Retsch®
MILLING SIEVING ASSISTING

PRODUCT OVERVIEW

MILLING | SIEVING | ASSISTING

SOLUTIONS FOR SAMPLE PREPARATION AND GRAIN SIZE ANALYSIS

part of VERDER scientific

THE NEW MIXER MILL
MM 500 SERIES:

EASY OPERATION COMBINED WITH EXCELLENT GRINDING RESULTS

THE PIONEERS IN SAMPLE HOMOGENIZATION

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, 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
- Know-how transfer through regular seminars, webinars and user trainings

Retsch GmbH in Haan, Germany

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.

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%.

1989

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

1993

Since 1993, RETSCH has consistently expanded its presence in the world’s most important economies.

2012

RETSCH moves to new premises with a spacious application center at the VERDER SCIENTIFIC headquarters in Haan.

2015

RETSCH celebrates its 100th anniversary.

2019

Market launch of the new MM 500, the perfect combination of Mixer Mill and Planetary Ball Mill.

2021

Market launch of the new MM 500 control – first Mixer Mill with temperature monitoring and control

THE ART OF MILLING

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.

THE RIGHT MILL FOR EVERY APPLICATION

SELECTION GUIDE FOR SIZE REDUCTION TOOLS

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.

● suitable ◐ suitable to a limited extent – not suitable

AT A GLANCE

NEW — **New Products**
This icon marks our product news

130 mm / 5 mm* — **Milling**
Maximum feed size and final fineness

This mill is suitable for cryogenic grinding

Cyclone for improved material discharge and additional cooling

25 mm / 20 µm — **Sieving**
Measuring range of sieve shakers / particle analyzers

Suitable for wet sieving / for measuring suspensions

Suitable for dry sieving / for measuring dry samples

This instrument can be used with the EasySieve software

CAL — This instrument can be calibrated

35 t — **Assisting**
Maximum pressure of the press

JAW CRUSHERS

RETSCH's range of jaw crushers comprises nine 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.

JAW CRUSHERS

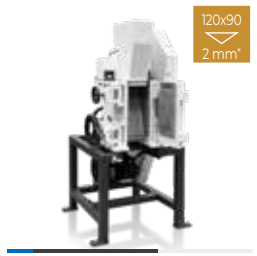
EFFICIENT PRELIMINARY AND FINE SIZE REDUCTION

Jaw Crusher BB 50

- Compact, space-saving desktop model
- Variable speed
- Zero-point adjustment to compensate for wear
- Comfortable control panel with digital display

Jaw Crusher BB 200

- All advantages of the BB 100
- Maintenance and lubrication-free slide bearings
- Suitable for integration in automatic installations
- Version for comminution of semiconductor materials



Jaw Crusher BB 250

- Easy access for cleaning due to front door
- Suitable for continuous crushing (option)
- Special version with automatic sorting into max. 4 fractions

Jaw Crusher BB 300

- All advantages of the BB 200
- Powerful crushing with 3 kW motor
- Large hopper allows sample size up to 130 mm

Jaw Crusher BB 400

- All advantages of the BB 250
- Suitable for larger sample pieces up to 220 x 90 mm

Jaw Crusher BB 500

- High degree of comminution 50:1
- Continuous or batch size processing
- Suitable for integration in automatic installations
- Version for comminution of semiconductor materials

Jaw Crusher BB 600

- High throughput capacity of up to 3500 kg/h
- Continuous or batch size processing
- Suitable for integration in automatic installations

ROTOR- AND CUTTING MILLS

PERFECT RESULTS FOR LABORATORIES AND PILOT PLANTS

Ultra Centrifugal Mill ZM 300

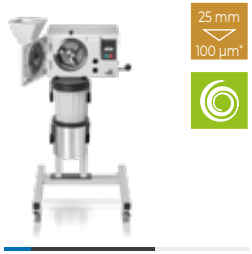
- High final fineness up to 40 µm possible
- Gentle, very fast pulverization
- Wide speed range 6000 – 23000 rpm
- Easily exchangeable grinding tools and sieves, optional cyclone

Hammer Mill HM 200

- Excellent crushing performance
- Very high throughput of up to 1500 kg/h
- Fixed speed of 3000 rpm
- Sieve range from 2 - 40 mm
- For batchwise and continuous grinding

Rotor Beater Mill SR 300

- For sample volumes up to 26 l
- Adjustable speed
- Optional grinding insert 180° for the comminution of hard-brittle samples
- Distance rotor (optional) reduces frictional heat



Cross Beater Mill SK 300

- For sample volumes up to 26 l
- Suitable for medium-hard, abrasive materials
- Adjustable speed
- Optional cyclone

Cyclone Mill TWISTER

- Ideal for the pulverization of feed, grain, etc.
- 3 controlled rotor speeds
- Cyclone with 250 ml collection vessel for quick sample recovery
- No cross-contamination

Cutting Mill SM 100

- Basic model for routine applications
- Rotor speed 9.4 m/s
- For feed sizes up to 60 x 80 mm
- Defined final fineness down to 0,25 mm possible

Cutting Mill SM 200

- All advantages of the SM 100
- Powerful cutting thanks to 2.2 kW motor
- Optimized cutting effect through double cutting bars
- Optional cyclone

Cutting Mill SM 300

- All advantages of the SM 200
- Very powerful cutting thanks to 3 kW motor and RES technology
- Variable speed 100-3000 rpm
- Optional V-Rotor available

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 (Rotational Energy Storage) – 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. For some models a cyclone-suction combination is available for better sample discharge and for cooling the material.

THE PROVEN
GRINDOMIX GM 200 PRINCIPLE:

ALSO SUITABLE FOR CRYOGENIC APPLICATIONS

KNIFE MILLS, DISC MILLS AND MORTAR GRINDERS

HOMOGENEITY IN THE SHORTEST TIME

Knife Mill GRINDOMIX GM 200

- Powerful homogenization of up to 700 ml sample material
- Variable speed 2000 – 10000 rpm
- Cryokit for cold grinding
- Wide range of accessories available

Knife Mill GRINDOMIX GM 300

- Homogenization of up to 4500 ml sample
- Variable speed 500 – 4000 rpm
- Cryokit for cold grinding
- Wide range of accessories available

Mortar Grinder RM 200

- Reproducible results by adjusting the pestle and scraper pressure
- Closed, dust-tight grinding chamber
- Large window to monitor grinding results
- Scraper available in 3 materials

Vibratory Disc Mill RS 200

- Variable speed 700 – 1500 rpm for extremely short grinding times
- Automatic recognition of agate and tungsten carbide
- Closed, soundproof grinding chamber
- Ergonomic design

Vibratory Disc Mill RS 300

- Short grinding time
- Grinding set sizes from 100 ml to 2000 ml
- Soundproof grinding chamber
- Optional autolifter for heavy grinding sets

Disc Mill DM 200

- Reproducible grinding results through precise gap adjustment
- Good accessibility of the grinding chamber
- Long service life of the grinding discs
- Can be used in combination with the BB 200 jaw crusher

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.

INNOVATIVE TECHNOLOGY THAT SETS GLOBAL STANDARDS

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 and short process times. The high-performance ball mill Emax and the planetary ball mills achieve high final finenesses with powerful performance, in many cases down to the nanometer range. They can be used for dry and wet grinding and are ideally suited for mechanical alloying and mechanochemical applications. Drum mills are the first choice for the pulverization of large sample quantities up to 35 l.

BALL MILLS AND DRUM MILLS

THE FIRST CHOICE FOR FINE SIZE GRINDING

High Energy Ball Mill Emax

- Faster and finer grinding than with any other ball mill
- Maximum speed of 2000 rpm
- No cooling breaks required due to innovative water cooling system
- Temperature monitoring with automatic on/off

Planetary Ball Mill PM 100

- Pulverization with max. 33.3-fold acceleration
- Speed ratio 1:-2
- Suitable for dry and wet grinding and long-term tests
- Optional pressure and temperature measuring system

Planetary Ball Mill PM 200

- Pulverization with max. 37.1-fold acceleration
- 2 grinding stations for grinding jars up to 125 ml nominal volume
- Speed ratio 1:-2
- All other features of the PM 100

Planetary Ball Mill PM 300

- Milling with up to 64.4 x acceleration of gravity
- Available jar sizes from 12 to 500 ml
- Variable speed from 100 to 800 rpm
- Ergonomic clamping unit

Planetary Ball Mills PM 400 & PM 400 MA

- Pulverization with max. 26.8-fold acceleration
- 4 grinding stations for grinding jars up to 500 ml nominal volume
- Speed ratio 1:-2 or for mechanical alloying 1:-2.5/1:-3
- All other features of the PM 100

Drum Mill TM 300

- Wet and dry grinding up to 20 l sample volume
- Variable speed, reproducible results
- Utilization as ball or rod mill
- Also suitable for determining the Bond Work Index

Drum Mill TM 500

- Dry grinding up to 35 l sample
- Variable speed, use as ball mill
- Optional separation grid to separate sample from grinding balls
- foodGrade 316 L stainless steel version available

MIXER MILLS

PULVERIZING, MIXING, HOMOGENIZING

XRD-Mill McCrone

- Crystal lattice structure remains intact
- Narrow, reproducible particle size distribution
- Very compact desktop unit
- Grinding speed adjustable in 4 steps

CryoMill

- Powerful cryogenic grinding
- Closed LN_2 system
- Low liquid nitrogen consumption
- Programmable cooling and grinding cycles
- Ceramic grinding jar available

Mixer Mill MM 400

- Powerful size reduction with up to 30 Hz
- 3 different grinding modes: dry, wet or cryogenic
- Time and frequency can be calibrated
- Suitable for efficient cell disruption

Mixer Mill MM 500 nano

- Suitable for the production of nanoparticles
- Comfortable handling
- Powerful grinding with max. 35 Hz
- Large grinding jars up to 2 x 125 ml

Mixer Mill MM 500 vario

- Powerful grinding with max. 35 Hz
- Comfortable handling
- High sample throughput due to 6 grinding stations
- Maximum capacity 50 x 2 ml tubes

Mixer Mill MM 500 control

- Heating and cooling in a temperature range from -100 to +100 °C
- Operation with different thermal fluids possible
- Powerful pulverization with max. 30 Hz
- Temperature display during grinding

XRD MILL AND MIXER MILLS

The compact XRD-Mill McCrone is used for sample preparation to X-Ray diffraction. The mixer mills are specially designed for quick grinding, mixing and homogenization of small sample volumes, as well as for cell disruption or for mechanosynthesis. 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.

RETSCH SIEVE SHAKERS
AND TEST SIEVES

FOR PRECISE PARTICLE SIZE ANALYSIS

VIBRATORY SIEVE SHAKERS

FOR THE PARTICLE SIZE DETERMINATION OF BULK MATERIALS

Vibratory Sieve Shaker AS 200 basic

- Basic model for dry & wet sieving of max. 3 kg sample
- 3D throwing movement
- Sieve stack up to 510 mm height for sieves with max. diameter 203 mm

Vibratory Sieve Shaker AS 200 digit cA

- All features of the AS 200 basic
- Regulated amplitude
- Interval operation (fixed 10 s)
- Digital display of vibration amplitude and time

Vibratory Sieve Shaker AS 200 control

- All features of the AS 200 digit cA
- Memory for 99 sieving programs
- Sieve stack up to 620 mm height
- Digital control of all process parameters

Vibratory Sieve Shaker AS 300 control

- All features of the AS 200 control
- Sieve stack up to 510 mm height
- Max. sample quantity up to 6 kg
- Max. diameter of the sieves 315 mm

Vibratory Sieve Shaker AS 450 basic

- Dry & wet sieving of large samples up to 15 kg
- 3D throwing movement
- Sieve diameter 400 mm or 450 mm
- Digital setting of all parameters

Vibratory Sieve Shaker AS 450 control

- All features of the AS 450 basic
- CET technology for controlled amplitude at high loads up to 25 kg
- Digital control of all process parameters
- Storage of up to 9 SOPs

Horizontal Sieve Shaker AS 400 control

- Sieving with circular motion according to DIN 53 477
- Sieve stack up to 510 mm height, up to max. 5 kg sample quantity
- Digital setting of all parameters
- Storage of up to 9 SOPs

Tap Sieve Shaker AS 200 tap

- Horizontally rotating sieve movement with vertical tapping impulses
- Suitable for dry sieving
- Sieve stack up to 350 mm height, max. 3 kg sample quantity
- Digital time setting

Air Jet Sieving Machine AS 200 jet

- Air jet technology for the deagglomeration of fine powders
- Open mesh function to reduce the number of near-mesh particles
- Variable nozzle speed up to 55 rpm
- Digital parameter setting

EasySieve® Software for particle size analysis

- Control, evaluation and documentation of sieve analyses according to relevant standards
- Also available as CFR-compatible version

THE PERFECT SIEVING MACHINE FOR EVERY MATERIAL

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.

OPTICAL PARTICLE ANALYSIS

Our sister company Microtrac MRB offers a comprehensive range of optical particle analyzers for reliable particle characterization by image analysis or laser diffraction.

For further information please visit:
www.microtrac.com

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 35 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.

SAMPLE DIVIDERS AND FEEDERS

ACCURATE AND REPRESENTATIVE

Sample Divider PT 100

- Extremely high dividing accuracy for 6, 8 or 10 partial samples
- Automatic material feed
- Quick clamping system of the sample bottles
- Monitoring and maintenance of constant speed

Sample Divider PT 200

- Exact division of larger quantities up to 30 l
- Adjustable dividing ratio, 1 to 3 sub-samples
- Automatic material output
- Division procedure according to DIN 51701

Sample Divider PT 300

- Exact division of larger quantities up to 30l or 60l
- Variable speed 18 – 53 min^{-1}
- 6 to 10 sub-samples for discontinuous operation
- 1 sub-sample in case of continuous processing with reject

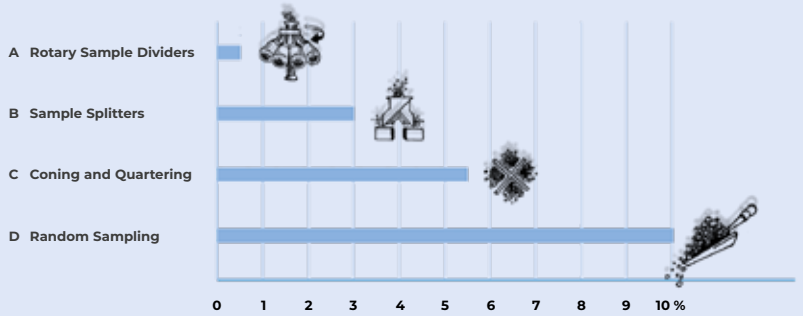
Vibratory Feeder DR 100

- Powerful drive for uniform material feed
- Variable volume flow
- Digital speed and time setting
- Compact control and feed unit

Sample Splitter RT 6.5-75

- For use in the laboratory and on site
- Manual dividing procedure, two sub-samples
- 7 models for different sample quantities
- Division procedure according to DIN 51701

Comparison of different sampling and sample division methods



Example: Bulk material, feed size < 5 mm

The diagram shows qualitative variations among part samples for various methods of sampling and sample division.

RETSCH sample dividers 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.

PELLET PRESSES, DRYERS AND CLEANERS

RELIABLE AIDES IN THE LABORATORY

Pellet Press PP 40

- Compact desktop unit
- Storage of 10 SOPs
- Convenient parameter setting via display
- Automatic press force control

Fluid Bed Dryer TG 200

- Gentle drying, dispersing and mixing
- Interval operation for better mixing of the fluidized bed
- Storage of up to 9 SOPs
- Container volume of 1 x 6 l or 3 x 0.3 l

Ultrasonic Baths UR 1/2/3

- Fast, gentle cleaning
- Small footprint
- Intensive homogenization, dispersion and degassing
- Three models with volumes of 6, 42 or 45 l

DustMon RD 100

- Measurement of the dust content
- Determination of the dust index
- Max. 10 overlay curves
- Analysis compliant with CIPAC MT 171 Standard

FOR RELIABLE ANALYSIS RESULTS

For the preparation of stable pellets with a smooth surface for X-ray fluorescence analysis, RETSCH offers the pellet press PP 40. 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 and is done with the Drum Mill TM 300 (see page 10). The DustMon RD 100 measures the dust content in powders and granules and determines the dust index.

Retsch®

MILLING SIEVING ASSISTING

Retsch GmbH

Retsch-Allee 1-5
42781 Haan
Germany

Phone: +49 2104 2333-100
Fax: +49 2104 2333-199

PREMIUM QUALITY
MADE IN GERMANY

info@retsch.com www.retsch.com

VERDER scientific

VERDER SCIENTIFIC

ENABLING PROGRESS.

Under the roof of VERDER SCIENTIFIC we support thousands of customers worldwide in realizing the ambition we share.

As their technology partner behind the scenes, we deliver the solutions they need to make progress and to improve the everyday lives of countless people. Together, we make the world a healthier, safer and more sustainable place.

CARBOLITE GERO
ELTRA
Retsch
QATM
MICROTRAC
ERWEKA