the operator to hold the package with both hands, eliminating the possibility of bonding errors (SONAC-55).

Model code	SONAC-35	SONAC-55
Oscillation frequency	60kHz	40kHz
Power output	20W	30W
Effective bonding area	2×5mm	3×6mm
Power supply	AC100V 0.4A	AC100V 0.5A
Output cable	1.5m	0.5m
Power cable	1.5m	1.5m
Dimensions (mm) / Weight	Hand piece:28(W)×163(D)×42(H) Approx.200g Ultrasonic Generator:155(W)×160(D)×65(H) Approx.1kg	Bonding effector:63(W)×190(D)×143(H) Approx.2.2kg Ultrasonic generator:155(W)×210(D)×73(H) Approx.1.6kg

※Tandem operation is possible when an optional rail is used. SONAC-35 also available with 220 VAC specification.

NEW

Fine cutting is made easy by giving ultrasonic vibrations to the blade.

Miniature Ultrasonic Cutter USW-333

- A safe and compact design with a hand piece holder.
- The cutting blade that is ultrasonically vibrated 40,000 times a second creates a fine cut surface.
- Easy operation using only the nearby power switch.
- Smooth cutting is possible with slight force generated by ultrasonic vibrations.

Model code	USW-333
Oscillation frequency	40kHz
Max. power output	20W
Power supply	AC100V 25VA
Overall size (mm) / Weight	Ultrasonic generator: (excluding protrusions) Approx. 420 g
	Hand piece: 1/34x124 (excluding blade) Approx. 120 g
Power cable	1.5m
Output cable	50cm curling cord

Exhibits great capability in cutting gates and removing burrs of plastics.

Miniature ultrasonic cutter USW-335

Patent pending

- Cutting blade that is ultrasonically vibrated 22,000 times a second creates a superb cut surface.
- Housed in a carrier made of aluminum, the entire machine can be carried to any place where the work is to be done.
- No adjustment is needed. Simply turn on the switch, and it can be operated by even inexperienced persons.
- Use the on/off foot switch to prevent wasteful consumption of electricity.
- Off-the-shelf cutter blades are employed for lower running cost.

Model code	USW-335
Oscillation frequency	22kHz
Power output	30W
Power supply	AC100V 1A
Output cable	1.4m
Power cable	1.5m
Foot-operated SW cable	1.5m
Dimensions (mm)	Aluminum carrier : 230(W)×275(D)×120(H) Approx. 3.1kg
Weight	Hand piece : φ25×190 Approx. 70g

USW-335 also available with 230 VAC specification

NEW

Three-micrometer mist produces various effects.
Immersible Ultrasonic Atomizer HM-303N

Patent pending

- Just immerse the atomizer and turn the power on, and it starts operation.
- The unique built-in liquid sensor prevents failures due to dry operation.
- Easy replacement of transducers is possible.
- Proper underwater position can be maintained by the exclusi-vely developed float.
- A compact design of monolithic structure consisting of a transducer and a oscillation circuit.

Model code	HM-303N
Oscillation frequency	2.4MHz
Power supply	100VAC (using the attached AC adapter)
Atomizing capacity	250±50mL/h (in the case of 25°C water)
Medium particle size	3μm (in the case of water)
Proper liquid level	25～35mm
Liquid temperature	5～50°C
Weight	Approx. 300g
Transducer life	10,000h
Protective function	Dry operation prevention using a liquid sensor
Option	Float (foam polyethylene), liquid scattering prevention cover

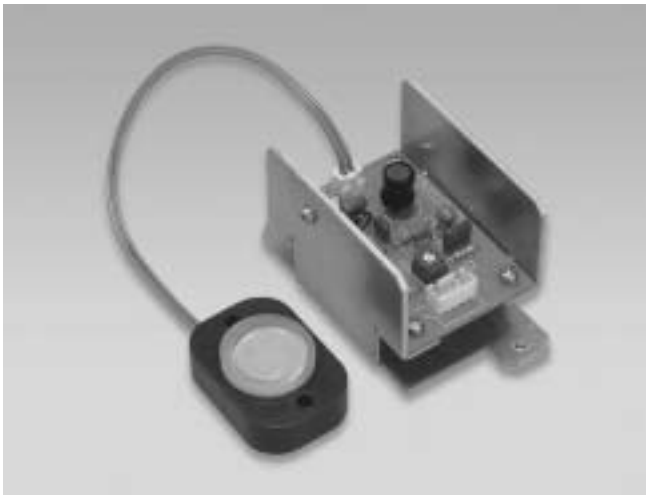
Completely decomposes odor substances with microscopic mist.
Ultrasonic Atomizing Deodorizer HM-300

- The mist consists of particles several micrometers in diameter generated by ultrasonic vibration, and does not moisten surrounding objects or persons.
- A flexible duct 0.5 m long makes it easy to direct the mist in any direction including toward the ceiling.
- No adjustment is required. Simply turn on the switch, and it can be operated by even inexperienced persons.
- The special deodorizer liquid HM-301 decomposes odor substances into non-smelling, non-toxic substances. It causes no harm to humans or the environment.

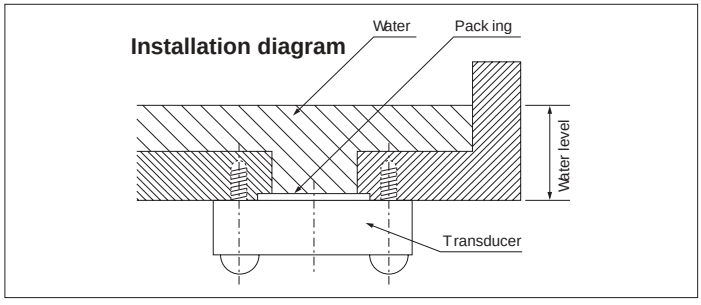
Model code	HM-300
Oscillation frequency	2.4MHz
Atomizing capacity	1.2 liters/h (Tank capacity 5 liters) (Water 25°C)
Median particle size	3μm for water
Spraying time (Reference)	30 sec./1m³
Power supply	100VAC 2A
Operating temperature	5～40°C
Duct size	φ55×0.5m
Dimensions (mm)	300 (W) ×375 (D) ×535 (H) (Duct excluded)
Weight	15kg
Timer	0 to 30 min. or continuous
Liquid-contact material	Tank: Polypropylene Vibrator plate: SUS316 Packing: Silicon rubber Main unit inner lining: Vinyl chloride

Fine mist generated by ultrasonic vibration has been finding ever expanding applications.
Ultrasonic Atomizer HM-2412 / HM-1630

(Soon to be released)



- Vibrator plate made of SUS316 allows the use of liquids other than water.
- Extremely fine mist (Median particle size about 3 μm) is generated.
- Low power consumption.



Model code	HM-2412	HM-1630
Oscillation frequency	2.4MHz	1.6MHz
Atomizing capacity	250±50mL/h (Water 25°C)	575±125mL/h (Water 25°C)
Median particle size	3μm for water	4μm for water
Power supply	24VDC / 550mA	48VAC / 640mA
Operating temperature	5～50°C	5～50°C
Proper liquid level	25～35mm (from the center of the transducer)	40～50mm (from the center of the transducer)
Heat dissipation of circuit	Forced air cooling	Forced air cooling
Weight	TD: 20 g, Circuit: 60 g	TD: 20 g, Circuit: 60 g
Liquid-contact parts material	Vibrator plate: SUS316 Packing: Silicon rubber	Vibrator plate: SUS316 Packing: Silicon rubber
Transducer life	10,000h	10,000h

*A floating level switch is optionally available.

Ultrasonic measurement has grown to become an indispensable tool in diverse fields. Such operations include flowrate measurement of various liquids, monitoring remaining quantity of powdery materials and in vivo observation.

Ultrasonic Measurements

Airborne ultrasonic level meter HD500

Airborne ultrasonic level meter HD700

Airborne ultrasonic level meter HD802

Ultrasonic interface level meter HL2000

Ultrasonic flowmeter USF-100A

Ultrasonic flaw detecting and imaging system HA-701W

Measure

Detect

Diagnos

Applications of ultrasonic measurement technology

Ultrasonic measuring instruments are generally based on the principle of echo; that is, ultrasonic waves are reflected from and transmitted through an object being measured and received by the transducer, while various information on the object is obtained from measuring the intensity and propagating time of the reflected ultrasonic wave.

The first advancements in ultrasonic measurement technology were triggered by the sinking of the Titanic, strong demands for underwater detection capability arising during WWI, as well as the discoveries of piezoelectric and magnetostrictive elements. Then, after WWII, military technologies of sonar and depth sounder evolved to be used in fish finders, flaw detectors for detecting defects in metallic members, and ultrasonic canners for medical diagnosis of body tissues. Ultrasonic measurement technology has now become an important pillar in various fields.

●Fish finder

An electric pulse transformed into a pulse of ultrasonic waves by a transducer is transmitted into water. The ultrasonic pulse is reflected on a school of fish or the sea bed and returns to the transducer, which transforms it into electric signals. The intensity of the electric signals is used to obtain the underwater conditions and is displayed on a video monitor.

●Doppler speedometer

Ultrasonic pulses are emitted from below a moving body such as a motor vehicle and reflected on the ground, with the reflected pulses received to determine the vehicle speed from the Doppler shift in the frequency.

●Airborne ultrasonic level meter

The travel time of ultrasound, from being emitted until the reflected wave is received, is measured to determine the distance of an object from the transducer.

●Ultrasonic flaw detecting and imaging system, ultrasonic microscope

Ultrasonic flaw detecting and imaging system have been widely used in non-destructive testing. This is because the ultrasonic flaw detecting and imaging system gives the elastic property data of the internal structure in the form of visual information, as the ultrasound is reflected, scattered and absorbed at an interface where density, elastic modulus, viscosity and other properties of the object change.

●Ultrasonic medical diagnosis equipment

Ultrasonic imaging of human organs is a safe and reliable tool for use in medical diagnosis, as it does not involve exposure to hazardous radiation as in X-ray and other techniques.

●Ultrasonic flowmeter

The flowmeter comprises two transducers that are separated by a predetermined distance in the direction of flow and emit and receive ultrasonic pulses between each other. The flowrate is determined from the difference in the propagation time caused by the flow and the cross section of the stream. The portions immersed in the liquid flow are coated with teflon and do not protrude into the stream. Applicable to various liquids as well as pure water.

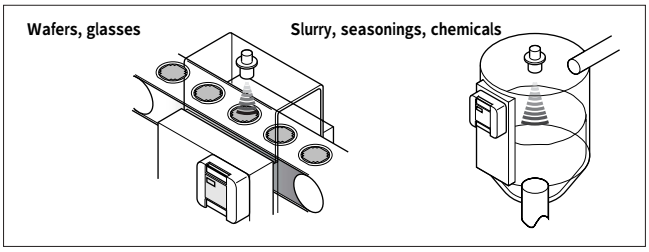
●Ultrasonic interface level meter

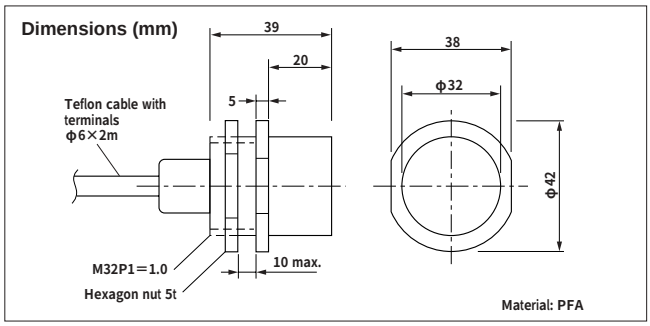
The depth of an interface in water is measured to determine the quantity of sediment, by receiving ultrasonic waves reflected on the interface. The ultrasonic interface level meter is used for the purpose of separating solids and liquids during water processing such as in sedimentation and concentration treatment.

Best suited for the control of liquid levels of various chemical tanks and slurry tanks.

Short-distance Airborne Ultrasonic Level Meter HD500-C/HD500-D

- Chemical resistant resin (PFA) is used as the sensor body material, which enables measurement of in-tank liquid levels and monitoring of the change of residual volume.
- A variety of output interfaces (RS232C, 4-20mA current, alarm switch) facilitate connection to various systems.
- The compact design of the main body and sensor makes it easy to select an installation location of the level meter.





Model code	HD500-C	HD500-D
Transmission/reception frequency	200kHz	400kHz
Objects to be measured	Liquid (flat surface)	
Standard measurable range	120～1000mm	60～450mm
Measurement accuracy	±0.25%F.S.	
Resolution	0.1mm	
Operating temperature	0～50°C	
Indication	4-digit LEDs (unit: mm)	
Output signals	Open-collector (upper/lower limits) 4-20mA current output RS232C	
Power supply	DC12～24V 3W	
Overall size (mm)	Main unit:113(W)×52.5(D)×94(H) mm／Sensor:φ42×39mm	
Weight	Main unit:300g／Sensor:150g	
Mounting	Main unit: wall-mount type／Sensor: panel-mount type	
Material	Main unit:ABS／Sensor:PFA	
Structure	Main unit:IP43／Sensor:IP65	
Sensor cable	2m	

Compactly constructed from chemical-resistant polypropylene, with an output port provided for personal computer as a standard specification.

Airborne Ultrasonic Level Meter HD700-A/HD700-B

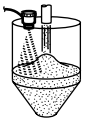
Patent pending

Ultrasonic pulses are transmitted to an object to be measured and reflected on the surface. The travel time of the ultrasound, from being emitted until the reflected wave is received, is measured to determine the distance of the object. applicable to the measurement of liquid/powder level in a tank and water level in sewer pipes and lakes.

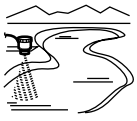
- Constructed compactly, with substantial reduction in price.
- Make of chemical-resistant material to ensure high durability.

Measurement of liquid level in various tank.

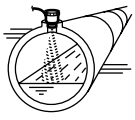
Measurement of powder level.

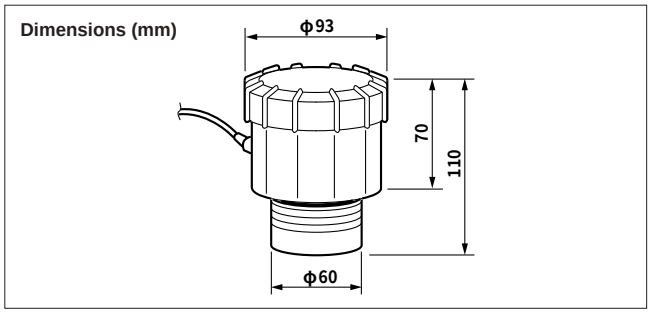


Measurement of tide, marsh and lake level.



Measurement of sewage pipe.





Model code	HD700-A	HD700-B
Oscillation frequency	50kHz	100kHz
Measured object	Powdery material (Liquid)	
mesurement range(max.)	50～500cm(999cm)	25～200cm(400cm)
Measuring accuracy	±0.25% of full scale or 10 mm, whichever is larger	
Resolution	Resolution of inner process: 1mm(RS232C) Display resolution: 1cm	
Storage temperature	−20～60°C	
Readout	3-digit LED (Unit: cm) Error indication (LED shows ---.)	
Output	Alarm output switch NPN open collector, one upper limit and one lower limit (Isolation) Current output from 4 to 20 mA RS232C	
Power supply	DC12～24V 3W	
Dimensions (mm)	φ93×110mm	
Weight	350g	
Mount	G2 (PF2) screwed	
Casing material	PP(Polypropylene)	
Construction	IP65	
Connection cable	10m	

Enables a broad measurement range and selection of the number of channels (1 or 2).

Airborne Ultrasonic Level Meter HD801 / HD802

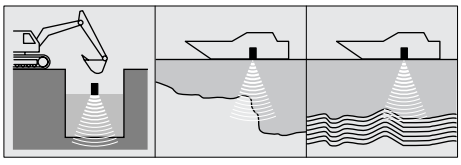
- A wide range from 0.3m to 12m can be measured.
- Graphic LCD screens can be set according to the use.
- Four easy-to-control alarm output signals are provided, and an occurrence of alarm can be monitored by the ALARM LED.
- Remote control with a data rate of up to 1200mbps is possible via the RS485 interface (standard specification).
- Minimizes adverse effect due to external noise and ultrasonic waves by correlative processing of received ultrasonic signals.

Model code	HD801	HD802
Number of channels	1 (one sensor)	2 (two sensors)
Transmission/ reception frequency	40kHz	
Object to be measured	Powder (liquid)	
Measurement range	0.3～12m	
Measurement accuracy	±0.25%FS	
Operating temperature	−20～70°C	
Indication	LCD (back-lighted)	
Output signals	4-20mA current output x1 4 types of relay output x1 RS485 output	4-20mA current output x2 4 types of relay output x2 RS485 output
Power supply	85～264VAC 15VA	
Overall size (mm)	Main unit:185(W)×85(D)×235(H) ／Sensor:φ84×60	
Weight	Main unit:1.8kg／Sensor:500g	
Mounting	Main unit: wall-mount type／Sensor: R1 (PT1) screwed	
Material	Sensor face: Epoxy, sensor case: PP	
Structure	Main unit:IP66／Sensor:IP66	
Sensor cable	φ7×5m	

Exhibits its superior perfomance and operability at every measurement site.

Ultrasonic Depth Sounder HFD700

- Superb functions and ease of operation serve well at any work site.
- Equipped with an output port (RS232C) for personal computer as a standard specification to improve the convenience of operation.



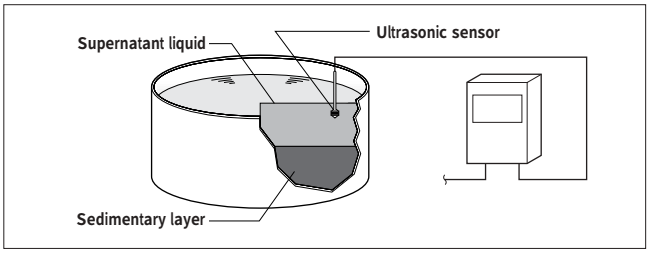
Model code	HFD700
Oscillation frequency	200kHz
Sounding range	0.5～99.9m
Measuring accuracy	±2%
Resolution	Inside 1 cm (RS232C) indication: 0.1 m
Operating temperature	−20～60°C
Readout	3-digit LED (Unit: m) Error indication (LED shows ---.)
Output	Alarm output switch NPN open collector, one upper limit and one lower limit (Isolation) Current output from 4 to 20 mA RS232C
Power supply	12～24VDC 3W
Dimensions (mm)	Main unit:100(W)×55(D)×77.4(H)／Sensor:55(W)×70(D)×50(H)
Weight	Main unit:200g／Sensor:200g
Mount	Fastened with screws.
Materials	Main unit: Aluminum case／Sensor: rubber mold, resin case
Construction	Main unit:IP40／Sensor: waterproof
Connection cable	10m

Enables real-time measurement and management of waste sludge interface level.

Ultrasonic Interface Level Meter HL2000

- Two locations can be measured with one level meter (standard: one sensor).
- Measurement can be performed using a fixed sensor in no contact with the interface. This allows secure use of the level meter avoiding contact with rake.
- Measurement with no influence of transparency/chromaticity of liquid and daytime/nighttime is possible
- Provided with the calculation processing in consideration of changes in supernatant liquid properties and sedimentary sludge concentration, the level meter makes its readjustment and change of its settings unnecessary.
- With no moving parts in the converter and sensor, stable long-time measurement is made possible.

Model code	HL2000
Transmission/reception frequency	400kHz
Object to be measured	Sludge interface level
Measurement range	0.5～10m
Measurement accuracy	±1cm
Operating temperature	−20～60°C
Indication	LCD
Output signals	4-20mA current output (each channel) Upper-limit/lower-limit relay output (each channel)
Power supply	85～264VAC 10VA
Overall size (mm)	Converter:230(W)×90(D)×320(H)／sensor:φ70×90
Weight	Converter:3.6kg／sensor:3kg
Mountin	Converter: wall mount-type／sensor: pipe-mount type(Rc1 1/2)
Material	Sensor case: CR rubber, SUS304
Structure	Converter: waterdrop-proof／sensor: waterproof
Sensor cable	20m
Configuration	One converter and one sensor (Two sensors are optionally available.)



All the liquid-contact portion is made of Teflon that is suited to the measurement and management of pure water.

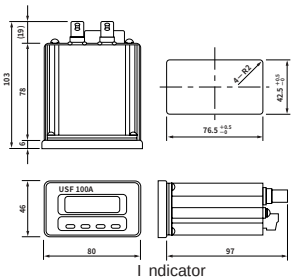
Ultrasonic Flowmeter USF100A Series

- All the liquid-contact portion is made of Teflon for measuring pure water and chemicals. (Calibration will be required for measurement of some chemicals.)
- A desired model is selectable out of the four models according to flow rate.
- Easy to attach/detach.

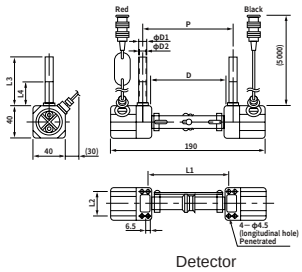
Model code	USF100A-G05EP	USF100A-G10EP	USF100A-G15EP	USF100A-G20EP
Fluid	Ultra-pure water, pure water			
Measurable flow rate	50～500mL/min	50～2000mL/min	0.5～20L/min	2～50L/min
Measurement accuracy	±1.5% at FS	±1% at FS	±1% at FS	±1% at FS
Withstand pressure	0.5MPa			
Operating temperature	0～50°C(no condensation)			
Detection method	Ultrasonic propagation time difference method			
Output signals	Measured data output: 4-20mADC Frequency output (open-collector pulse) Cumulative pulse output (open-collector pulse) Comparative output (open-collector pulse) Fail output (open-collector pulse)			
Oscillation frequency	1MHz			
Power supply	12-24VDC, approx. 1.2W			

Heat durability	Max. 80°C			
Liquid-contact portion material	NEW PFA			
Cable length	5m coaxial cable (ETFE sheathing)			
Pipe diameter	TV3/8(9.52mm)	TV3/8(9.52mm)	TV1/2(12.7mm)	TV3/4(19mm)

Dimensions (mm)



Indicator

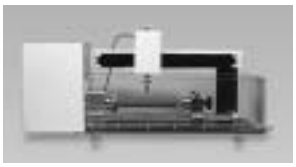


Detector

Spec.	Flow rate	Dimensions (mm)							
		D	L1	L2	L3	L4	P	φD1	φD2
G05	50～500mL/min	90	100	30	60	30	110	9.53	6.33
G10	50～2000mL/min	90	100	30	60	30	110	9.53	6.33
G15	0.5～20L/min	86	100	30	80	40	105	12.7	9.53
G20	2～50L/min	72	84	32	100	55	100	19.0	15.8

Observation and inspection of internal structure or defects in various materials including metals and ceramics.

Ultrasonic Flaw Detecting and Imaging System HA-701W / HA-701 / HA-501 Patented



HA-701W

- A-, B- and C-mode images are displayed on the CRT at the same time, to enable quick recognition of flaw depth, location (X, Y) and size.
- Polymer ultrasonic probe of recessed face for a desired frequency can be selected according to the material, size and flaw of the object to be tested.
- Capable of detecting cracks, voids, delamination in semiconductors, ceramics, resins, metals, castings, etc.

HA-701

HA-501

- A- and B-mode images are displayed at the same time, to enable quick and accurate determinations.
- A linear probe of 2, 5 or 7.5 MHz can be selected according to the material, size and flaw of the object to be tested.
- Sound velocity can be set for the type of material tested to produce accurate images.

			HA-701W	HA-701	HA-501
Ultrasonic flaw detection function	Transmitted/ received frequency		5～50MHz	1～25MHz、(25～100MHz) ※1	1～10MHz
	Probe	Standard	25MHz		2MHz linear probe
		Option	10、50MHz	10、(50、100) MHz ※1	5、7.5MHz linear probe
Image data collection	Display		A、B、C scopes simultaneous/B, C mode region adjustable		A、B modes simultaneously adjustable
	Max. number of images taken		8 simultaneous images		Max. 40 frames/sec.
	Image data sampling method		Cursor sampling (Gate 4 nsec.), Gate hold sampling (4 nsec to 38.4 μsec.), Tracking gate sampling (4 nsec to 38.4 μsec)	Cursor sampling (Gate 20 nsec.), Gate hold sampling (20 nsec to 38.4 μsec.), Tracking gate sampling (20 nsec to 38.4 μsec.),	Measured values: Distance, peripheral length, area, time (echo time)
Scanner	Type		X、Y、Z-stage scanning		Manual scan
	Stroke of stage motion (mm)		140(X)×140(Y)×50(Z)		
	Scanning speed		Max. 400 mm/sec.	Max. 200 mm/sec.	
	Field of view		Free size	8-size	
	Rough scan		———	2、4、8、16 (4 levels)	
Image display	Monitor		17" color CRT	9" color CRT	
	Display resolution		800 (H)×600 (V) dots	640 (H)×480 (V) dots	
Power supply			100VAC/600VA		100VAC/180VA
Weight	Main unit		CRT 22kg Control unit 17kg	30kg	30kg
	Scanner		38 kg	38kg	
Dimensions (mm)	Main unit		CRT 410(W)×425(D)×409(H) Control unit 216(W)×461(D)×406(H)	420×616×244 (W) (D) (H)	
	Scanner		470×560×300 (W) (D) (H)		

※Optional compact scanner and rotary scanner available. ※1 Separate high-frequency transceiver TRX-2 is required.

Wide applications include observation of the surface, adjacency of the surface, internal condition of a specimen and acoustic properties.

Mechanically-scanned Ultrasonic Microscope AMS-7000

Model code	AMS-7300	AMS-7500	AMS-7510
Scanning method	Electromagnetic scan of probe		Electromagnetic scan of probe stage motion scanning selected
Transmitted/ received frequency	Variable from 100 to 200 MHz in 1 MHz steps	Variable from 100 to 500 MHz in 0.1 MHz steps	Variable from 20 to 500 MHz in 0.1 MHz steps
Probe	170MHz	170MHz、400MHz	25MHz、170MHz、400MHz
Directional resolution(Medium: Water)	Approx. 5 to 10μm	Approx. 2.5 to 10μm	Approx. 2.5 to 60μm
Field of view	0.5mm (0.48×0.48) 1.0mm (0.96×0.96) 2.0mm (1.92×1.92)	0.25mm (0.24×0.24) 0.5mm (0.48×0.48) 1.0mm (0.96×0.96) 2.0mm (1.92×1.92)	0.25mm (0.24×0.24) 0.5mm (0.48×0.48) 1.0mm (0.96×0.96) 2.0mm (1.92×1.92) 0.24～19.92mm (Continuously variable in 0.24 mm steps)
Scan time	8 sec.		18 min. when scanning the stage, 3 min. when rough scanning (for field of view 4.8 mm) 8 sec. when scanning electromagnetically (for field of view o.25, 0.5, 1.0 or 2.0 mm)
Image display	Monochromatic CRT×2	Monochromatic CRT×2, color CRT×1	
Power consumption	100VAC, 50/60Hz, 300VA	100VAC, 50/60Hz, 1kVA	
Dimensions (mm)	2700(W)×800(D)×1356(H)		

- Wide frequency range from 20 to 500 MHz makes it possible to observe the condition several millimeters below the surface of specimen, as well as the surface condition.
- Frequency can be changed from 20 to 500 MHz in steps of 0.1 MHz. The frequency at which a particular probe shows the highest efficiency can be selected, and images taken at different frequencies can be compared to determine the frequency dependence of the object under test.
- Ultrasonic microscope images and optical microscope images taken at the same position can be compared in a single operation.

●Foreign matter trapped between topcoat and undercoat of painting.
Foreign matter is clearly located at approximately 150 μm from the paint surface.
・Operating frequency: 170 MHz
・Field of view: 1.92×1.92 mm

Ultrasonic microscope image of paint surface

Ultrasonic microscope image of inside of paint

●Crystal grain boundary Mn-Zn ferrite
Anisotropic crystal can be viewed with contrast among grains, because the surface wave velocity differs depending on the orientation.
・Operating frequency: 400 MHz
・Field of view: 0.48×0.48 mm

Optical microscope image of Mn-Zn ferrite

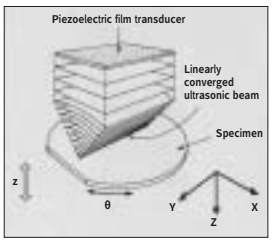
Ultrasonic microscope image of inside of Mn-Zn ferrite

Leakage surface acoustic wave velocity/ propagation loss is determined from V(z) curve, for testing single crystal substrate or ceramic substrate.

Linearly Converged Beam Ultrasonic Measuring Instrument AMS-5000

Patented

- Elastic properties can be measured quantitatively.
- Anisotropic materials can also be measured with the use of a linearly converged beam transducer.
- Ability to change the frequency makes it easy to measure frequency dependence (ultrasonic microscopectroscopy).



Mode	Reflected pulse mode
Measuring frequency range	100～450MHz
Sound velocity measuring accuracy	±0.1%
Attenuation measuring accuracy	Several % to several tens of %
Power supply	100VAC 50/60Hz 1kVA

Superior ultrasonic instruments are born of superior transducers.

Ultrasonic Transducer

Application of ultrasonic cleaning

Application of ultrasonic motor

Application of ultrasonic underwater measurement

Application of ultrasonic measurement

Application of ultrasonic airborne measurement

Application of ultrasonic machining

Transducer (Piezoelectric ceramics)

Acoustic sounds are generated just by hitting an object. The generation of high-frequency ultrasound, however, requires a special method.

A transducer made of a piezoelectric ceramic material repetitively contracts and expands when subject to alternating voltage. Conversely, when alternating pressures are applied to the transducer, alternating voltage appears across the transducer. This is the piezoelectric effect. The transducer is also called an electroacoustic element.

A piezoelectric ceramic material is a polycrystal ceramic made by compressing a high-purity powder (titanium oxide, barium oxide, etc.) and firing it at a high temperature. When a polarization process is applied, this ceramic material attains a piezoelectric property similar to that of a single crystal such as quartz. Ultrasonic transducers based on the piezoelectric ceramics are the key technology supporting the advance of ultrasonic devices.

Monocrystal

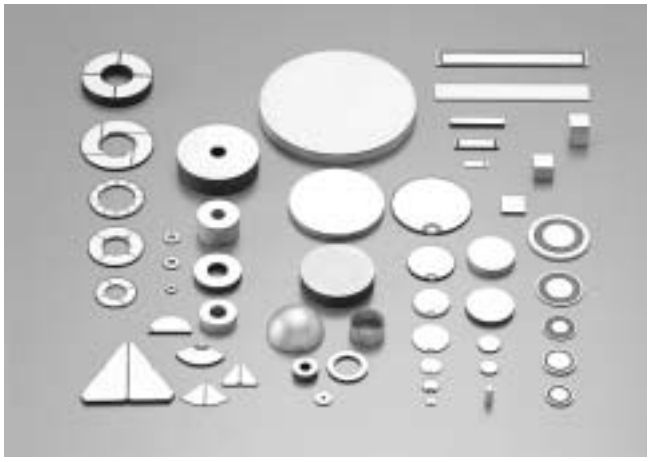
Ceramics

Thin film

Polymer film

Expansion of Ultrasonic Transducer

Ultrasonic transducer technology that supports the unlimited potential of ultrasound has developed ceaselessly.



Types of ultrasonic transducer

Ultrasonic transducers can be roughly classified into single-crystal (quartz, lithium niobate, etc.), ceramic (barium titanate, PZT, etc.) and high polymer (polyvinylidene fluoride film, etc.) types. Honda Electronics uses the following piezoelectric materials.

●Piezoelectric ceramics
[$BaTiO_3$, PZT, $PbTiO_3$]
Piezoelectric ceramics are polycrystal ceramics made by compressing a high-purity powder such as titanium oxide or barium oxide and firing it at a high temperature, with the piezoelectric property obtained through a polarization process.

●Piezoelectric polymer film [P(VDF-TrFE)]
A piezoelectric polymer film is produced by forming a film from molten polymer or its solution, and applying a polarization process to the film. This type of piezoelectric material is characterized by very low acoustic impedance, flexibility and ease of forming a thin film from a solution.

●Piezoelectric thin film [ZnO]
A piezoelectric thin film is made by sputtering zinc oxide (ZnO). To make an ultrasonic transducer, zinc oxide film is formed on a carrier such as quartz or sapphire in a C-axis orientation.

Table of physical properties

Property	Unit	Symbol	HC-60AH	HC-50GS	HC-30D	HC-40H	Zn-P
Electro-mechanical coupling coefficient	%	k_p	58	60	25	5	
		k_{31}	32	32	14	—	
		k_{33}	68	67	28	52	20.0～26.0
Relative dielectric constant		$\varepsilon_{33}^T/\varepsilon_0$	1900	1050	900	190	7.5～10.0
Frequency constant	Hz･m	N_p	2095	2035	3246	2180	3000～3075
		N_{31}	1490	1600	—	—	
		N_{33}	1450	1660	—	—	
		N_t	1900	2000	3340	2180	
Piezoelectric strain constant	$\times10^{-12}$ m/V	d_{31}	-162	-110	-36	—	
		d_{33}	380	290	140	—	
Piezoelectric putput constant	$\times10^{-3}$ V･m/N	g_{31}	-10.0	-10.5	-4.5	—	
		g_{33}	24.0	32.0	18.0	—	
Elastic modulus	$\times10^{10}N/m^2$	Y_{33}^E	4.5	5.0	11	—	
Mechanical Q value		Q_m	75	1000	300	600	
Dielectric loss	%	$\tan\delta$	1.6	0.5	2.0	1.5	
Poisson ratio		σ	0.36	0.32	0.32	—	
Density	$\times10^3kg/m^3$	ρ	7.50	7.55	5.36	6.75	5.5
Curie point	℃	T_c	320	320	160		
Application			Flaw detection, Thickness measurement, Medical diagnosis, Airborne level measurement	Cleaning, Machining, Atomizing, Welding	Fish finding, Airborne level measurement	Flaw detection, Thickness measurement, Medical diagnosis	Microscopy, Flaw detection

Bolt clamped Langevin transducer for ultrasonic cleaners

Since piezoelectric ceramics are mechanically combined, this type of transducer is very solid and durable with no damage during high-amplitude vibrations. Furthermore, stable operation is possible with high electroacoustic conversion efficiency and less heat generation.

Model code	Standard dimensions			Joint screw size	Frequency (kHz)	Measurement voltage (Vrms)	Impedance (Ω)	Static capacity (pF)	Max. input power (W)
	Weight (g)	Diameter (mm)	Length (mm)						
HEC-30502	130	31.5	49	M10 P1	50	1.0	50 or less	2100	30
HEC-301002	175	30	75	M10 P1	108	1.0	50 or less	2600	30
HEC-45282	395	45	80	M10 P1	28	1.0	35 or less	3300	50
HEC-45402	225	45	54	M10 P1	40	1.0	35 or less	3300	50
HEC-45254M	385	45	88	M10 P1	25•46	1.0	35 or less	6600	50
HEC-60282	410	60	72	M10 P1	28	1.0	35 or less	3300	50

Bolt clamped Langevin transducer for machining

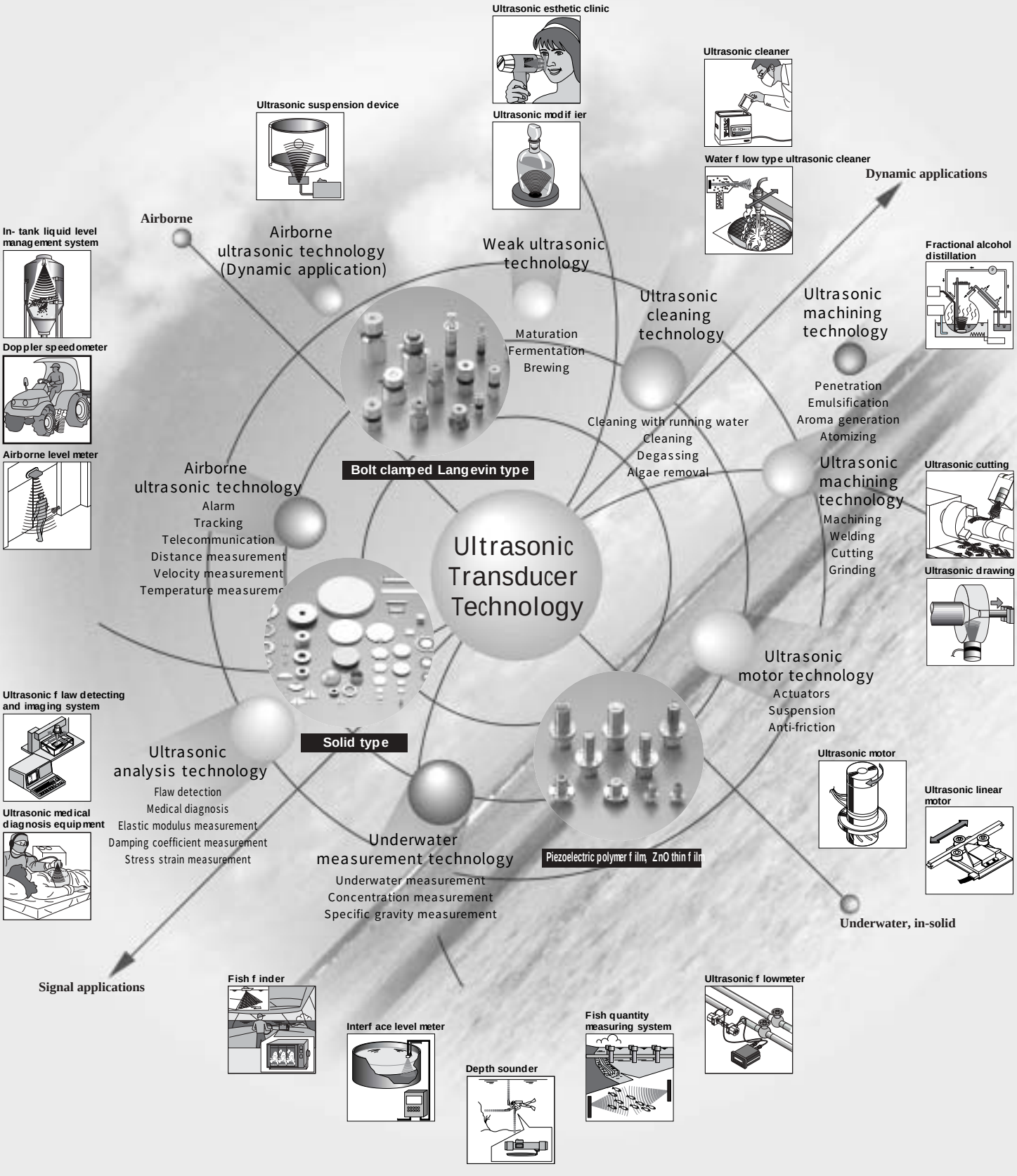
A high amplitude can be achieved with high electroacoustic conversion efficiency, low mechanical vibration loss, and less heat generation due to the unique structural design.

Model code	Standard dimensions			Joint screw size	Frequency (kHz)	Measurement voltage (Vrms)	Admittance (mS)	Static capacity (pF)	Max. input power (W)
	Weight (g)	Diameter (mm)	Length (mm)						
HEC-1340P4A	30	13	65	M6 P0.75	40	10	15	2500	20
HEC-1540P2BF	40	15	65	M6 P0.75	40	10	10	850	30
HEC-1560P4B	30	15	39	M5 P0.5	60	10	20	2300	50
HEC-2528P2BF	165	25	88	M8 P1	28	10	25	2100	150
HEC-2528P4B	180	25	89	M8 P1	28	10	40	4300	300
HEC-3020P2BF	310	30	130	M10 P1	20	10	20	3000	200
HEC-3028P2BF	225	30	90	M10 P1	28	10	20	3000	200
HEC-3028P4B	280	30	88	M10 P1	28	10	45	5750	400
HEC-3039P4B	115	30	62	M10 P1	39	10	120	7600	300
HEC-4020P4B	570	40	125	M16 P1	20	10	100	8100	500
HEC-4027P4B	445	40	89	M16 P1	27	10	120	10000	500
HEC-4028P4BH	435	40	90	M10 P1.5	28	10	130	10000	500
HEC-5020P4B	925	50	180	M18 P1.5	20	10	200	15500	700
HEC-5020P6B	980	50	124	M18 P1.5	20	10	250	23000	1000
HEC-6015P4B	1800	60	161	M20 P1.5	15	10	120	10500	1500

*In addition to the specifications above, customized transducers will be available.

The Ultrasonic Transducer Technologies are Spreading to Broader Fields.

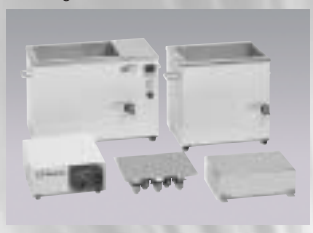
Superior transducers produce superior ultrasonic devices and instruments.



ULTRASONIC APPLICATIONS

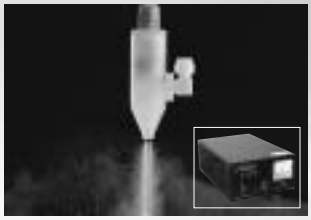
ULTRASONIC CLEANING TECHNOLOGY

Cleaning



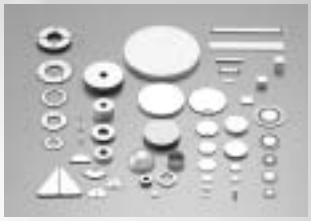
Small-article cleaning

Cleaning with running water



ULTRASONIC TRANSDUCER

Piezoelectric ceramics / piezoelectric polymer f ilm / piezoelectric thin f ilm



Bolt clamped Langevin transducer

ULTRASONIC MEDICAL DIAGNOSTIC TECHNOLOGY

Medical diagnostic imaging, Ax ial length measurement

Echo sounder

ULTRASONIC MEASUREMENT TECHNOLOGY

Underwater measurement, f low rate measurement, concentration measurement

Flaw detection, elastic modulus measurement

Ranging, velocity measurement

HIGH- POWER ULTRASONIC TECHNOLOGY

Machining, welding, cutting, grinding

Atomization, aroma generation, emulsif ication, penetration

Honda Electronics Co., Ltd. is certified and registered to be in conformity with ISO9001/EN46001.

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