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Bead beater homogenizer Ultrasonic homogenizer

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Selecting a suitable model depends on the type of sample or extractions being crushed. Consider before purchasing.

Bead beater homogenizers

Beads Crusher
μT-01N



Beads Crusher
μT-01



Beads Crusher
μT-12

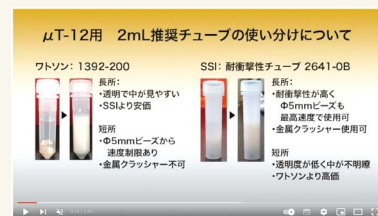


Powerful Bead Crushing without freezing various biological samples in Microtubes.

Page	Model	Suitable sample shapes and Throughput
P.100	μT-01N	<ul style="list-style-type: none"> •Solid (with/without buffer) 0.1 to 0.2 g/2 mL Microtube × 1
	μT-01	
P.101	μT-12	<ul style="list-style-type: none"> •Solid (with/without buffer) 0.1 to 0.2 g/2 mL Microtube × 12 0.2 to 1 g/5 mL tube × 2

[μT-12 "Crushing Tips and Various Samples" on YouTube!]

Beads Crusher μT-12 can crush various samples in 2 mL or 5 mL tubes. In this video, we introduce tips on how to select tubes and beads for crushing, as well as actual crushing of pig belly, fatty meat, and rice.



ビーズ破砕機μT-12 破砕のコツと、各種サンプル破砕の様子

Frozen sample crusher

Freeze Crusher
μT-48



Powerful Crushing simultaneously 48 samples frozen with liquid nitrogen. Rigid samples, Proteins weak to heat denaturation, RNA, etc. Optimum for Extraction.

Page	Model	Suitable sample shapes and Throughput
P.105	μT-48	<ul style="list-style-type: none"> •Solid (Liquid nitrogen freezing) 0.1 to 0.2 g/2 mL Microtube × Max. 48 1 to 2 g/Stainless steel-made strong crushing vessel × 4

Ultrasonic homogenizer

Ultrasonic homogenizer
VP-050N



Ultrasonic homogenizer
VP-300N



For Solubilization of cells expressed protein and Emulsification of samples. Also, random fragmentation of Genomic DNA, automatic tuning and easy operation, in addition to various operation modes according to the condition of the sample.

Page	Model	Suitable sample shapes and Throughput
P.108	VP-050N	<ul style="list-style-type: none"> •Liquid (suspension) 0.1 to 10 mL
P.109	VP-300N	<ul style="list-style-type: none"> •Liquid (suspension) 10 to 250 mL (standard) 0.1 to 500 mL (use optional parts)

NEW

Constant temperature incubator/shaker
OD Monitor

For cell culture related products

Shaker

Mixer
Rotator
Stirrer

Bead beater
homogenizer
Ultrasonic

Aluminum block Bath
Mini-size Bath

Water bath
Shaking Water bath
Immersion cooler

Hybridization
Incubator
Constant temperature
Chambers

Centrifugal
Concentrators
Cold Trap

Freeze dryers

Substrate
Electroporation apparatus
Blotting device for
hybridization

Constant-temperature
water-circulating
system [Chilled]

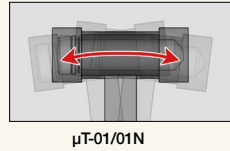
Appendix

As nucleic acid is fragmented even in any disruption method, not suitable for extraction of genomic DNA.

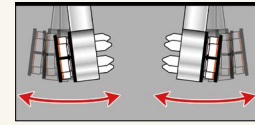
[Bead crushing by μ T Series]

Beads and Metal crushers collide by shaking, resulting in crushed samples. The crushing effect depends on the strength and the number of collisions (It is also important to use the suitable size of beads).

All μ T Series are Horizontal shaking as shown in the figure below. However, the μ T-01/01N makes the number of collisions by increasing the shaking speed while the μ T-12 makes the collision strength by increasing the amplitude. The former for microorganisms and the latter for tissue fragments. In the latter case, the advantage is that heat generation due to friction is relatively small (there is a Tube holder with excellent cold insulation). Also, since the μ T Series has a strong crushing power, adding a radical drug such as Phenol to frozen crushing and crushing samples is not recommended because of the consideration of the risk of tubes breaking.



μ T-01/01N



μ T-12

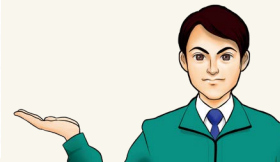
	Features	Applications	Crushing method	Shaking speed and width	Page
●	<ul style="list-style-type: none"> Outstanding stability even with high-speed shaking at 4600 r/min For one (1) sample 2 mL Microtube (Throughput 0.2 g) With Speed memory (1 x Setting) 	<ul style="list-style-type: none"> Crushing of Microbes (bacteria, chlorella, yeast) and Insects Crushing of Cells, Tissues and Organs of animals and plants Crushing of Tablets and Resin pellets (with low viscosity) 	<ul style="list-style-type: none"> Crushing by strongly striking the sample with Beads or Metal crushers by shaking in loose arc (freezing and phenol not recommended). 	<ul style="list-style-type: none"> 2000 to 4600 r/min (Stepless setting) Shaking width : small 	P.100
	<ul style="list-style-type: none"> Outstanding stability even with high-speed shaking at 4600 r/min For one (1) sample 2 mL Microtube (Throughput 0.2 g) With Timer (6-step setting) 			<ul style="list-style-type: none"> 2500 to 4600 r/min (6-step setting) Shaking width : small 	
●	<ul style="list-style-type: none"> Powerful crushing with the speed of 3200 r/min and large amplitude Up to 12 tubes of 2 mL Microtubes, 5 mL can also be used The throughput is 0.2 g/2 mL and 1 g/5 mL Microtubes 	<ul style="list-style-type: none"> Crushing of Microbes (bacteria, chlorella, yeast) and Insects Crushing of Cells, Tissues, and Organs of animals and plants Crushing of Hair for analysis and Tablets, etc. 		<ul style="list-style-type: none"> 1800 to 3200 r/min (8-step setting) Shaking width : large 	P.101



ビデオ録画機 μ 12 撮影のコツと、各種サンプル撮影の様子



ビデオ録画機 μ 12 撮影のコツと、各種サンプル撮影の様子



[Frozen Crushing with μ T-48]

Put Metal crushers and a sample in the tube and then freeze the whole holder with liquid nitrogen. Next, set them in the μ T-48 and quickly perform crushing before they are melted. Unlike the μ T-01 series and μ T-12, teeth and bones and inanimate samples such as rubber can be crushed with strong crush force by vertical longitudinal shaking with vibration and quietness slightly sacrificed in addition to the embrittlement of freezing. (recommended to use a strong stainless steel crushing vessel when crushing these rigid samples). Frozen crushing is also effective in suppressing sample decomposition and denaturation by frictional heat.



Freeze the whole holder with excellent cold insulation using liquid nitrogen

	Features	Applications	Crushing method	Shaking speed and width	Page
●	<ul style="list-style-type: none"> Crushing of frozen samples in a vessel with liquid nitrogen 2 mL Microtube or Dedicated metal container is used The throughput is 0.2 g to 2 g (Depending on the vessels) 	<ul style="list-style-type: none"> Crushing of Yeast, Mold, Tissue piece of animals and plants Crushing of bones, teeth and limbs of small animals Crushing of Wire covering and Plastics, Asbestos sample, etc. 	<ul style="list-style-type: none"> Crushing the frozen sample by colliding it with Metal crushers by vertical shaking. 	<ul style="list-style-type: none"> 0 to 2500 r/min Vertically reciprocal shaking 	P.105

[Ultrasonic crushing with VP Series]

When the tip of the chip vibrates in the liquid, this vibration is transmitted through the liquid in the form of compression waves due to the repetition of pressure difference and Innumerable bubbles that are generated, which are the nucleus of gas and particles. These bubbles are generated under low pressure and collapsed under high pressure (called Cavitation), but during the collapse, they impact and fracture the surrounding particles from all directions. "Ultrasonic-type Homogenizer" generates this cavitation efficiently and uses that for Crushing etc. In principle, Ultrasonic Crushing can be used on only objects that are present in liquid phase or through the moisture.



	Features	Applications	Crushing method	Transducer normal output and Oscillation frequency	Page
●	<ul style="list-style-type: none"> Handy type for small volume. The throughput is 0.1 to 10 mL Easy tuning completed in about 5 seconds Auto power operation to adjust output automatically during use 	<ul style="list-style-type: none"> Disruption and Solubilization of E. coli that protein expressed Random fragmentation of Genomic DNA Homogenization and Emulsification of samples 	<ul style="list-style-type: none"> Crushing or Homogenization due to cavitation generated by immersing the vibrator (chip of tip) in liquid sample. 	<ul style="list-style-type: none"> 10 to 40 W 19.5 to 20.5 kHz 	P.108
●	<ul style="list-style-type: none"> High output type using with stand. Standard throughput is 10 mL to 250 mL Easy tuning completed in about 5 seconds Oscillation function and various operation modes according to the tip used 	<ul style="list-style-type: none"> Disruption and Solubilization of E. coli that protein expressed Random fragmentation of Genomic DNA Emulsification of samples 		<ul style="list-style-type: none"> 50 to 200 W 19 to 21 kHz 	P.109

NEW

Beads Crusher μ T-01/01N

Strong crushing and High stability using High speed pendular swinging. A model equipped with Shaking speed stepless setting and Memory function as a new line-up.

- Microtubes that are used with Beads crushers --> P.102 •The data of temperature of crushed samples with this unit --> P.103
- Use of various types of crushers --> P.104



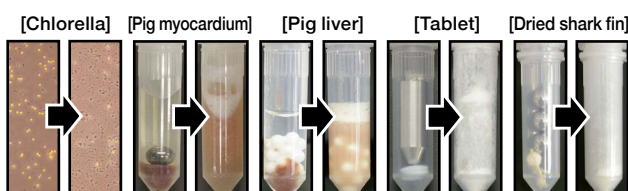
Features

- Outstanding stability even with high speed shaking at 4600 r/min
- For one simple 2 mL Microtube (Throughput 0.2 g)
- Stainless steel beads and Metal crusher can be used

Applications

- Crushing of Microbes (bacteria, chlorella, yeast) and Insects
- Crushing of Cells, Tissues and Organs of animals and plants
- Crushing of Tablets and Resin pellets (with low viscosity)

Examples These are a few examples.



Beads crushing method

This method is adapted to extract nucleic acids, proteins and residual substances from biological/environmental samples. Nucleic acids are often fragmented and basically served for PCR templates and not suitable for genome extraction. Used for human DNA identification, drug toxicological examination from human hair, seed quality examination, examination of BSE and Johne's disease, investigation of soil microflora, etc. and also sample preparation for spectroscopic analysis for resin.

Model	μ T-01	μ T-01N
Crushing method	Crushing beads with pendular swing method	
Shaking speed	2500 to 4600 r/min (6-step setting) (*1)	2000 to 4600 r/min (Stepless setting: per 100 r/min) (*1)
Capacity	1.5/2.0 mL Screw cap microtube(Outer diameter below 11 mm of the body of Microtubes can be used.)(*2)	
Applicable beads	Non-metal beads, Stainless steel beads, Metal crusher, Zirconia Crusher (*1) (*3)	
Ambient temperature	5°C to 35°C (No condensation) (*4)	
Speed memory	-	Setting
Timer	6-step setting (5, 10, 15, 30, 45, 60 seconds) (*1)	-
Safety devices/functions	Braking when cover is open during operation, Motor stopping when cover is open, Motor overcurrent protection	
Dimensions (WxDxH)/Weight	175 x 280 x 160 mm, Approx. 5 kg	
Power supply	AC100V-240V/0.5A (universal power supply)	

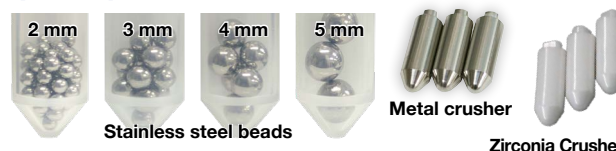
(*1) Set below 4000 r/min and 15 seconds when using Metal crusher.

(*2) Refer Recommended Microtubes on page 102.

(*3) Stainless steel beads and Metal/Zirconia crusher are available as an option. Marketed Glass and Zirconia beads can be used.

(*4) An actual shaking speed may be slower than that of specs due to load.

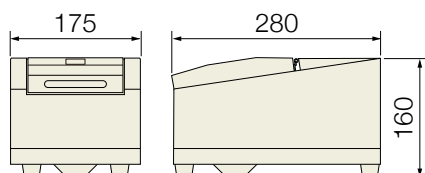
Optional parts



Product Name/Model	Remarks
Stainless steel beads ϕ2 mm	70 g (approx. 2100 pcs)
Stainless steel beads ϕ3 mm	150 g (approx. 1300 pcs)
Stainless steel beads ϕ4 mm	150 g (approx. 560 pcs)
Stainless steel beads ϕ5 mm	150 g (approx. 280 pcs)
Mixed Stainless steel beads	ϕ 2 pcs/20 g, 3 pcs/40 g, 4 pcs/40 g, 5 pcs/50 g
Metal crusher	2 mL Microtube (Conical bottom) 6 pcs
Zirconia crusher	2 mL Microtube (Conical bottom) 3 pcs

*Stainless steel beads and Metal crusher are made of stainless steel.

Dimensions (μ T-01 and μ T-01N are the same)



Constant temperature incubator shaker
 OD Monitor

For cell culture related products

Shaker

Mixer
 Rotator
 Stirrer

Bead beater
 homogenizer
 Ultrasonic
 homogenizer

Aluminum block bath
 Mini-size Bath

Water bath
 Shaking Water bath
 Immersion cooler

Hybridization incubator
 Consistent temperature chambers

Centrifugal concentrators
 Cold Trap

Freeze dryers

Substrate Electrophoresis apparatus
 Blotting device for hybridization

Constant temperature water circulating system [Chiller]

Appendix

Beads Crusher μ T-12

Strong crushing by High speed pendular swinging for various samples. 5 mL tubes can be used. Suitable for Molecular biological applications. Low heat generation due to friction.

- Microtubes that are used with Beads crushers --> P.102
- The data of temperature of crushed samples with this unit --> P.103
- Use of various types of crushers --> P.104

Features

- Powerful crushing with the speed of 3200 r/min and large amplitude
- Up to 12 tubes of 2 mL Microtubes, 5 mL can also be used
- The throughput are 0.2 g/2 mL and 1 g/5 mL Microtubes

Applications

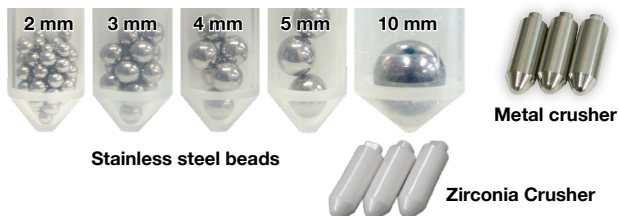
- Crushing of Microbes (bacteria, chlorella, yeast) and Insects
- Crushing of Cells, Tissues and Organs of animals and plants
- Crushing of Hair for analysis and Tablets, etc.

Optional accessories: Microtube holders



Model	Product Name/Remarks
TH-0206	1.5/2.0 mL Screw cap Microtube 6 pcs-Holder
TH-0203	1.5/2.0 mL Screw cap Microtube 3 pcs-Holder for cold storage The cold-keeping property of the sample can be increased by keeping it in the refrigerator (The screw should be loosened at below -20°C. Make sure not to refrigerate the microtube directly at below 0°C).
TH-0501	5.0 mL Screw cap Microtube 1 pc-Holder "QSP Transport Tube 5 mL" (580-GRD-Q) is recommended. Unsuitable for Eppendorf tubes.
TH-0501EP	5.0 mL Screw cap Microtube Holder for Eppendorf The maximum diameter of beads that can reach the tip of the tube is 3 mm. When crushing, use beads with a diameter of 3 mm or less, or mix beads of different sizes.

Optional parts



Product Name/Model	Remarks
Stainless steel beads ϕ2 mm	70 g (approx. 2100 pcs)
Stainless steel beads ϕ3 mm	150 g (approx. 1300 pcs)
Stainless steel beads ϕ4 mm	150 g (approx. 560 pcs)
Stainless steel beads ϕ5 mm	150 g (approx. 280 pcs)
Mixed Stainless steel beads	ϕ 2 pcs/20 g, 3 pcs/40 g, 4 pcs/40 g, 5 pcs/50 g
Stainless steel beads ϕ10 mm	150 g (approx. 36 pcs) (*)
Metal crusher	2 mL Microtube (Conical bottom) 6 pcs
Zirconia crusher	2 mL Microtube (Conical bottom) 3 pcs

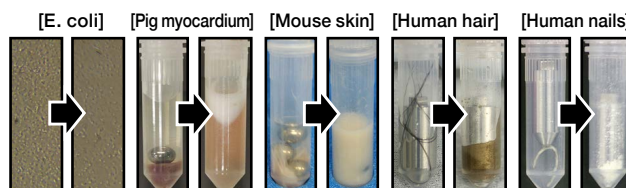
(*) For 5 mL Microtubes
• Stainless steel beads and Metal crusher are made of stainless steel.



μ T-12 with Optional Microtube holders

Examples

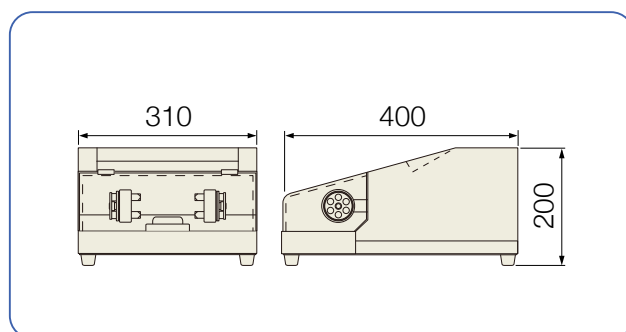
These are a few examples.



Model	μ T-12
Crushing method	Crushing beads with pendular swing method
Shaking speed	1800 to 3200 r/min (8-step setting) (*1)
Capacity	1.5/2.0 mL Screw cap microtube: Max. 12 pcs (*2) 5.0 mL Screw cap tube: Max. 2 pcs (*3)
Applicable beads	Non-metal beads, Stainless steel beads, Metal crusher, Zirconia Crusher (*4)
Ambient temperature	5°C to 35°C (No condensation)
Timer/Memory	1 to 300 seconds (Per 1 second setting. Up to 2 parameter settings can be memorized)
Safety devices/functions	Braking when the cover is open during operation, Motor overcurrent protection
Dimensions (WxDxH)/Weight	310 x 400 x 200 mm, Approx. 15 kg
Power supply	AC100V-240V/4A (universal power supply)

(*1) Set below 2500 r/min and within 30 seconds when using Metal crusher and 5 mL Tubes.
(*2) Refer Recommended Microtubes on page 102. Maximum 12 pcs when using Metal crusher.
(*3) "QSP Transport Tube 5 mL" (580-GRD-Q) is recommended. (*4) Stainless steel beads and Metal/Zirconia crusher are available as an option. Marketed Glass and Zirconia beads can be used.

Dimensions



NEW

Constant temperature incubator/shaker OD Monitor

For cell culture related products

Shaker

Mixer Rotator Stirrer

Bead beater Ultrasonic homogenizer

Aluminum block Bath Mini-size Bath

Water bath Shaking Water bath Immersion cooler

Hybridization Incubator Constant temperature Chambers

Centrifugal Concentrators Cold Trap

Freeze dryers

Substrate Electrophoresis apparatus Blotting device for hybridization

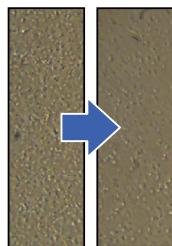
Constant-temperature water circulating system [Chiller]

Appendix

µT-12 Sample Crushing Example and Holder Usage

µT-12 Details of sample crushing example and the holders used

① E. coli (1 mL of bacterial solution suspended in Buffer)



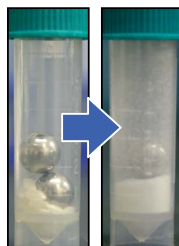
Beads: Zirconia beads ϕ 0.2 mm
Tube: 2 mL Screw cap microtube
3200 r/min, 180 s



Microtube holders for use
Versatile, high capacity holder. 1.5/2 mL Screw cap microtubes \times 6

TH-0206

③ 1 g raw rice, crushing without Buffer



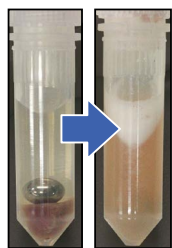
Beads: SUS beads ϕ 10 mm \times 2
Tube: 5 mL Screw cap freestanding tube
No solvent. 2000 r/min, 1 min



Microtube holders for use
Large 10 mm diameter beads with high crushing power and about 1 g sample. 5 mL \times 1
For crushing Dry matter.

TH-0501

② Pig myocardium 100 mg



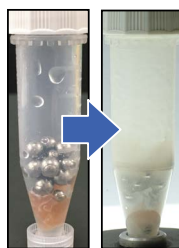
Beads: SUS beads ϕ 5 mm \times 1
Tube: 2 mL Screw cap microtube
Solvent 1 mL, 3200 r/min, 30 s



Microtube holders for use
For heat-sensitive samples, pre-cooling the holder in a freezer (up to -20°C) before use is recommended. 1.5/2.0 mL \times 3

TH-0203

④ 1 g pig belly, crushing with Buffer



Beads: SUS beads ϕ 5 mm \times 8 + ϕ 3 mm \times 10
Tube: Eppendorf 5 mL Screw cap tube
Solvent 500 μL , 2000 r/min, 1 min

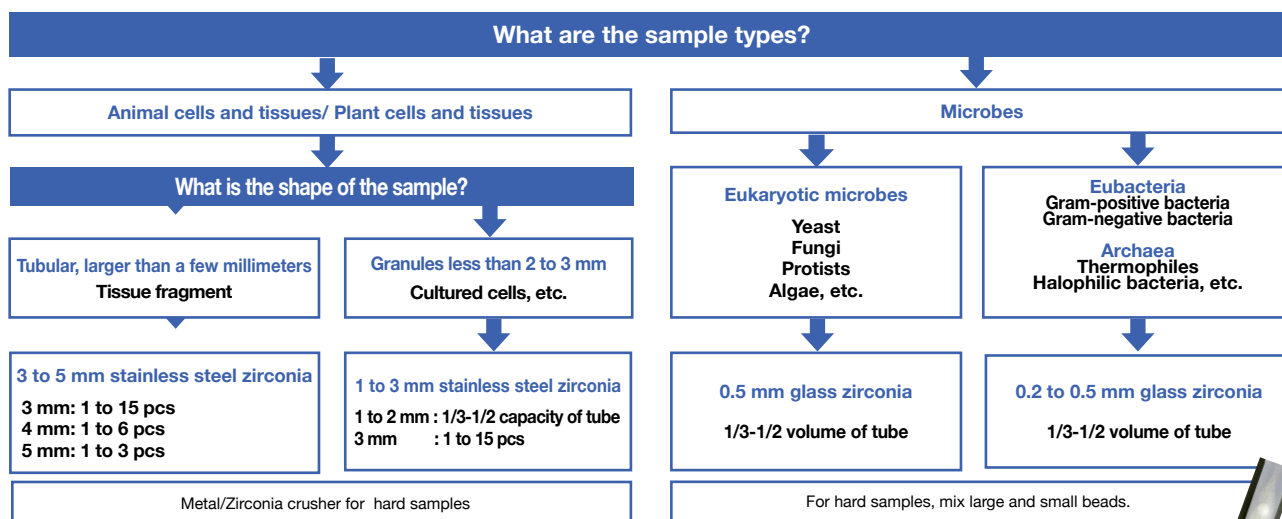


Microtube holders for use
Eppendorf 5 mL Screw cap tube and this holder are recommended **if you want to crush a sample of about 1 g with solvent.**

TH-0501EP

Selection of Beads and Microtubes for Bead Crushing

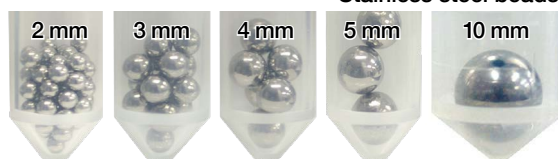
Bead Selection Criteria



Metal/Zirconia crusher for hard samples

For hard samples, mix large and small beads.

Stainless steel beads



Metal crusher



- The weight is stainless steel > zirconia > glass, and the crushing power increases in that order. 0.2 mm and other fine zirconia beads are expensive. Increase the crushing time when using more affordable glass beads.

- Stainless steel beads and metal crushers, and zirconia crushers are sold separately.
- Use commercially available glass and zirconia beads.
- The number of beads is an example for 2 mL tubes. For 5 mL tubes, increase the bead volume as needed.

Data on the temperature of samples when crushing

Data on the heat generation of samples when crushing in μ T-12

Data on the heat generation of samples when crushing in μ T-12

In Crushing of samples with beads in μ T-12, we found that the sample temp. did not rise even when the sample of RT was broken. The heat generation can be further reduced by pre-cooling the sample and/or the sample below RT can be kept with the holder for cold storage (TH-0203) after crushing it.



Vessels	Bead types and Shaking conditions	Temperature inside the vessels before shaking	Vessel temperature inside after shaking for each holder	
2.0 mL Screw cap Microtube	ϕ 3 mm zirconia \times 15 water 0.5 mL Shaking for 60 seconds at 3200 r/min	+23.5°C	6 pcs-holder	+27.8°C
			3 pcs-holder for cold storage (Pre-chilled at +4°C)	+22.5°C
			3 pcs-holder for cold storage (Pre-chilled at -10°C)	+16.3°C
	ϕ 3 mm stainless steel \times 15 water 0.5 mL Shaking for 60 seconds at 3200 r/min	+23.5°C	6 pcs-holder	+25.8°C
			3 pcs-holder for cold storage (Pre-chilled at +4°C)	+23.2°C
			3 pcs-holder for cold storage (Pre-chilled at -10°C)	+17.0°C
	ϕ 5 mm stainless steel \times 2 water 0.5 mL Shaking for 60 seconds at 3200 r/min	+23.0°C	6 pcs-holder	+25.1°C
			3 pcs-holder for cold storage (Pre-chilled at +4°C)	+22.9°C
			3 pcs-holder for cold storage (Pre-chilled at -10°C)	+17.5°C
	Metal crusher \times 1 no solvent Shaking for 30 seconds at 2500 r/min	+23.3°C	6 pcs-holder	+29.3°C
			3 pcs-holder for cold storage (Pre-chilled at +4°C)	+24.3°C
			3 pcs-holder for cold storage (Pre-chilled at -10°C)	+19.2°C
5.0 mL Screw cap Test tube	ϕ 5 mm stainless steel \times 15 water 2.0 mL Shaking for 60 seconds at 2500 r/min	+23.3°C	+25.4°C	

•The sample temp. before and after shaking measured with thermocouple in each condition. •After shaking, the sample temp. with stainless steel beads rose about 2°C and that with zirconia beads and Metal crusher rose about 4°C and 6°C respectively. •The sample temp. was almost constant before and after shaking when using 3 pcs-holder for cold storage with sufficient pre-cooling in a refrigerator (4°C). •The sample temp. dropped by about 5°C on average compared to before shaking when using 3 pcs-holder for cold storage that was fully pre-cooled in the freezer (-10°C). •Do not cool the 3 pcs-holder for cold storage at temp below -20°C. It may cause the screws get loosen from metal shrinkage. •Do not use tubes that have been cooled directly at negative temp. The tubes will be easily broken.

About 2 mL recommended tubes

- 1 SARSTEDT made 72.693 for less than ϕ 3 mm beads (Crushing of Bacteria and Yeast).
- 2 Scientific Specialties Inc. (US) made 2641-0B for ϕ 4 to 5 mm beads or Metal crushers (Animals and Plants cell and Rigid samples). SARSTEDT 72.693 could be used for low speed. See the right page for details.

[Impact-resistant tubes for use with ϕ 4 to 5 mm beads and metal crushers]

Shatter Resistant 2.0 mL Tube & Cap Made by Scientific Specialties Inc. (US)



The strength test of this impact-resistant tube resulted in no damage even if it was shaken with ϕ 5 mm Stainless steel beads and Metal crushers in μ T-01/ μ T-12, as long as it is within the speed limit. (See the "Details for Scientific Specialties-made Microtubes" on the right page.)

In fact, this tube is slightly difficult to tell whether the sample can be crushed well due to its white translucent color.

Therefore, SARSTEDT 72.693 is recommended if you prefer a tube that is highly visible inside. Please note that SARSTEDT has a speed limitation. (See the "Limitation on SARSTEDT 72.693 on the right page.)

This tube is recommended for the crushing of rigid tissue or plant seeds.

μ T-12 About 5 mL recommended tubes



TH-0501

Optional holders for μ T-12

•QSP Transport Tube 5 mL (580-GRD-Q) is recommended as a 5 mL freestanding tube for TH-0501. For dry matter. up to 2200 r/min for 1 \times Φ 10 mm SUS bead, up to 2000 r/min for 2 beads.



TH-0501EP

•Use the dedicated TH-0501EP holder for Eppendorf 5 mL tubes.

The maximum diameter of beads that can reach the tip of the tube is 3 mm. When crushing, use beads with a diameter of 3 mm or less, or mix beads of different sizes.

How to use Bead beater homogenizers, Frozen sample crusher, and Ultrasonic homogenizers

Easily crush microbes

Bead crushing in 2 mL tube. For crushing E. coli and yeast.

The bead crushing method, in which beads and samples are placed in a microtube and shaken vigorously, is fast, convenient, and powerful. It is ideal for protein and DNA extraction from microbes with 1 to 2 mL of culture medium.

- For larger volume crushing, use an Ultrasonic homogenizer.
- For RNA extraction, we recommend the use of a Frozen sample crusher.



In bead crushing, it is important to use beads of the appropriate size for the sample. (Listed on P.102).

In the crushing of Microbes with hard cell walls, such as yeast, the crushing power is increased by adding one large-diameter bead in addition to the main small-diameter beads.



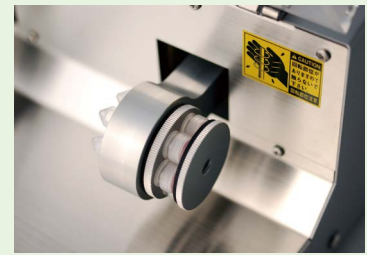
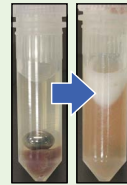
--> μ T-01/01N/12 series + commercially available glass or zirconia beads (P.100 to 101)

Crush tissue and tablets

Bead crushing can be processed to the hardness of cartilage. For Tissues and Organs of animals and plants.

For samples such as a piece of meat, 0.1 to 0.2 g/2 mL tube or 1 g/5 mL tube can be processed. For a piece of tissue as small as the heart or liver, we recommend using a 5 mm bead, and for harder tissue, we recommend using a Metal crusher.

- Harder bones, plastics, etc. should be crushed with a Frozen sample crusher.

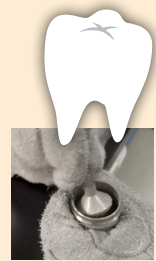


--> μ T-01/01N/12 series + Optional stainless steel beads or Metal crusher (P.100 to 101)

For RNA extraction

Extraction of RNA and hard samples such as bones can be done with a Frozen sample crusher.

Bead crushing is easy, but the crushing force is strong. For safety reasons, we do not recommend beads crushing method in the presence of phenol or other harsh chemicals, and using liquid nitrogen for frozen crushing. For RNA extraction, a Frozen sample crusher is recommended. Hard samples such as bone fragments and teeth can also be brittle at cryogenic temperatures and crushed in a sturdy stainless steel vessel.



--> μ T-48 + Holder for 2 mL tube/Stainless steel-made strong crushing vessel (P.105)

Crushing large-volume E. coli

Use Ultrasonic homogenizer for processing several mL to several hundred mL of E. coli.

The maximum tube volume that can be used with TAITEC's bead beater homogenizers is 5 mL. If you need to crush larger volumes of bacteria, use an Ultrasonic homogenizer and use the appropriate horn for the volume to be processed.

*Microbes with cell walls, such as chlorella, and plant and animal tissues are difficult to crush with ultrasound. Use a Bead beater homogenizer or Frozen sample crusher with stronger crushing power, although the amount of the volume to be processed per one time is lower.



If the amount of bacterial solution is too large and crushing takes time, use a Bead bath instead of ice to keep the vessel stable and in place while crushing.

--> VP-050N, VP-300N (P.108 to 109)

Freeze Crusher μ T-48

Powerful crushing of frozen samples with liquid nitrogen. 48 samples can be treated simultaneously. Optimum for extracting hard samples, proteins susceptible to heat denaturation, RNA, etc.

•Example of various frozen crushed samples including inanimate objects. --> P.106-P.107

Features

- Crushing of frozen sample in vessels with liquid nitrogen
- 2 mL Microtube or Dedicated metal container are used
- The throughput is 0.2 g to 2 g (Depends on the vessels)

Applications

- Crushing of Yeast, Mold, Tissue piece of animals and plants
- Crushing of bones, teeth and limbs of small animals
- Crushing of Wire covering and Plastics, Asbestos samples, etc.



Vertically reciprocal shaking



The procedure for freeze crushing Work gloves are worn when freezing the sample with liquid nitrogen in the photo. Use gloves that are suitable for handling liquid nitrogen in actual use.



1 Put the specified amount (below) of sample and metal crusher into the vessel.



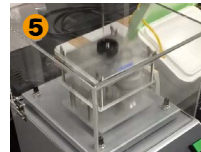
2 When a vessel requires a holder, attach it in the holder.



3 Soak and freeze in liquid nitrogen until bubbling stops.



4 Quickly attach to the μ T-48 main unit.



5 Close the hood and check the time and shaking speed, and then start crushing.



6 After crushing, take out the crusher and proceed to the next process.

Adapted to various samples with 3 types of vessel holders

Powerful crushing of frozen samples with liquid nitrogen. Living tissues and organs, Hard tissues such as bones, etc. and also some inanimate samples such as rubber and plastic can be crushed. Adapted to Marketed 2 mL tubes and Dedicated stainless steel crushing vessels.

Optional accessories: Vessel holders



Product Name / Model / Remarks

① 48pcs-Holder for μ T-48 TH-0248T

1 pc of Holder (Capacity : 48 pcs of 2.0 mL round bottom Microtubes) and 100 pcs of Metal crushers come as a set. Sample throughput is 0.1 to 0.2 g/1 pc.

② 3pcs-Holder for μ T-48 TH-0203T

4 pcs of Holders (Capacity : 3 pcs of 2.0 mL round bottom Microtubes), 24 pcs of Metal crushers and Rack come as a set. 4 holders can be attached to μ T-48 (max. 12 tubes of 2.0 mL), which is superior to TH-0248T in heat retention.

③ Stainless steel-made strong crushing vessel TH-SPT

Crushing vessel 4 pcs, Dedicated crusher and Rack come as a set. Suitable for samples that cannot be crushed by Microtube with Metal crusher. Larger amount of samples (1.0 to 2.0 g/1 pc) can be crushed than that of Microtubes.

Recommended shaking speed in each crushing sample

- Stainless steel strong crushing vessel: Up to 1000 r/min
- Metal crusher: Up to 1200 r/min
- Crushing beads: Up to 1600 r/min

A shaking speed that is higher than the above speeds may cause breakage of tubes and vessels. Therefore, make sure to observe the shaking speeds above.

USER'S VOICE

Very useful when extracting substances susceptible to denaturation and degradation of RNA and proteins.



Model	μT-48
Crushing method	Vertically reciprocal shaking
Shaking speed	0 to 2500 r/min (*1)
Capacity	2.0 mL Microtube: Max. 48 pcs (*2)(*3) Stainless steel powerful crushing vessel : Max. 4 pcs (*3)
Timer	1 to 999 seconds
Safety devices/functions	Holder attachment detection switch, Cover opening detection switch
Dimensions (WxDxH)	220 x 310 x 315 mm
Weight	Approx. 10.0 kg
Power supply	AC100V/1A (Need a step-down transformer)

(*1) Around 1200 r/min should be necessary and sufficient condition to crush the sample in actual use.

(*2) Eppendorf "Safe-Lock Tube 2 mL" is recommended. (*3) Microtube and Stainless powerful crushing vessel are available as an option.

NEW

Constant-temperature incubator/shaker OD Monitor

For cell culture related products

Shaker

Mixer Rotator Stirrer

Bead beater Ultrasonic homogenizer

Aluminum block Bath Mini-size Bath

Water bath Shaking Water bath Immersion cooler

Hybridization Incubator Constant-temperature Chambers

Centrifugal Concentrators Cold Trap

Freeze dryers

Substrate Electrophoresis apparatus Blotting device for hybridization

Constant-temperature water-circulating system [Chilled]

Appendix

Example ① Freeze crushing of various samples including inanimate samples

Embrittlement by freezing enables strong crushing.
The freeze crushing with μ T-48 is also suitable for Obligatory anaerobe samples.



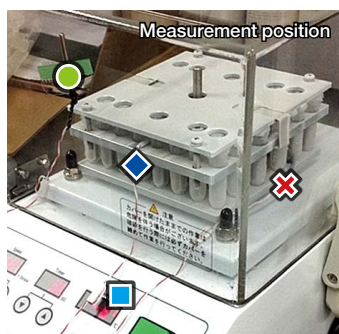
•Freeze Crusher μ T-48 --> P.105

Test results

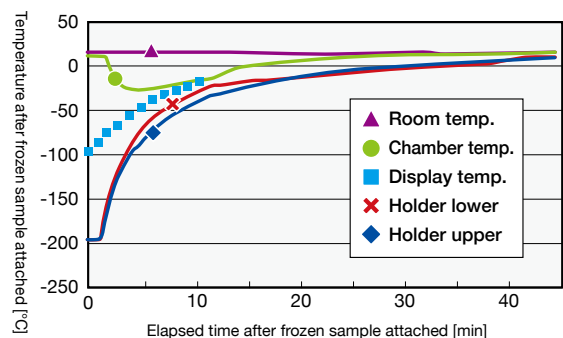
- Freezing method Immerse the vessels with the sample and crusher into liquid nitrogen (2.0 mL: Vessel holder) and then freeze them.
- Rushing time 30 sec (Additional 30 sec if not completely crushed)
- Judgment whether sample is crushed Whether powder forms or nearly forms (Cut samples into any size that can be put in vessels).
- Vessels
 Safe-Lock tube 2.0 mL ...Marketed product (Made by Eppendorf)
 Metal crusher.....Included in Optional 48 pcs-holder for μ T-48 (used in this experiment)
 Stainless steel-made strong crush vesselsOptional parts (Dedicated crusher is included.)

<p>Chicken thigh</p> <p>Vessels: Safe-Lock tube 2.0 mL Sample volume: 0.1 g Shaking speed: 1200 r/min Crushed with: Metal crusher</p>	<p>Human hair</p> <p>Vessels: Safe-Lock tube 2.0 mL Sample volume: 0.1 g Shaking speed: 1200 r/min Crushed with: Metal crusher</p>	<p>Human nails</p> <p>Vessels: Safe-Lock tube 2.0 mL Sample volume: 0.2 g Shaking speed: 1200 r/min Crushed with: Metal crusher</p>
<p>Mouse skin (with body hair)</p> <p>Vessels: Safe-Lock tube 2.0 mL Sample volume: 0.2 g Shaking speed: 1200 r/min Crushed with: Metal crusher</p>	<p>Mouse heart</p> <p>Vessels: Safe-Lock tube 2.0 mL Sample volume: 0.2 g Shaking speed: 1200 r/min Crushed with: Metal crusher</p>	<p>Mouse tail</p> <p>Vessels: Stainless steel-made strong crush vessel Sample volume: 1 g Shaking speed: 1000 r/min Crushed with: Dedicated crusher</p>
<p>Hypocotyl of Radish</p> <p>Vessels: Safe-Lock tube 2.0 mL Sample volume: 0.2 g Shaking speed: 1200 r/min Crushed with: Metal crusher</p>	<p>Okra seeds</p> <p>Vessels: Safe-Lock tube 2.0 mL Sample volume: 2 pcs Shaking speed: 1200 r/min Crushed with: Metal crusher</p>	<p>Hard rubber (Polychloroprene)</p> <p>Vessels: Stainless steel-made strong crush vessel Sample volume: 2 g Shaking speed: 1000 r/min Crushed with: Dedicated crusher</p>

Frozen sample/Holder temperature (Reference)



The 48 pcs-holder for 2 mL tube TH-0248T with 48 tubes and Metal crusher that was frozen with liquid nitrogen was attached to the unit. Then, the temperature change of each part while shaking at 1200 r/min was measured. The cryogenic temp. was completely kept for 30 to 60 sec which was required for crushing. The display temp. indicates the temp. stage of the top surface on which the holder is placed.



Example ② Freeze crushing of various samples including inanimate samples

Freeze crushing of Plastic samples using Freeze crusher μ T-48 with Stainless steel-made strong crush vessel.

• Freeze Crusher μ T-48 --> P.105



Results and Examination

We tried some crushing of samples such as polystyrene, polypropylene, and polycarbonate that are well known. Each result is as follows.

<p>Polystyrene①: Fair</p> <p>Sample shape and volume: φ6 mm ball shaped, 1 g Shaking speed: 1000 r/min Crushing time: 300 sec</p>	<p>Polystyrene②: Fair</p> <p>Sample shape and volume: φ6 mm ball shaped, 0.4 g Shaking speed: 1000 r/min Crushing time: 300 sec</p>	<p>Polystyrene③: Excellent</p> <p>Sample shape and volume: 10 mm square chip shaped, 0.5 g Shaking speed: 1000 r/min Crushing time: 180 sec</p>
<p>Polypropylene①: Good</p> <p>Sample shape and volume: 10 mm square chip shaped, 0.5 g Shaking speed: 1000 r/min Crushing time: 150 sec</p>	<p>Polypropylene②: Good</p> <p>Sample shape and volume: 10 mm square chip shaped, 0.5 g Shaking speed: 1100 r/min Crushing time: 300 sec</p>	<p>Polycarbonate: Poor</p> <p>Sample shape and volume: 10 mm square chip shaped, 0.5 g Shaking speed: 1000 r/min Crushing time: 300 sec</p>

Polystyrene was able to be powdered completely (③). However, in case of the φ6 mm ball-shaped sample, there were large fragments that remained at a certain rate even after trying with different amounts and crushing times (①②). It seems that the ball-shaped sample remained uncrushed if it is stuck in upward of the crusher.

The result suggests that the shape of the sample is better to be like a chip shape (or a tablet shape) Polypropylene in order to be crushed into fine fragments. However, it was not crushed into powder (①). In order to improve (although the shaking speed limit is exceeded when using a strong crushing container), the shaking speed was performed at 1100 r/min for 5 minutes. It becomes fine, but like a braided piece of cotton (②). At this stage, it becomes difficult to collect unless suspended in a solvent.

Polycarbonate proved to be difficult to crush. Even if the shaking speed was reduced to 1100 r/min or by reducing sample amount, the result of this experiment was that only a small amount of powder was produced and the chip shape remained almost unchanged.

Freeze crushing procedure when using stainless steel-made strong crushing vessel

An adjustable plier is useful for taking the Stainless steel-made strong crushing vessel (referred to as crushing vessel) in and out of the liquid nitrogen. Make sure to wear leather gloves when touching the frozen crushing vessel or the vessel holder that has become cold by contacting the frozen vessel. Make sure to ventilate the room well when using liquid nitrogen as there is risk to get Anoxia unknowingly because vaporized liquid nitrogen can become a huge volume of nitrogen gas.

- Pour liquid nitrogen into a polystyrene foam container. *1
- Put the weighed sample *2 into the crushing vessel.
- Put the dedicated crusher into the crushing vessel and close the lid tightly.
- Submerge the crushing vessel in liquid nitrogen completely with the adjustable plier, etc.
- Close the Styrofoam container with the lid and wait until the liquid nitrogen is boiling.
- Take out the crushing vessel with *3 adjustable plier, etc. when the boiling settles down.
- With your glove, take the crushing vessel that you have just taken out.
- Place the crushing vessel on the unit and put on the lid of the mounting rack. *4
- Secure the lid of the rack with the black-colored knob. *5
- Shake at the prescribed speed and time.
- After the shaking is complete, open the lid and check inside it. *6
- It is complete when the sample is crushed satisfactorily. *7

*1. Desirable to use the minimum-sized polystyrene foam container that the required number crushing vessels can be immersed to minimize the amount of liquid nitrogen used.

*2. The processing capacity of the crushing vessel is 1.2 g per 1 pc while it is better to make it to 0.5 g per 1 pc for plastic samples (Up to 1 g polystyrene can easily be crushed by freezing).

*3. Wait for at least 2 minutes after the boiling is settled out to freeze the sample in the crushing vessel sufficiently.

*4. Place at least two "frozen" Stainless steel-made strong crushing vessels for balance and secure fixation. Because metal shrinks when frozen, both vessels must be frozen to ensure a firm fixation.

*5. In December 2017, the rack was changed to a new type that does not require thumbscrews to secure vessels.

*6. The crushed sample may stick to the crusher so tap it with the inner wall of the vessel to drop it.

*7. If the crushing is insufficient, return the crusher to the unit to freeze it and shake again.

Ultrasonic homogenizer VP-050N

Automatic tuning and easy operation. Various operation modes according to the condition of samples. Small hand-held type is suitable for small-volume samples. For disruption of E. coli, etc. after expression of protein.



VP-050N with Stepped Micro Tip (Optional)

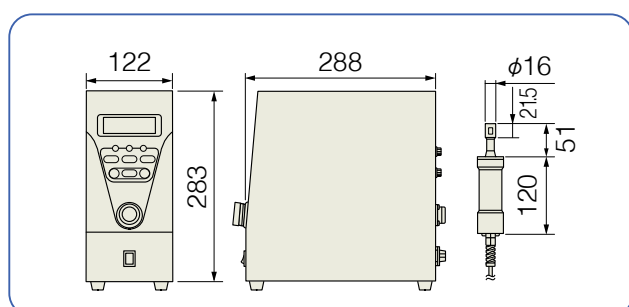
Automatic tuning and Operation mode

The automatic tuning before use is completed in about 5 seconds just by pressing the button. Possible for Timer operation and Program interval operation. Equipped with PWM operation mode that automatically adjusts the output according to the viscosity change of the sample. It is also equipped with POW operation mode that performs stable oscillation when the sample viscosity and temp. changes are small.

Model	VP-050N
High frequency output	Maximum 50 W
Transducer normal output	10 to 40 W
Oscillation frequency range	19.5 to 20.5 kHz
Turning	Automatically
Operation mode	PWM operation: Automatic output adjustment according to viscosity change of sample POW operation: Stable oscillation when change in viscosity or temp are small
Other functions	Timer operation (1 sec to 120 min) Programmed interval operation (ON: 3 to 60 sec, OFF: 1 to 60 sec)
Display	Real time output value %, Output value setting %, Output value when oscillation start (%), Oscillation frequency
Configuration	Main unit, Converter (Horn/Oscillation switch integrated)
Oscillation switch	Equipped in both Main unit and Converter (Optional foot switch can be used)
Dimensions (WxDxH)	122 x 288 x 283 mm
Weight	Approx. 4.5 kg
Power supply	AC100V/1A (Need a step-down transformer)

•Optional step type Micro Tip required for use. •The chips for the previous model VP-5S cannot be used. The chips for this model can be used in the previous model VP-5S. •The chips for this model cannot be used in the previous model VP-5.

Dimensions



Features

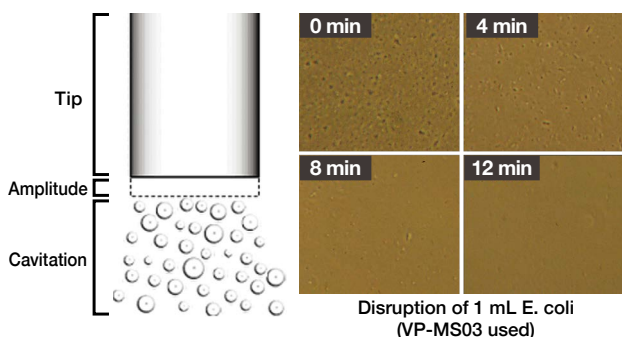
- Handy type for small volume. The throughput is 0.1 to 10 mL
- Easy tuning completed in about 5 seconds
- Auto power operation to adjust output automatically during use

Applications

- Disruption and Solubilization of E. coli where protein is expressed
- Random fragmentation of Genomic DNA
- Homogenization and Emulsification of samples

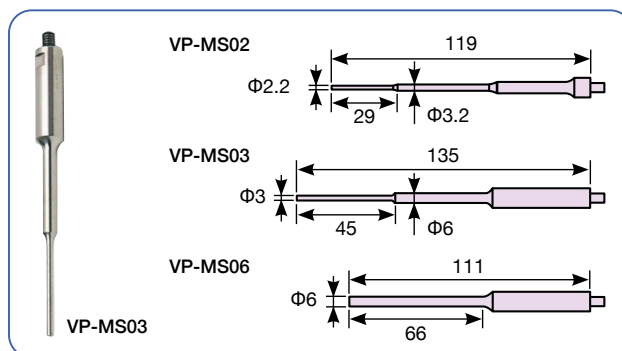
Sonication

The vibration of the tip causes a cavitation of innumerable bubbles in the liquid to disrupt the object. The advantage is that the object can be disrupted uniformly. On the other hand, Intermittent operation or Ice-cooling of the sample is recommended as the sample may generate heat.



Disruption of 1 mL E. coli (VP-MS03 used)

Optional accessories



Product Name/Model	Remarks
Φ2mm Stepped Micro Tip VP-MS02	Throughput 0.1 to 10 mL
Φ3mm Stepped Micro Tip VP-MS03	Throughput 0.25 to 10 mL
Φ6mm Stepped Micro Tip VP-MS06	Throughput 2 to 10 mL
Foot switch VP-FS01	Compatible with VP-300N

(*)Microtubes (0.5/1.5/2.0 mL) can be used with Φ2 mm and Φ3 mm. •Each material of the Chip is Titanium. Replace the Chips if necessary as it is a consumable. •Compatible with previous models (VP-5S/15S/30S/60S). Confirm that the Chips can be used in the instruction manual.

Ultrasonic homogenizer VP-300N

Easy operation. High output is suitable for large volume samples. Used with the stand. Various horn options are also available.

Features

- High output type used with a stand, Standard throughput is 10 mL to 250 mL
- Easy tuning completed in about 5 seconds
- Oscillation function and various operation modes according to the chip used

Applications

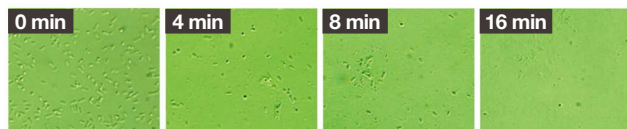
- Disruption and Solubilization of E. coli where protein is expressed
- Random fragmentation of Genomic DNA, Emulsification of samples



VP-300N with Optional stand

Oscillation and Operation mode

Optimal oscillation is done by setting the chip used on the screen. PWM operation mode automatically adjusts the output according to the viscosity change of the sample. POW operation mode performs stable oscillation when the sample viscosity and temp. SEN operation mode controls the output so that the value of oscillation sensor inside constantly. (Effective for Sonicating for a long time with optional continuous disruption cell)



Disruption of E. coli 35 mL (50 mL Centrifuge tube and ϕ 12 mm standard horn used)

Optional Make sure to read the next page for the combinations.

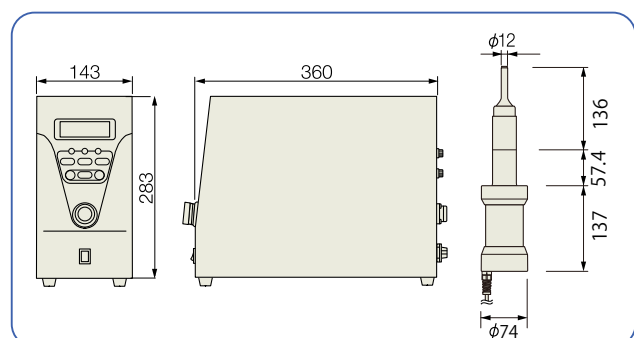
Product Name/Model	Remarks
Φ12 mm Standard horn VP-HN12 *standard accessory of VP-300N	For 10-250 mL sample (*) This product includes VP-ET12.
Φ20 mm Standard horn VP-HN20	For 25-500 mL sample (*) This product includes VP-ET20.
Φ12 mm Tip VP-ET12	For Replacement when consumed
Φ20 mm Tip VP-ET20	For Replacement when consumed
Φ12 mm Extender VP-EX12	L 100 mm version of VP-ET12
Φ20 mm Extender VP-EX20	L 100 mm version of VP-ET20
Φ3 mm Tapered Micro Tip VP-MT03	For 1-10 mL, Tip diameter ϕ 3.5 mm
Φ5 mm Tapered Micro Tip VP-MT05	For 2-10 mL, Tip diameter ϕ 5 mm
Φ6 mm Tapered Micro Tip VP-MT06	For 3-10 mL, Tip diameter ϕ 6.6 mm
Coupler VP-CP01	For connection with Stepped Micro Tip
Φ2 mm Stepped Micro Tip VP-MS02	For 0.1-10 mL, Tip diameter ϕ 2.2 mm
Φ3 mm Stepped Micro Tip VP-MS03	For 0.25-10 mL, Tip diameter ϕ 3 mm
Φ6 mm Stepped Micro Tip VP-MS06	For 2-10 mL, Tip diameter ϕ 6 mm
Dedicated stand VP-ST30	Almost required in VP-300N
Absorption silencer VP-SB01	No need to stand when use
Foot switch VP-FS01	Foot switch

(*) In E. coli, considering the efficiency, the throughput is ideally around the described median. When it reaches Max amount, processing takes time (approx. 15 min with about 35 mL for crushing of above 90% in ϕ 12 mm, approx. 40 min with 250 mL).

Model	VP-300N
High frequency output	Maximum 300 W
Transducer normal output	50 to 200 W (*)
Oscillation frequency range	19 to 21 kHz
Turning	Automatically
Operation mode	PWM operation: Automatic output adjustment according to viscosity change of sample POW operation: Stable oscillation when change in viscosity or temp are small SEN operation: Controls the output so the value of oscillation sensor inside is constant
Other functions	Timer operation (1 sec to 120 min) Programmed interval operation (ON: 3 to 60 sec, OFF: 1 to 60 sec)
Display	Real time output value %, Output value setting %, Oscillation frequency, The tip used, Operation mode
Configuration	Main unit, Converter, ϕ 12 mm Standard horn (Pre-installed Tip)
Oscillation switch	Equipped in Main unit (Optional foot switch can be used)
Dimensions (WxDxH)/Weight	143 x 360 x 283 mm, Approx. 6.7 kg
Standard accessories	Standard horn (ϕ 12 mm: VP-HN12), Tip (ϕ 12 mm: VP-ET12)
Power supply	AC100V/5A (Need a step-down transformer)

(*) The upper limit varies depending on the horn and the tip used.

Dimensions



NEW

Constant temperature incubator/shaker
OD Monitor

For cell culture related products

Shaker

Mixer
Rotator
Stirrer

Bead beater
Ultrasonic homogenizer

Aluminum block Bath
Mini-size Bath

Water bath
Shaking Water bath
Immersion cooler

Hybridization
Incubator
Constant temperature Chambers

Centrifugal Concentrators
Cold Trap

Freeze dryers

Substrate Electrophoresis apparatus
Blotting device for hybridization

Constant-temperature water circulating system (Chilled)

Appendix

Optional accessories for Ultrasonic homogenizer VP-300N

Variety of options such as the Chip, Cell combined with Standard horn, and Stepped Micro Tip (Compatible with that for VP-050N) combined with Couplers for are available in VP-300N. Current Chips for VP-300N can be used with the previous model VP-15S/30S. (Except for Couplers and stepped Micro Tip)

Stepped Micro Tip for VP-050N combined with Couplers can be attached to the converter for VP-300N.

Use it when a chip that is thinner than Tapered Micro Tip is required. It is consumed gradually by use.



**Stepped Micro Tip
VP-MS02/03/06**



**Coupler
VP-CP01**
(Attach by removing the standard horn)



Various optional accessories can be chosen according to samples and vessels in VP-300N.

VP-300N with Converter



**Standard horn
VP-HN12/20**
(Attach any of the following)



**Tip
VP-ET12/20**
(Comes with Standard horn)

This is attached on the Tip of the Standard horn and will be gradually consumed by use so it should be replaced regularly. (Comes in Standard horn)



**Extender
VP-EX12/20**

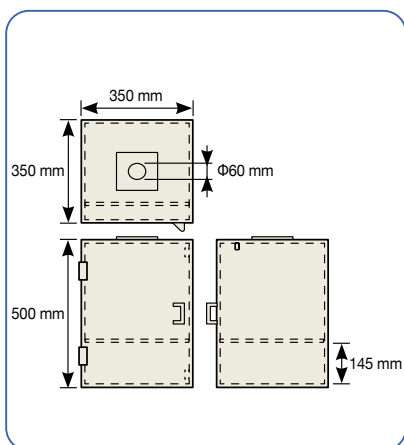
This is used when processing the sample in deep vessels (e.g. Separatory funnel) that the Standard horn/chip cannot reach the sample. Attach it on the Standard horn. It will be consumed gradually by use.
* It cannot be immersed deeply in liquid. The immersible part is up to 2 cm to 3 cm from the chip (Total length 10 cm).



**Tapered Micro Tip
VP-MT03/05/06**
(Only VP-HN12 can be attached)

This is used to process samples in thin and deep vessels that the sample cannot be put inside it. It is attached to the Standard horn and will be consumed gradually by use.

Absorption silencer Dimensions



Absorption silencer VP-SB01

The converter is fixed to the top surface for crushing process internally to make the offensive resonance noise lower during ultrasonic oscillation.

* It cannot be used with Continuous crushing cell and/or the Cup horn that we have sold in the past.



**Dedicated stand VP-ST30
(with Converter)**

This is used to fix the converter (Absorption silencer and Stand required in VP-300N). Prepare a telescopic table, etc. on that the sample vessels being placed if necessary.