RETSCH – More than 100 Years of Innovation

Global market leader in the preparation and characterization of solids – quality „made in Germany”.

The company was founded in 1915 by F. Kurt Retsch. A few years later he registered his first patent in grinding technology: a mortar grinder that became famous worldwide as the “RETSCH Mill”. This innovation replaced tiresome manual grinding with hand mortars which was the standard in laboratories at the time and earned RETSCH an excellent reputation in the international science and research community.

Today RETSCH is the leading solution provider for size reduction and particle sizing technology with subsidiaries in the US, China, Japan, India, France, Italy, Benelux, Russia, UK, Thailand, South Africa and Brazil and an export share of 80%.

RETSCH’s philosophy is based on customer orientation and leading edge technology. This is reflected in instruments whose high-quality components are designed for perfect interaction. RETSCH products not only guarantee representative and reproducible results for grinding and particle analysis but also allow for easy and comfortable operation.

With RETSCH you get:

- First class product quality thanks to advanced manufacturing methods
- Comprehensive application support including free test grindings and product trainings
- Excellent sales and service network throughout the world

www.retsch.com
Integrated Solutions

We see ourselves as solution providers. In addition to our extensive product program we offer competent application support and technical assistance.

Application Consulting
For us professional customer service is about offering individual and specific advice, by phone or on-site in our application laboratories worldwide. Our application experts process and measure your samples free-of-charge and provide a recommendation for the most suitable method and instrument. Finally, we offer free application consultations at your doorstep with our fully equipped laboratory bus.

Application Database
Our application specialists process and characterize a large number of customer samples every day. The most interesting results are collected in an online database which currently contains more than 2,000 test reports. The application database is an excellent tool for a first impression as to which instrument may be suitable for a particular application or sample material.

Test Grinding
The „Applications“ menu offers the possibility to download the questionnaires for “milling” and “sieving”. These can be sent together with the sample material to our lab team for free test grinding or sieving. Use this direct link www.retsch.com/testgrinding.

Seminars and Workshops
Alone or with renowned partners in the laboratory industry we regularly offer seminars and workshops about different aspects of sample preparation, particle measurement and analytics. Dates and places are published on our website.

1915
The company is founded by F. Kurt Retsch in Duesseldorf.

1923
F. Kurt Retsch develops and patents a mortar grinder which becomes known as the RETSCH Mill and is synonymous with the concept of easier and better laboratory work.

1952
Engineer Dirk Sijsling assumes management responsibility for F. Kurt Retsch KG. The production of laboratory equipment gains more and more importance.

1959
RETSCH extends the product line with sieve shakers, sample dividers and magnetic stirrers. More space is required for production, leading to the move of the company into larger premises in Haan.

1963
RETSCH intensifies its cooperation with universities and institutes to ensure their equipment is always up to the latest technological standards. By the end of the sixties, the export share has increased to 35%.

1976
The company moves to a new expanded location in Haan.

1989
RETSCH becomes part of the Dutch VERDER group and gradually manages the transition from a family business to an international company.

as of 1993
Subsidiaries in the US, China, Japan, India, France, Italy, Benelux, Russia, UK and Thailand ensure RETSCH’s direct presence in the major economies of the world.

1998
Foundation of RETSCH TECHNOLOGY.

2012
RETSCH moves to new premises in Haan (headquarter of the Verder Scientific division).

2014
Market launch of the revolutionary High Energy Ball Mill Emax.

2015
RETSCH celebrates its 100th anniversary.
Reproducible Sample Preparation for Reliable Analysis Results

A reliable and accurate analysis can only be guaranteed by reproducible sample preparation. The “art of milling and homogenization” is turning a laboratory sample into a representative part sample with homogeneous analytical fineness. For these tasks RETSCH offers a comprehensive range of the most modern mills and crushers for coarse, fine and ultra-fine size reduction of almost any material. The choice of grinding tools and accessories not only ensures contamination-free preparation of a wide range of materials but also the adaptation to the individual requirements of such different areas of application as construction materials, metallurgy, foodstuffs, pharmaceuticals or environment.

To find the best suited mill for a specific application, the following should be considered in advance:

- Quality/characteristics of sample (e.g. dry, tough, abrasive, fibrous, brittle, hard, soft, temperature-sensitive etc.)
- Feed size
- Required final fineness
- Sample volume
- Sample throughput
- Subsequent analysis (which type of contamination by abrasion of grinding tools is acceptable?)
- May the sample be dried or embrittled before grinding?

Depending on the quality of the material different size reduction principles are applied to obtain the required fineness. Hard-brittle materials, for example, are best comminuted with impact and friction, for example in a planetary ball mill. For soft and elastic materials, however, size reduction with knife or cutting mills is the most suitable method.

Large particles cannot always be ground to analytical fineness in one step. In some cases it is possible to carry out coarse and fine grinding in the same mill with different settings; in other cases two mills or crushers are required.

An essential rule of thumb for size reduction is to only grind the sample as fine as necessary and not as fine as possible.

"Only grind as fine as necessary and not as fine as possible."

The grind sizes indicated in this catalog relate to the d90 value which means that 90% of the sample has a particle size smaller or equal to that value. The exemplary graphic shows that the sample also contains considerably smaller particles. Generally, the achievable grind sizes depend on the sample characteristics and instrument configurations which means that different results may be obtained with apparently similar samples.
# Selection Guide for Size Reduction Tools

The following selection guide gives an initial overview of the application areas of RETSCH mills and crushers. The selection of a suitable mill depends on the individual application. Contact us to find the optimum solution for your application!

## Jaw Crushers

<table>
<thead>
<tr>
<th>Jaw Crushers</th>
<th>Model</th>
<th>Feed size approx.</th>
<th>Final fineness approx.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jaw Crusher</td>
<td>BB 50</td>
<td>40 mm</td>
<td>500 µm</td>
</tr>
<tr>
<td>Jaw Crusher</td>
<td>BB 100 / 200 / 300</td>
<td>50 / 90 / 130 mm</td>
<td>4 / 2 / 5 mm</td>
</tr>
<tr>
<td>Jaw Crusher</td>
<td>BB 250</td>
<td>120x90 mm</td>
<td>2 mm</td>
</tr>
<tr>
<td>Jaw Crusher</td>
<td>BB 400</td>
<td>220x90 mm</td>
<td>2 mm</td>
</tr>
<tr>
<td>Jaw Crusher</td>
<td>BB 500</td>
<td>110 mm</td>
<td>500 µm</td>
</tr>
<tr>
<td>Jaw Crusher</td>
<td>BB 600</td>
<td>350x170 mm</td>
<td>6 mm</td>
</tr>
</tbody>
</table>

## Rotor Mills

<table>
<thead>
<tr>
<th>Rotor Mills</th>
<th>Model</th>
<th>Feed size approx.</th>
<th>Final fineness approx.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultra Centrifugal Mill</td>
<td>ZM 200</td>
<td>10 mm</td>
<td>40 µm</td>
</tr>
<tr>
<td>Rotor Beater Mill</td>
<td>SR 300</td>
<td>25 mm</td>
<td>50 µm</td>
</tr>
<tr>
<td>Cross Beater Mill</td>
<td>SK 300</td>
<td>25 mm</td>
<td>100 µm</td>
</tr>
<tr>
<td>Cyclone Mill</td>
<td>TWISTER</td>
<td>10 mm</td>
<td>250 µm</td>
</tr>
</tbody>
</table>

## Knife Mills

<table>
<thead>
<tr>
<th>Knife Mills</th>
<th>Model</th>
<th>Feed size approx.</th>
<th>Final fineness approx.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knife Mill</td>
<td>GRINDOMIX GM 200</td>
<td>40 mm</td>
<td>300 µm</td>
</tr>
<tr>
<td>Knife Mill</td>
<td>GRINDOMIX GM 300</td>
<td>130 mm</td>
<td>300 µm</td>
</tr>
</tbody>
</table>

## Cutting Mills

<table>
<thead>
<tr>
<th>Cutting Mills</th>
<th>Model</th>
<th>Feed size approx.</th>
<th>Final fineness approx.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutting Mill</td>
<td>SM 100</td>
<td>80x60 mm</td>
<td>250 µm</td>
</tr>
<tr>
<td>Cutting Mill</td>
<td>SM 200 / 300</td>
<td>80x60 mm</td>
<td>250 µm</td>
</tr>
<tr>
<td>Cutting Mill</td>
<td>SM 400</td>
<td>170x220 mm</td>
<td>1 mm</td>
</tr>
</tbody>
</table>

## Mortar Grinders/Disc Mills

<table>
<thead>
<tr>
<th>Mortar Grinder/Disc Mills</th>
<th>Model</th>
<th>Feed size approx.</th>
<th>Final fineness approx.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortar Grinder</td>
<td>RM 200</td>
<td>8 mm</td>
<td>10 µm</td>
</tr>
<tr>
<td>Disc Mill</td>
<td>DM 200 / 400</td>
<td>20 mm</td>
<td>100 / 50 µm</td>
</tr>
<tr>
<td>Vibratory Disc Mill</td>
<td>RS 200</td>
<td>15 mm</td>
<td>20 µm</td>
</tr>
<tr>
<td>Vibratory Disc Mill</td>
<td>RS 300</td>
<td>20 mm</td>
<td>20 µm</td>
</tr>
</tbody>
</table>

## Ball Mills

<table>
<thead>
<tr>
<th>Ball Mills</th>
<th>Model</th>
<th>Feed size approx.</th>
<th>Final fineness approx.</th>
</tr>
</thead>
<tbody>
<tr>
<td>XRD-Mill</td>
<td>McCrone</td>
<td>500 µm</td>
<td>1 µm</td>
</tr>
<tr>
<td>Mixer Mill</td>
<td>CryoMill</td>
<td>8 mm</td>
<td>5 µm</td>
</tr>
<tr>
<td>Mixer Mill</td>
<td>MM 200</td>
<td>6 mm</td>
<td>10 µm</td>
</tr>
<tr>
<td>Mixer Mill</td>
<td>MM 400</td>
<td>8 mm</td>
<td>5 µm</td>
</tr>
<tr>
<td>Mixer Mill</td>
<td>MM 500</td>
<td>10 mm</td>
<td>100 nm</td>
</tr>
<tr>
<td>High Energy Ball Mill</td>
<td>Emax</td>
<td>5 mm</td>
<td>80 nm</td>
</tr>
<tr>
<td>Planetary Ball Mill</td>
<td>PM 100 / 100 CM / 200 / 400</td>
<td>10 / 10 / 4 / 10 mm</td>
<td>100 nm</td>
</tr>
<tr>
<td>Drum Mill</td>
<td>TM 300 / 500</td>
<td>20 mm</td>
<td>20 µm</td>
</tr>
</tbody>
</table>

**Please note:**
The achieved final fineness depends on the sample material and instrument configurations which means that different results may be obtained with apparently similar samples.
Jaw Crushers

RETSCH’s range of jaw crushers comprises four different models for coarse and primary size reduction of hard, brittle materials – from compact bench-top units to robust floor models with high throughput rates which can be integrated into automatic installations. Breaking jaws of different materials ensure neutral-to-analysis size reduction.

At a glance

- Maximum feed size and final fineness
- Measuring range of sieve shakers / particle analyzers
- This mill is suitable for cryogenic grinding
- Cyclone for improved material discharge and additional cooling
- Suitable for wet sieving / for measuring suspensions
- Suitable for dry sieving / for measuring dry samples
- This instrument can be used with the EasySieve software
- This instrument can be calibrated
Rotor Mills

Four different types of rotor mills are available for the pulverization of granular, soft, medium-hard or fibrous sample materials. All mills can be equipped with a cyclone for improved sample discharge and cooling. Depending on the model, the mills are suitable for the preparation of very small amounts but also for use in pilot plants.

Cutting Mills

RETSCH offers a whole family of cutting mills – from the budget-priced basic model to the powerful high performance unit with high torque and RES technology – for primary size reduction of soft, medium-hard, elastic, tough and fibrous sample materials. The wide range of accessories allows for perfect adaptation to a variety of applications.
Cutting Mill SM 400 – large sample pieces, high throughput

With a grinding chamber volume of 7.5 L, the SM 400 accepts sample pieces measuring up to 170 mm x 220 mm. Thus, large sample volumes may be fed to the mill and completely homogenized in one working run. Compared to smaller models like the SM 300, the throughput is substantially higher. The SM 400 achieves grind sizes down to 1 mm, depending on the sample material.
Knife Mills

The GRINDOMIX Knife Mills are perfectly suited for the quick and thorough homogenization of solid samples with high liquid, oil or fat content. Thanks to interval and reverse mode and a wide selection of accessories even difficult samples are completely homogenized in the GRINDOMIX mills.

Disc Mills and Mortar Grinders

The RETSCH portfolio comprises the ergonomic Vibratory Disc Mill RS 200 – the standard mill for sample preparation to spectral analysis within seconds – as well as two disc mill models for primary and fine size reduction of hard and abrasive materials up to 8 Mohs. All disc mills can be equipped with grinding tools made of different materials to ensure neutral-to-analysis sample preparation. The RETSCH mortar grinder mixes and homogenizes powders, suspensions and pastes, also with high viscosity.
Ball Mills

RETSCH’s ball mill range is the widest in the world, offering optimum solutions for the pulverization of medium-hard, hard, brittle and fibrous samples with high energy input. The High Energy Ball Mill Emax and the Planetary Ball Mills pulverize samples down to the nanometer range with impact and friction in dry and wet mode. These mills are also ideally suited for mechanical alloying.

Mixer Mills and Drum Mills

The mixer mills are specially designed for quick grinding, mixing and homogenization of small sample volumes, as well as for cell disruption. The CryoMill is the perfect choice for efficient pulverization and homogenization of elastic and temperature-sensitive sample materials under continuous embrittlement with liquid nitrogen at -196 °C. The compact XRD-Mill McCrone is used for sample preparation to X-Ray diffraction.
Innovative Technology Sets Standards Worldwide

RETSCH’s range of sieving machines not only covers a very wide measuring range, it also provides a suitable model for virtually any bulk material thanks to different sieving motions and sieve diameters. The instruments are used in research & development, quality control of raw materials, semi-finished and finished products as well as in production monitoring and comply with the requirements of DIN EN ISO 9000 ff.

All “control” sieve shakers can be calibrated and provide reproducible, globally comparable results thanks to the possibility to set the sieve acceleration which is independent of the power frequency.

Vibratory Sieve Shakers

The patented electromagnetic drive of the vibratory sieve shakers produces a 3-D throwing motion which ensures optimum use of the open sieve area and lets the sample move equally over the whole sieving surface. The AS 200 series provides a suitable instrument for every requirement and budget. The AS 300 control is designed for large feed quantities up to 6 kg.

The two AS 450 models fractionate up to 15, respectively 25 kg of sample in one working run and achieve high separation efficiency.

Test sieves with diameters of 100, 150, 305, 315, 400 and 450 mm
AS 200 control – meeting the highest standards for quality control

The microprocessor-controlled measuring and control unit of this model ensures a constant vibration height, allowing for 100% reproducibility of results even among different AS 200 control shakers. One particular characteristic makes this RETSCH product stand out from others: Instead of the vibration height, it is possible to set the sieve acceleration which is independent of the power frequency. Together with the possibility of calibration, this ensures comparable and reproducible sieving results worldwide. Thus, all requirements for the test materials monitoring according to DIN EN ISO 9000 ff are met.
Horizontal Sieve Shaker, Tap Sieve Shaker and Air Jet Sieving Machine

Horizontal sieving (AS 400), tap sieving (AS 200 tap) and air jet sieving (AS 200 jet) are used for the particle size determination of materials which are not suitable for vibratory sieving and whenever these separation methods are stipulated by certain standards.

Particle Size and Particle Shape Analysis with Image Analysis

Dynamic Image Analysis is one of the most accurate methods when it comes to measuring the particle size and particle shape. It is an established alternative to sieve analysis and laser diffraction and is greatly superior to these with regard to precision, reproducibility and information content in a size range from 0.8 µm to 30 mm. The particle analyzer CAMSIZER P4 measures pourable bulk goods and granulates with a maximum particle size of 30 mm. The CAMSIZER X2 is ideally suited for analyzing fine powders and suspensions up to 8 mm. The CAMSIZER M1 characterizes particles from 0.5 µm to 1500 µm with static image analysis and provides accurate size and shape information down to the low micron range.

The perfect solution for each measuring range
Assisting – The Key to Greater Efficiency in the Laboratory

From representative, reproducible sampling and sample division to uniform, continuous material feed; from efficient preparation of solid pellets for XRF analysis to rapid cleaning of grinding tools and test sieves to gentle sample drying: RETSCH offers a comprehensive range of useful assistants which enhance the performance of our mills and sieve shakers even further and ensure reliable analysis results.

Sample Dividers and Feeders

RETSCH’s range of sample dividers comprises both rotating sample dividers and sample splitters. They divide all pourable solids up to 10 mm so accurately that the characteristic composition of each fraction of the sample corresponds exactly to that of the original bulk sample. The vibratory feeder DR 100 is used for the uniform, continuous feeding and conveyance of pourable bulk materials and fine powders.
Pellet Presses, Dryers and Cleaners

RETSCH offers three models of pellet presses with different pressure forces for the preparation of solid and smooth pellets suitable for XRF analysis. The fluid bed dryer TG 200 permits the gentle drying of organic, inorganic, chemical or pharmaceutical bulk materials without localized overheating. For quick and easy cleaning of test sieves and grinding tools RETSCH provides ultrasonic baths. Determination of the Bond Index is a method to characterize the crushing behavior of mineral samples.

Expert Guides

Would you like to learn more about Milling and Sieving? Please visit our website and download our expert guides:

“The Art of Milling”
with comprehensive material overview

“Sieve Analysis – Taking a close look at quality”
with sieve comparison table

www.retsch.com/downloads

We are happy to send you a printed copy on request.
The new RETSCH App

Welcome to the Internet of Things! Get a head start with the new RETSCH App and optimize work with your RETSCH mill.

Now available in your app store!