

*Sample Preparation*

**PRODUCTOVERVIEW**



**MILLING SIEVING DIVIDING**



**1920**

Company founded as a technical precious stones dealer



**1955**

Specialising in sample preparation and particle sizing



**1962**

First patent: FRITSCH Planetary Mill



**1985**

First step into Laser-Technology



**1998**

Opening of the first foreign representative office in Singapore



**2007**

Milling down into the nano range



**2012**

FRITSCH *premium line* offensive for hightech laboratory mills

# TRADITION WITH A FUTURE

FRITSCH is more than just a brand: it is backed by a strong, medium-sized, family business in its fourth generation, which has been firmly embedded in the region since 1920 and globally active for decades with subsidiaries in Russia, Singapore, China and the USA as well as 2 employees in France. Today, this tradition is continued by Robert Fritsch, with the support of technical director Wolfgang Mutter, general sales manager Wolfgang Simon, and approximately 100 employees. And with Sebastian and Maximilian Fritsch the next generation is ready to follow.

FRITSCH laboratory instruments for milling, sizing, sieving and dividing set the standard worldwide and are synonymous with efficient, reliable operation in industry and research. The innovative ideas of our development department are inspired by the close relationship with our customers and their practical work in the lab. Satisfied customers worldwide count on our quality, our experience and our service. This makes us proud and motivates us.

## FRITSCH. ONE STEP AHEAD.



**2014**

New production facility at company's site in Idar-Oberstein



**2015**

A new generation is ready to follow



# CONTENT

<b>➤</b>	<b>SAMPLE PREPARATION</b>	
	Homogenisation and division .....	5
	Choosing the type of comminution .....	6
	The right mill for every material .....	7
<b>➤</b>	<b>MILLING</b>	
	Ball Mills .....	8
	Planetary Mills .....	9–11
	Mortar Grinder .....	14
	Knife Mill .....	15
	Cutting Mills .....	16–17
	Rotor / Beater Mills .....	18–19
	Jaw Crushers .....	20–21
	Disk Mills .....	22–23
<b>➤</b>	<b>SIEVING</b>	
	Sieve Shakers .....	24–25
<b>➤</b>	<b>DIVIDING / FEEDING / CLEANING</b>	
	Sample Dividers .....	26–27
	Sample Feeders .....	28
	Ultrasonic Cleaners .....	29
<b>➤</b>	<b>WORLDWIDE AT YOUR SERVICE</b>	
	Service and application consultation .....	30–31

## FRITSCH PARTICLE TECHNOLOGY

### Static Light Scattering and Dynamic Image Analysis

Choose FRITSCH Particle Sizers to take advantage of the technical superiority resulting from more than 30 years of practical experience in the field of hightech particle technology: Static Light Scattering in a convergent laser beam and Dynamic Image Analysis for exact information about particle size distribution and particle shape in a single range of instruments – total measuring range: 0.01 µm–20 mm.

[www.fritsch-international.com/particle-sizing](http://www.fritsch-international.com/particle-sizing)





# OPTIMAL SAMPLE PREPARATION

## for first-rate analysis

The quality of every product or material analysis depends on the quality of the sample preparation. It is therefore extremely important to consider all the individual milling parameters in order to make an informed choice: material properties of the sample such as density, degree of hardness, feed size, sample quantity, grinding time and desired final fineness, any abrasion of the grinding parts, temperature sensitivity or residual moisture – all these factors are significant. And of course the costs. For this reason, FRITSCH offers a wide selection of high-performance mills with various comminution principles for every application and every specific need. They are all easy to operate and quick to clean. For highly efficient work in the lab.

### Homogeneous samples

Sample homogeneity is one of the key requirements of a precise analysis. In specific terms, this means that the material you're using for the analysis must represent all the components or properties of the original sample in an even proportion. Beans, for example, consist of a seed coat (their outer shell), the seed leaf and the radicle. This is why they have to be homogenised during a grinding process so that the sample to be analysed has a representative quantity of all three components. This analysis preparation process is necessary for the majority of all samples. FRITSCH Cutting Mills or Variable Speed Rotor Mills, for example, provide valuable assistance in this regard.

**Our suggestion: Analytical fineness**

In the case of most analytical methods, the required final fineness of the sample material to be analysed is between 20 µm and 2 mm.

### Representative sample division

Often, you only need a small quantity of the original sample for your analysis. Choosing a subsample of your sample material at random would falsify the analysis result. Here, too, it is essential to create representative subsamples with absolutely identical properties like the original sample – no matter whether division takes place before or after the grinding process. You will find the ideal FRITSCH Sample Dividers on pages 26–27.

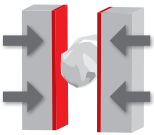

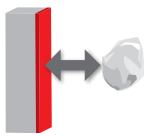

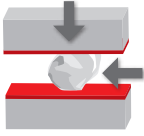

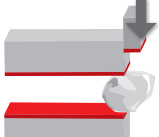

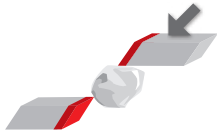



Homogeneous sample: Beans before and after grinding with the Variable Speed Rotor Mill PULVERISETTE 14

## Choosing the right type of comminution

Each material has specific breaking characteristics. The wide range of FRITSCH laboratory mills always offers the perfect solution for this purpose. Hard and brittle materials, for example, require pressure, impact or friction for efficient comminution, in this case Planetary Mills, Vibratory Mills, Disk Mills, Mortar Grinders or Jaw Crushers are the right choice. In contrast, soft and fibrous materials can be ideally ground with shearing and cutting action, as provided by Cutting Mills, Knife Mills, Variable Speed Rotor Mills and Cross Beater Mills.

### Comminution principles

	Type of comminution	Mill categories
	<p> <b>Pressure</b> Moving surfaces apply pressure to the sample in between.</p>	Jaw Crushers
	<p> <b>Impact</b> The sample is accelerated against a surface at an extremely high speed.</p>	Planetary Mills Ball Mills Vibrating Cup Mill Variable Speed Rotor Mills Cross Beater Mills
	<p> <b>Friction</b> With friction-based comminution, the sample is ground between two surfaces due to the vertical pressure of one surface relative to the other during simultaneous movement.</p>	Mortar Grinder Disk Mills
	<p> <b>Shearing</b> Here, comminution takes place due to the shearing effect between at least one fixed surface and one moving surface that both move against one another.</p>	Disk Mills Variable Speed Rotor Mills Cross Beater Mills
	<p> <b>Cutting</b> Rotating knives cut the sample between blades or fixed knives.</p>	Cutting Mills Knife Mills



# The right mill for every material

For simple orientation, you can find the most common materials and the recommended mills in this brochure. Alternatively, you can take a look in our practical grinding report database, which contains detailed information, at [www.fritsch-international.com/grinding-reports](http://www.fritsch-international.com/grinding-reports).

<b>Abrasives</b>	Ball Mills, Planetary Mills, P-9
<b>Alloys</b>	Ball Mills, Planetary Mills, P-1
<b>Analytic</b>	Ball Mills, Planetary Mills, P-11, P-14
<b>Animal food</b>	Cutting Mills, Ball Mills
<b>Biology</b>	Ball Mills, Planetary Mills, Cutting Mills, P-11
<b>Bones</b>	P-19, P-25, P-0
<b>Building materials</b>	Ball Mills, Planetary Mills, P-1, P-13, P-9
<b>Catalytic converters</b>	Ball Mills, Planetary Mills, P-1
<b>Cement clinker</b>	Ball Mills, Planetary Mills, P-1, P-13, P-9
<b>Ceramics</b>	Ball Mills, Planetary Mills, P-1, P-13, P-9
<b>Coal</b>	Ball Mills, Planetary Mills, P-16, P-1, P-13
<b>Coating powder</b>	Ball Mills, Planetary Mills, P-14
<b>Compound materials</b>	Cutting Mills, P-25/P-19 Combination, P-14
<b>Drugs</b>	Ball Mills, Planetary Mills, Cutting Mills
<b>Electronic scrap</b>	Cutting Mills, P-0, P-14
<b>Environment</b>	Cutting Mills, P-11, Ball Mills
<b>Feed (pellets)</b>	Cutting Mills, P-11, P-2, P-14
<b>Fertilisers</b>	Ball Mills, Planetary Mills, P-14, P-2
<b>Fibres</b>	Ball Mills, Planetary Mills, P-1, P-13, P-9
<b>Foils</b>	Cutting Mills
<b>Food</b>	Ball Mills, Planetary Mills, Cutting Mills, P-11, P-2
<b>Glass</b>	Ball Mills, Planetary Mills, P-1, P-13, P-9
<b>Grains</b>	Cutting Mills, P-14
<b>Household waste</b>	Cutting Mills, P-25/P-19 Combination
<b>Leather</b>	Cutting Mills

<b>Lime</b>	Ball Mills, Planetary Mills, P-2
<b>Materials research</b>	Planetary Mills, P-4, P-7 <i>premium line</i> , P-6 <i>premium line</i>
<b>Mechanical alloying/activation</b>	Planetary Mills, P-4
<b>Metallurgy</b>	Planetary Mills, P-1, P-9
<b>Minerals</b>	Ball Mills, Planetary Mills, P-1, P-13, P-9
<b>Mining</b>	Ball Mills, Planetary Mills, P-1, P-13, P-9
<b>Ores</b>	Ball Mills, Planetary Mills, P-1, P-13, P-9
<b>Pharmaceuticals</b>	P-14, P-2
<b>Pigments</b>	Ball Mills, Planetary Mills, P-2
<b>Plants</b>	Cutting Mills, P-11, P-2, P-14
<b>Plastics</b>	Cutting Mills, P-14
<b>Refractory materials</b>	Ball Mills, Planetary Mills, P-1, P-13, P-9
<b>Rocks</b>	Ball Mills, Planetary Mills, P-1, P-13, P-2, P-9
<b>RoHS</b>	Cutting Mills, P-0, P-9, P-14
<b>Rubber</b>	Cutting Mills, P-14
<b>Sediments</b>	Ball Mills, Planetary Mills, P-2, P-9
<b>Slags</b>	Planetary Mills, P-1, P-9
<b>Soil research</b>	Ball Mills, Planetary Mills, P-1, P-13
<b>Spectroscopy</b>	Ball Mills, Planetary Mills, P-14
<b>Spices</b>	Cutting Mills, P-14
<b>Tablets</b>	Ball Mills, Planetary Mills, P-2
<b>Textiles</b>	Cutting Mills
<b>Wood</b>	Cutting Mills, P-14

**Ensure that your analysis is of a good quality by choosing the right mill! We will be happy to advise you.**  
+49 67 84 70-150 · [service@fritsch.de](mailto:service@fritsch.de)

# BALL MILLS

Effective for batchwise comminution

FRITSCH Ball Mills are effective for rapid batchwise comminution of hard, medium-hard, soft, tough, fibrous, temperature-sensitive and moist samples down to the finest particle sizes. Grinding can take place dry or wet. Grinding sets made of many different materials are available. FRITSCH Ball Mills are also the ideal lab assistants for mixing and homogenising.

## IDEAL FOR

Chemical analysis | Environmental research | Pharmaceuticals and medicine | Biotechnology | Forensic analysis | Materials synthesis | Materials technology | RoHS

Product	Max. feed size (depends on material)	Max. sample quantity	Final fineness (depends on material)	Grinding bowl oscillations per minute
 <p><b>Vibratory Micro Mill</b> <b>PULVERISETTE 0</b> <a href="http://www.fritsch-international.com/p-0">www.fritsch-international.com/p-0</a></p>	5 mm	10 ml	10 µm	3,000–3,600 at 1–3 mm amplitude
 <p><b>Mini-Mill</b> <b>PULVERISETTE 23</b> <a href="http://www.fritsch-international.com/p-23">www.fritsch-international.com/p-23</a></p>	6 mm	5 ml	5 µm	900–3,000 at 9 mm amplitude



# PLANETARY MILLS



The high-performance all-rounders for every laboratory

**FRITSCH Planetary Mills *classic line*** are ideally suited for wet and dry comminution of hard, medium-hard, brittle and fibrous materials. Samples can be processed from a few milligrams to several kilograms at a wide range of fineness levels down to less than 1  $\mu\text{m}$ . They are absolutely reliable, especially easy to operate and simple to clean. **FRITSCH Planetary Mills *premium line*** are extremely strong high-performance all-purpose mills that offer *premium* performance, usability and safety as well as revolutionary rotational speeds of up to 1,100 rpm (rotational speed of the grinding bowls up to 2,200 rpm). Your advantage: extremely short grinding times and reliable reproducible results down into the nano range. The FRITSCH Planetary Mills are also the perfect choice for highly efficient mixing and homogenising or for mechanical alloying and activation in materials research.



**IDEAL FOR**

Geology and mineralogy | Metallurgy | Ceramics | Materials research | Mechanical alloying | Nanotechnology | Pharmaceuticals | Chemistry | Biology | Sample preparation for analysis

Product	Max. feed size (depends on material)	Max. sample quantity	Final fineness (depends on material)	Rotational speed of main disk
<p><i>premium line</i></p>  <p><b>Planetary Micro Mill PULVERISETTE 7</b> <i>premium line</i></p> <p><a href="http://www.fritsch-international.com/p-7pl">www.fritsch-international.com/p-7pl</a></p>	5 mm	70 ml	< 0.1 µm	100–1,100 rpm
<p><i>premium line</i></p>  <p><b>Planetary Mill PULVERISETTE 6</b> <i>premium line</i></p> <p><a href="http://www.fritsch-international.com/p-6pl">www.fritsch-international.com/p-6pl</a></p>	10 mm	450 ml	< 0.1 µm	100–800 rpm

**FRITSCH software MillControl**





The FRITSCH software MillControl enables automatic control of your Planetary Mills *premium line* and validation of the grinding process. The set and actual rotational speed and the power consumption are monitored and documented.

**IN SITU measurement**

Turn your Planetary Mill into an analytical measuring system for continuous measurement of gas pressure and temperature directly in the grinding bowl using the FRITSCH GTM system.

**IDEAL FOR**

Geology and mineralogy | Metallurgy | Ceramics | Materials research | Mechanical alloying |  
Pharmaceuticals | Chemistry | Biology | Sample preparation for analysis

Product	Max. feed size (depends on material)	Max. sample quantity	Final fineness (depends on material)	Rotational speed of main disk
 <p><b>Planetary Micro Mill</b> <b>PULVERISETTE 7</b> <i>classic line</i> <a href="http://www.fritsch-international.com/p-7cl">www.fritsch-international.com/p-7cl</a></p>	5 mm	40 ml	< 1 µm	100–800 rpm
 <p><b>Planetary Mono Mill</b> <b>PULVERISETTE 6</b> <i>classic line</i> <a href="http://www.fritsch-international.com/p-6cl">www.fritsch-international.com/p-6cl</a></p>	10 mm	225 ml	< 1 µm	100–650 rpm
 <p><b>Planetary Mill</b> <b>PULVERISETTE 5</b> <i>classic line</i> <a href="http://www.fritsch-international.com/p-5/4cl">www.fritsch-international.com/p-5/4cl</a> <a href="http://www.fritsch-international.com/p-5/2cl">www.fritsch-international.com/p-5/2cl</a></p>	10 mm	<p><b>with</b> <b>4 working stations</b> 900 ml</p> <p><b>with</b> <b>2 working stations</b> 450 ml</p>	< 1 µm	50–400 rpm
 <p><b>Vario-Planetary Mill</b> <b>PULVERISETTE 4</b> <i>classic line</i> <a href="http://www.fritsch-international.com/p-4cl">www.fritsch-international.com/p-4cl</a></p>	10 mm	450 ml	< 1 µm	0–400 rpm





# QUALITY MADE IN GERMANY

We can essentially only control what we actually produce. This is why all FRITSCH-products are manufactured according to special, constantly verified quality standards at our German headquarters in Idar-Oberstein – with an extensive in-house production depth that is one of our particular strengths. All steel, aluminium and stainless steel metal parts are milled and turned in our CNC prefabrication area. Purchased items such as plastic housings and sheet metal parts are predominantly sourced from long-standing partners in Germany. Our production is meticulously performed manually in small batches by experienced, specialist personnel. With no assembly line and no piece work. This close connection is important to us and is a key condition for that special FRITSCH-quality.

Our in-house development department produces new models from the initial idea right through to the prototype, which is prepared for production after a series of endurance tests – always inspired from your practical work routine as well as from intense interaction with the FRITSCH laboratory.

**This is how FRITSCH works.**




# MORTAR GRINDER

The all-purpose mill for every application

The FRITSCH Mortar Grinder PULVERISETTE 2 is ideal for dry and wet grinding of hard, medium-hard, soft, brittle and temperature-sensitive samples for analysis, quality control and materials testing. It even grinds difficult samples with a moist, fibrous or elastic structure using liquid nitrogen. And it's also excellently suited for mixing and homogenising organic and inorganic solids and liquids. To avoid the risk of undesired abrasion, grinding sets are offered in seven different materials.

## IDEAL FOR

Pharmaceuticals | Food | Chemistry | Mining and metallurgy | Geology and mineralogy | Glass and ceramics industry | Agriculture and forestry

Product	Max. feed size (depends on material)	Max. sample quantity	Final fineness (depends on material)	Rotational speed of the mortar bowl
 <p><b>Mortar Grinder PULVERISETTE 2</b></p> <p><a href="http://www.fritsch-international.com/p-2">www.fritsch-international.com/p-2</a></p>	8 mm	190 ml	10–20 µm	70/80 rpm




# KNIFE MILL

## The multifunctional, industrial-grade mill

The FRITSCH Knife Mill PULVERISETTE 11 grinds and homogenises moist, oily, fatty, soft, medium-hard and fibrous samples pleasantly quiet, fast and gentle. Programming and saving of recipe creations is particularly easy. A separated knife holder ensures fast, thorough cleaning and cost-efficient knife replacement. The autoclavable collecting vessel with a 1.3 l capacity is available in plastic, glass or stainless steel. A practical compression lid ensures clean grinding – even under cooling.

### IDEAL FOR

Food | Agriculture and forestry | Pharmaceuticals | Biology

Product	Max. feed size (depends on material)	Max. sample quantity	Final fineness (depends on material)	Rotational speed
 <p><b>Knife Mill</b> <b>PULVERISETTE 11</b></p> <p><a href="http://www.fritsch-international.com/p-11">www.fritsch-international.com/p-11</a></p>	40 mm	1,300 ml	< 300 µm	14,000 rpm

# CUTTING MILLS

## Maximum flexibility

Cutting Mills are ideal for comminution of soft to medium-hard, brittle, fibrous and tough materials, for temperature-sensitive samples and plastics, as well as for preparation of heterogeneous mixtures. The samples are comminuted by cutting and shearing forces, and the sieve cassette determines the desired fineness. Various knife geometries and replaceable blades ensure maximum flexibility and durability. Cutting tools made of various steel types, as well as of hardmetal tungsten carbide, can be used for controlling the abrasion behaviour.

## Unmatched ease of cleaning!

A feature that's unique to FRITSCH Cutting Mills: The entire grinding chamber can be opened without any tools in seconds with just two simple motions for complete cleaning of all the cutting tools. Unbeatably fast, simple and efficient!



**IDEAL FOR**

Plastics and textiles | Agriculture and forestry | Environment | RoHS | Analytic | Construction materials | Chemistry | Food

Product	Max. feed size (depends on material and funnel)	Max. throughput (depends on material and sieve cassette)	Final fineness (depends on sieve cassette)	Rotor speed (depends on voltage and frequency)
 <p><b>Cutting Mill</b> <b>PULVERISETTE 15</b> <a href="http://www.fritsch-international.com/p-15">www.fritsch-international.com/p-15</a></p>	70 x 70 mm	50 l/h	0.25–20 mm	2,800/3,400 rpm
 <p><b>Universal Cutting Mill</b> <b>PULVERISETTE 19</b> <a href="http://www.fritsch-international.com/p-19">www.fritsch-international.com/p-19</a></p>	70 x 80 mm	60 l/h	0.2–6 mm	2,800/3,400 rpm resp. 300/360 rpm
 <p><b>Power Cutting Mill</b> <b>PULVERISETTE 25</b> <a href="http://www.fritsch-international.com/p-25">www.fritsch-international.com/p-25</a></p>	120 x 85 mm	85 l/h	1–10 mm	300/360 rpm
 <p><b>Cutting Mill Combination</b> <b>PULVERISETTE 25/ PULVERISETTE 19</b> <a href="http://www.fritsch-international.com/p-25/19">www.fritsch-international.com/p-25/19</a></p>	120 x 85 mm	60 l/h	0.2–6 mm	300/360 resp. 2,800/3,400 rpm

**Completely in stainless steel**

The PULVERISETTE 19 is also available in a 316L stainless steel version for the food and pharmaceutical industry.

**Optimal sample exhaust systems: FRITSCH Cyclone separators**

The FRITSCH Cyclone separators ensure simple feeding and faster throughput due to their powerful airflow. Due to faster operation and stronger cooling even temperature-sensitive samples can be ground without any problems.

## ROTOR / BEATER MILLS

High grinding energy – even for plastics

Due to their high grinding energy, Rotor / Beater Mills are the best choice for soft to medium-hard and temperature-sensitive samples like for example plastics. The final fineness of the samples depends on the selected sieve insert. To avoid undesired abrasion, the FRITSCH Variable Speed Rotor Mills PULVERISETTE 14 can be equipped with rotors and sieve rings made of stainless steel, pure titanium or with a titanium nitride coating.




**FRITSCH *premium advantage*:** The Variable Speed Rotor Mill PULVERISETTE 14 *premium line* offers impact, shearing and cutting comminution in one instrument – with a higher performance, better cooling and particularly safe operation due to the AutoLOCK grinding chamber and Intelligence-Safety-Control-System.

The Cross Beater Mills PULVERISETTE 16 are available with a grinding insert made of cast iron or of harder, stainless steel.



**IDEAL FOR**

Analytic | Biology | Chemistry | Agriculture and forestry | Food | Plastics and textiles | Pharmaceuticals | Environment/RoHS | Geology and mineralogy | Mining and metallurgy | Ceramics

Product	Max. feed size (depends on material)	Max. throughput (depends on material and sieve insert)	Final fineness (depends on sieve insert)	Rotor speed
<p><i>premium line</i></p>  <p><b>Variable Speed Rotor Mill PULVERISETTE 14</b> <i>premium line</i> <a href="http://www.fritsch-international.com/p-14pl">www.fritsch-international.com/p-14pl</a></p>	15 mm	15 l/h	0.08–6 mm	6,000–22,000 rpm
 <p><b>Variable Speed Rotor Mill PULVERISETTE 14</b> <i>classic line</i> <a href="http://www.fritsch-international.com/p-14cl">www.fritsch-international.com/p-14cl</a></p>	10 mm	5 l/h	0.08–6 mm	6,000–20,000 rpm
 <p><b>Cross Beater Mill PULVERISETTE 16</b> <a href="http://www.fritsch-international.com/p-16/iron">www.fritsch-international.com/p-16/iron</a> <a href="http://www.fritsch-international.com/p-16/steel">www.fritsch-international.com/p-16/steel</a></p>	25 mm	80 l/h	0.12–10 mm	2,000–4,000 rpm

**Multifunctional: Comminution with impact or cutting rotor**

Turn your PULVERISETTE 14 *premium line* into a Cutting Mill with just a few simple motions for fast, efficient pre-grinding of fibrous materials and plastics with up to 10,000 rpm.

**Optimal sample exhaust systems: FRITSCH Cyclone separators**

The FRITSCH Cyclone separators ensure simple feeding and faster throughput due to their powerful airflow. Due to faster operation and stronger cooling even temperature-sensitive samples can be ground without any problems.

# JAW CRUSHERS

## Full power for pre-crushing

FRITSCH Jaw Crushers *premium line* and *classic line* are the classic “workhorses” for batchwise or continuous pre-crushing of very hard to medium-hard, brittle and tough materials. FRITSCH offers grinding parts made of various steel types, tungsten carbide and zirconium oxide.



**FRITSCH *premium advantage*:** Only the FRITSCH Jaw Crushers *premium line* have a completely accessible grinding chamber for cleaning because the crushing jaws can be completely swivelled out or removed. The gap adjustment with millimetre accuracy is set with a single motion and offers variable crushing jaw kinematics for higher final fineness. And integrated dust exhaust channels enable perfect dust exhaust.





**IDEAL FOR**

Mining and metallurgy | Chemical industry | Geology and mineralogy |  
Glass and ceramics industry | Rocks and soils

Product	Max. feed size (depends on material)	Max. continuous throughput	Final fineness (depends on gap adjustment)	Power consumption
<p><i>premium line</i></p>  <p><b>Jaw Crusher PULVERISETTE 1 premium line</b></p> <p><a href="http://www.fritsch-international.com/p-1/1pl">www.fritsch-international.com/p-1/1pl</a> <a href="http://www.fritsch-international.com/p-1/2pl">www.fritsch-international.com/p-1/2pl</a></p>	<b>Model I</b> 60 mm	140 kg/h	0.3–15 mm	1.7 kW
	<b>Model II</b> 95 mm	250 kg/h	0.3–15 mm	3.5 kW
 <p><b>Jaw Crusher PULVERISETTE 1 classic line</b></p> <p><a href="http://www.fritsch-international.com/p-1/1cl">www.fritsch-international.com/p-1/1cl</a> <a href="http://www.fritsch-international.com/p-1/2cl">www.fritsch-international.com/p-1/2cl</a></p>	<b>Model I</b> 60 mm	140 kg/h	1–15 mm	1.7 kW
	<b>Model II</b> 95 mm	200 kg/h	1–15 mm	2.6 kW

**Pre- and fine-grinding in a single step**

The combination of Jaw Crusher and Disk Mill PULVERISETTE 13 is ideal for automatic and continuous pre- and fine-grinding in a single step – even for large quantities.

**Metal-free grinding**

FRITSCH Jaw Crushers and Disk Mills are also available for completely metal-free pre-crushing and fine-grinding, e.g. for use in the ceramics industry or in medical and dental engineering.

# DISK MILLS

## Fine-grinding of large quantities

FRITSCH Disk Mills PULVERISETTE 13 *premium line* and *classic line* are ideal for fine-grinding within the medium particle size range of soft to hard, tough and temperature-sensitive solids.




**FRITSCH *premium advantage*:** The Disk Mill PULVERISETTE 13 *premium line* is even safer due to the automatic locking of the collecting vessel and grinding chamber, and even easier to operate due to the precise motor-driven grinding gap adjustment with digital gap display and the fact that all the parameters are shown on a clearly arranged display.

The FRITSCH Vibrating Cup Mill PULVERISETTE 9 is ideal for extremely fast grinding of soft to hard, brittle, tough and fibrous materials down to analytical fineness.



## IDEAL FOR

Mining and metallurgy | Glass and ceramics industry | Rocks and soils | Soil research | Agriculture and environment | Sample preparation for IR, XRF and XRD

Product	Max. feed size (depends on material)	Max. throughput (depends on material)	Final fineness	Motor speed
<p><i>premium line</i></p>  <p><b>Disk Mill</b> <b>PULVERISETTE 13</b> <i>premium line</i> <a href="http://www.fritsch-international.com/p-13pl">www.fritsch-international.com/p-13pl</a></p>	20 mm	150 kg/h	0.05–12 mm	440 rpm
 <p><b>Disk Mill</b> <b>PULVERISETTE 13</b> <i>classic line</i> <a href="http://www.fritsch-international.com/p-13cl">www.fritsch-international.com/p-13cl</a></p>	20 mm	150 kg/h	0.1–12 mm	440 rpm
 <p><b>Vibrating Cup Mill</b> <b>PULVERISETTE 9</b> <a href="http://www.fritsch-international.com/p-9">www.fritsch-international.com/p-9</a></p>	12 mm	250 ml	10–20 $\mu\text{m}$	600–1,500 rpm

### Pellet Press

For fast and easy preparation of both: solid and highly permeable pellets for X-ray fluorescence analysis or infrared spectroscopy – manual, hydraulic, easy.

- Variable pressure force of up to 250 kN
- Simple operation via hand lever
- Solid and compact with impact-resistant cladding
- Easy cleaning



## SIEVE SHAKERS

Comfort and precision for reliable sieve analysis

FRITSCH Sieve Shakers for sieves up to 450 mm in diameter offer maximum comfort and precision for reliable and precisely reproducible dry, wet and micro-precision sieving. These instruments feature automatic amplitude control, a high-quality sieve stack tensioning system, individual creation of sieve programmes and automatic evaluation of sieve analysis using the control and evaluation software AUTOSIEVE.



**IDEAL FOR**

Sieving | Measuring the quantitative particle size distribution of solids and suspensions | Separating | Fractioning

Product	Max. sample quantity (approx.)	Sieve diameter	Max. number of sieves per sieve stack	Testing instrument calibration according to ISO 9001
 <p><b>Vibratory Sieve Shaker</b> <b>ANALYSETTE 3 PRO</b> <a href="http://www.fritsch-international.com/a-3pro">www.fritsch-international.com/a-3pro</a></p>	2 kg	100 mm 200 mm 8"	10 (50 mm height) 16 (25 mm height)	yes
 <p><b>Vibratory Sieve Shaker</b> <b>ANALYSETTE 3 SPARTAN</b> <a href="http://www.fritsch-international.com/a-3spartan">www.fritsch-international.com/a-3spartan</a></p>	2 kg	100 mm 200 mm 8"	10 (50 mm height) 16 (25 mm height)	no
 <p><b>Heavy Duty Analytical Sieve Shaker</b> <b>ANALYSETTE 18</b> <a href="http://www.fritsch-international.com/a-18">www.fritsch-international.com/a-18</a></p>	15 kg	200–450 mm / 8"–18"	12 (65 mm height)	yes

**Fast alternative to sieving**

If you conduct many and frequent sieve analyses, the FRITSCH Particle Sizer ANALYSETTE 28 ImageSizer is the ideal, time-saving alternative completely without weighing, assembly of the sieve stack and time-consuming cleaning. Additionally, you receive besides the particle size distribution, also valuable information about the particle shape.



# SAMPLE DIVIDERS

## Guaranteed representative subsamples


With a representative sample preparation, the FRITSCH Sample Dividers are laying the foundation for a precise analysis. They create representative subsamples with absolutely identical properties like the original sample. The FRITSCH Rotary Cone Sample Divider LABORETTE 27 divides samples with up to 3,000 dividing steps per minute centred over a rotating dividing cone into up to 30 separate channels and thus ensures unbeatable dividing accuracy of up to 99.9%. Variable division ratios and the design in several variants guarantee simple adaptation to an extremely wide range of applications.





**IDEAL FOR**

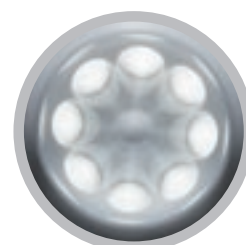
Representative sample division

Product	Division ratio	Max. feed size	Max. sample quantity	Capacity of sample bottles
 <p>Dividing head</p> <p><b>Rotary Cone Sample Divider</b> <b>LABORETTE 27</b> <a href="http://www.fritsch-international.com/l-27">www.fritsch-international.com/l-27</a></p>	1:8	10 mm	4,000 ml	500 ml, 250 ml, 25 ml
	1:10	10 mm	2,500 ml	250 ml, 25 ml
	1:30	2.5 mm	300 ml	15 ml, 20 ml, 30 ml

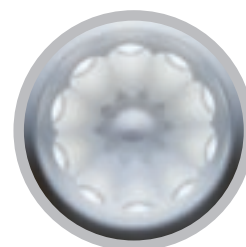
## Dividing heads for every material

Choose the suitable dividing head according to your application in the division ratios of 1:8; 1:10 or 1:30 made of sturdy POM plastic, and you'll receive 8, 10 or 30 individual samples with identical chemical and physical properties.

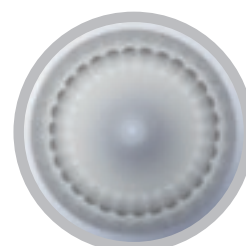
Anodised aluminium dividing heads – 1:8 and 1:10 – are available for materials and suspensions with abrasive properties. And for especially aggressive solids and suspensions, the resistant PTFE-coated aluminium dividing head 1:30 is available.



**Dividing head 1:8**



**Dividing head 1:10**



**Dividing head 1:30**

# SAMPLE FEEDERS

## Perfect sample feeding

The FRITSCH Vibratory Feeders LABORETTE 24 are your ideal assistants for slow and absolutely uniform feeding of even smallest quantities of sample dividers, mills, mixers, sieve shakers, balances and other laboratory instruments. Depending on your choice, their vibrating stainless steel channel transports free-flowing samples either with a narrow, directed (V-shaped channel) or a wide material feed (U-shaped channel). The flow rate, intensity and time can be reproducibly adjusted via a separate control unit. The material flow can also be finely adjusted even for smallest quantities.

### IDEAL FOR

Perfect sample feeding

Product	Max. feed quantity	Min. feed quantity	Suitable for	Length of the feed channel (total)
 <p><b>Vibratory Feeder LABORETTE 24</b></p> <p><a href="http://www.fritsch-international.com/l-24v">www.fritsch-international.com/l-24v</a> <a href="http://www.fritsch-international.com/l-24u">www.fritsch-international.com/l-24u</a></p>	<b>V-shaped channel</b> 1,500 g/min	1 g/min	narrow, directed sample discharge	330 mm
	<b>U-shaped channel</b> 2,500 g/min	5 g/min	uniform, wide sample feeding	330 mm

# ULTRASONIC CLEANERS


Gentle – thorough – clean

Both models of the Ultrasonic Cleaners LABORETTE 17 guarantee especially gentle cleaning of sensitive parts such as glassware, filters, sieves or valuable micro-precision sieves. The high-performance ultrasonic bath works quickly and thoroughly, and dissolves stubborn soiling even at inaccessible points.

In addition to cleaning, the LABORETTE 17 is also suitable for the external dispersion of suspensions for particle size analysis and for acceleration and improvement of process sequence of chemical reactions, such as the extraction of plant substances. Two other additional functions are the degassing of liquids and the emulsifying of oily and aqueous phases.

**IDEAL FOR**

Perfect cleaning

Product	Useful capacity	Interior bath dimensions	Insert tray dimensions	Max. ultrasonic output
 <p><b>Ultrasonic Cleaner LABORETTE 17</b></p> <p><a href="http://www.fritsch-international.com/l-17/1">www.fritsch-international.com/l-17/1</a> <a href="http://www.fritsch-international.com/l-17/2">www.fritsch-international.com/l-17/2</a></p>	<p><b>Size I</b> 5.6 litres</p>	<p>Ø 24 cm 13 cm deep</p>	<p>Ø 21.8 cm 5 cm high grid 5 x 5 mm</p>	<p>2 x 240 watt/period 35 kHz</p>
	<p><b>Size II</b> 28 litres</p>	<p>50 x 30 x 20 cm</p>	<p>45.5 x 24.5 x 5 cm grid 5 x 5 mm</p>	<p>2 x 600 watt/period 35 kHz</p>



# WORLDWIDE AT YOUR SERVICE

Wherever you use your FRITSCH instruments: we are nearby. In our global network of international representative offices, highly trained staff is available to help with technical service and application consultation. Or meet with us at major national and international trade fairs and exhibitions.

## Free sample grinding or particle analysis

Especially convenient: Send us your sample for a free-of-charge sample grinding or sample analysis. We'll then send you a detailed grinding or sizing report, identifying which instrument is the right one for your application.

## On-site test in the mobile laboratory

Test the FRITSCH instruments with your own samples – practically and easily in our fully equipped mobile laboratory.

## Training and workshops

We share our expertise – in regular workshops and seminars on your site or at convenient locations worldwide. Ask us about them!

## Grinding and sizing reports online

You will find an extensive grinding and sizing report database for various materials and industries online at [www.fritsch.de](http://www.fritsch.de). It's worth taking a look!

## Long-term maintenance and spare parts supply service

We ensure optimal long-term use of your FRITSCH laboratory instruments with competitive maintenance contracts and a delivery guarantee for all the important spare parts of at least 10 years – to maximise the security of your investment.

## Our experts are happy to advise you:

**+49 67 84 70 150**

**[service@fritsch.de](mailto:service@fritsch.de) · [www.fritsch.de](http://www.fritsch.de)**





Fritsch GmbH

Milling and Sizing

Industriestrasse 8

55743 Idar-Oberstein

Germany

Phone +49 67 84 70 0

Fax +49 67 84 70 11

[info@fritsch.de](mailto:info@fritsch.de)

[www.fritsch.de](http://www.fritsch.de)