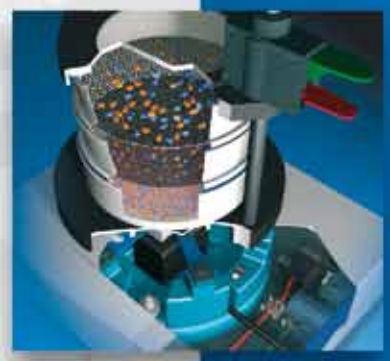
Sample Preparation & Quality Control

Milling

Including latest product news!



Sieving

Assisting

Retsch®

Solutions in Milling & Sieving

RETSCH Sets Standards

More than 90 years of experience in the preparation and characterization of solids – quality “made in Germany”.

As the world-market leader in milling and sieving technology we are constantly striving for customer and market oriented solutions in our research and development activities and implement them systematically in our products and services. The RETSCH philosophy is based on customer orientation and leading edge technology. Based on the principle of the Greek philosopher Aristotle, “The whole is greater than the sum of its parts”, RETSCH develop instruments whose high-quality components are designed for perfect interaction. Thus, they 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**
- **Comprehensive application support including test grindings**
- **Excellent sales and service network throughout the world**

The Company

Milling

The Art of Homogenizing

Particle Sizing

When Size Matters

Assisting

The Key to Greater Efficiency in the Laboratory

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

1923
The company's first own piece of laboratory equipment is developed, a mortar mill, 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 becomes more and more important.

1959
RETSCH enlarges the equipment program for sieve shakers, sample dividers and magnetic mixers. The wider production program needs more room, and so the company moves to Haan.

1963
RETSCH intensifies its cooperation with universities and institutes to ensure that 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 new offices in Haan, which with continual enlargements, is where the company sits today.

1989
André Verder and Frans Bakker take over the F. Kurt Retsch GmbH shares in equal parts. Gradually RETSCH manages the transition from a family business to an internationally active company.

1993
A subsidiary in United Kingdom is opened

1998
Foundation of Retsch Technology as a profit center under the roof of RETSCH in co-operation with Jenoptik L.O.S. GmbH.

1999
A subsidiary in Japan is opened.

2000
Foundation of Retsch Technology as an independent company.
A subsidiary in the USA is opened.

2005
90 years RETSCH:
The headquarters in Haan, Germany, are rebuilt and modernized. The extended and completely refurbished application laboratory is put into operation.

2006
A subsidiary in China is opened.
Relaunch of the website www.retsch.com.

2008
RETSCH opens subsidiaries in Italy, Norway and South Korea.

RETSCH – the company

RETSCH is active in the fields of neutral-to-analysis sample preparation as well as size and shape characterization of solids and enjoys the trust of customers throughout the world.

From the preparation of a representative sample, the contamination-free size reduction process in compliance with related standards to exact and reproducible sieve analyses – RETSCH instruments are essential tools for preparing samples for laboratory analyses. They are characterized by reliability, precision and durability. These three decisive criteria, in addition to over 90 years experience in this sector, have made us the market leader in the manufacture of instruments and supply of solutions. Worldwide sales and marketing of the products are carried out in cooperation with our own subsidiaries, authorized distributors and laboratory dealers in more than 75 countries as well as directly to the end customers.

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 in our application laboratory, for every application. Thus, we find the optimum solution for each sample preparation task.

Free-of-charge Test Grinding

Our application laboratory processes and measures your samples free-of-charge and provides a recommendation for the most suitable method and instrument. All you have to do is fill in the questionnaire and send it to us together with your sample.

Mobile Application Laboratory

With our RETSCH Bus, the laboratory on wheels, we offer you the possibility of an individual, specific and free-of-charge application consultation.

Headquarters:

Retsch GmbH
www.retsch.com

RETSCH subsidiaries:

Retsch Inc.
www.retsch-us.com

Retsch U.K. Ltd.
www.retsch.co.uk

Retsch Italia srl
www.retsch.it

Verder Retsch (Shanghai)
www.retsch.cn

Retsch Co. Ltd.
www.retsch.co.jp

Retsch Norge AS
www.retsch.no

Retsch Korea & Co. Ltd.
www.retsch.co.kr

For the complete list of subsidiaries and distributors please visit www.retsch.com.

Technical Service

RETSCH instruments are designed for a long working life and only require a minimum of maintenance. In case a technical problem does occur, our technical service hotline will help you to solve it quickly and professionally.

Seminars and Workshops

Alone or with renowned partners in the laboratory industry we regularly offer practical seminars and workshops about different aspects of sample preparation, particle measurement and analytics. The dates and places can be found on our website.

Customer Magazine “the sample”

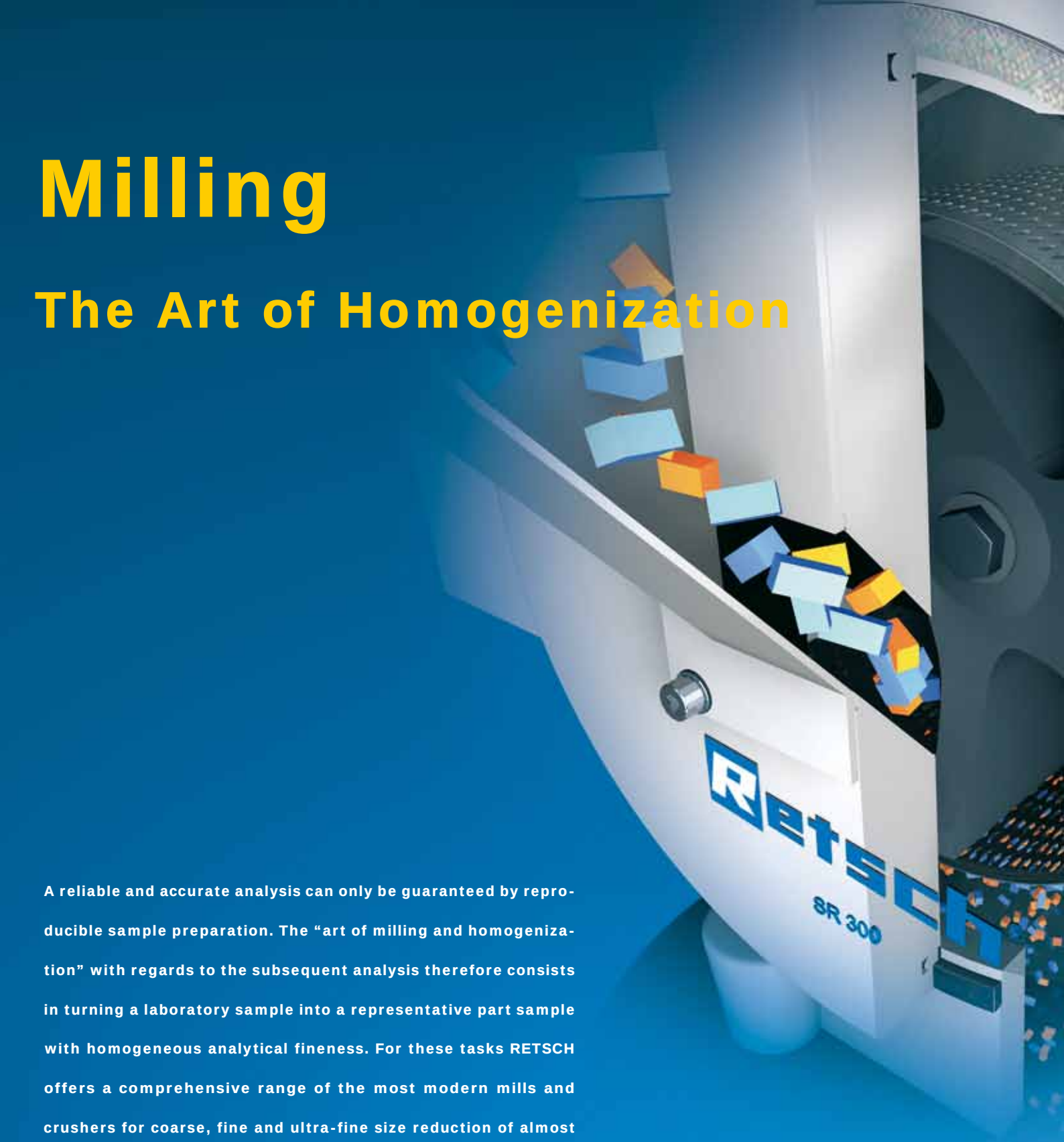
RETSCH's popular customer magazine “the sample” provides readers with the latest information about products, applications, seminars and campaigns. Detailed articles give insight into the particularities of sample preparation and particle analysis and provide valuable tips and tricks.

Product Videos

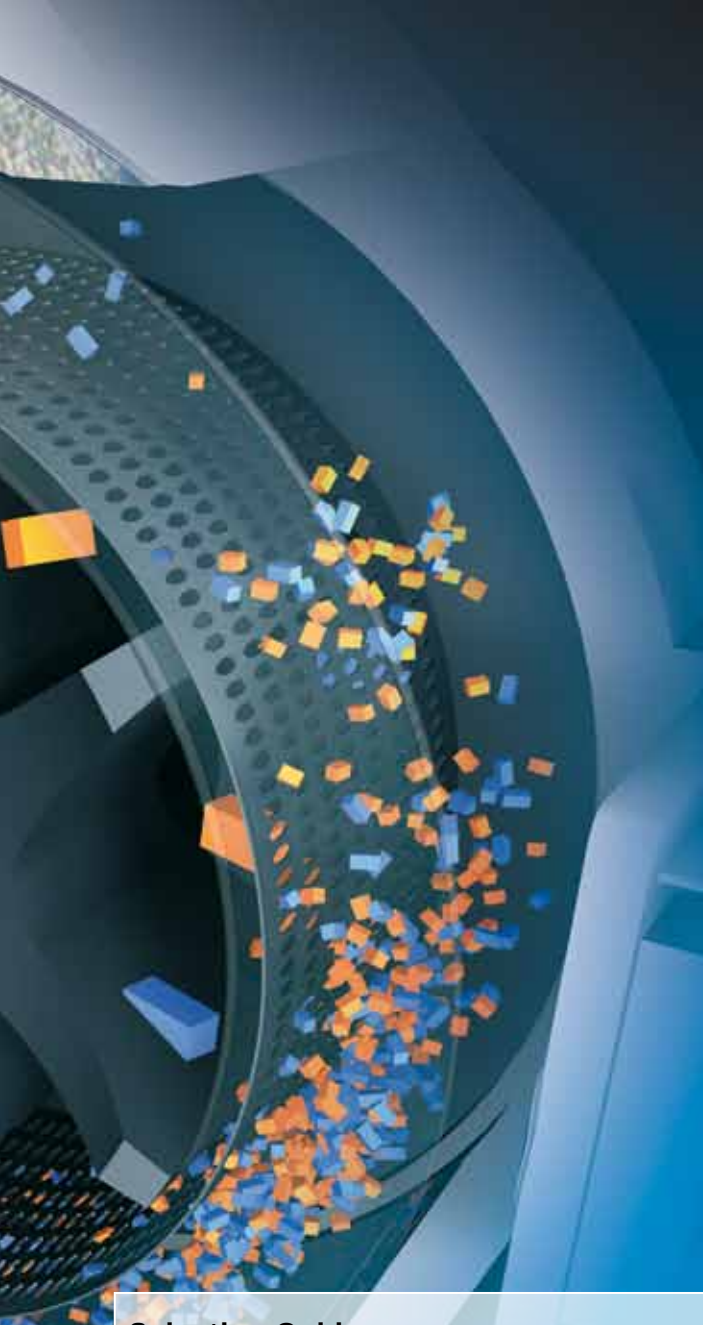
With RETSCH's operation and application videos, no question is left unanswered. The viewer can take a look into the sieve or the grinding jar and see for himself how the machine works. Realistic computer animations help to understand the working principle, the operation and a range of applications are explained in detail.

Milling

The Art of Homogenization



A reliable and accurate analysis can only be guaranteed by reproducible sample preparation. The “art of milling and homogenization” with regards to the subsequent analysis therefore consists in 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.



The matrix below demonstrates the interdependence of instrument, sample material and working principle.

Device	hard and brittle materials	soft, elastic and fibrous materials	Working Principle
Jaw Crusher	■		Pressure
Ultra Centrifugal Mill		●	Impact, Shearing
Cross Beater Mill	■		Impact, Shearing
Rotor Beater Mill	●	● ■	Impact, Shearing
Cutting Mill		■	Shearing, Cutting
Knife Mill		●	Cutting
Mortar Grinder	●		Pressure, Friction
Disc Mill	●		Pressure, Friction
Mixer Mill	●	●	Impact, Friction
CryoMill	●	●	Impact, Friction
Planetary Ball Mill	●	●	Impact, Friction

■ preliminary size reduction
● fine grinding

The Selection Guide gives you an overview of the RETSCH instruments which are, in principle, suitable for certain materials.

Selection Guide

	Jaw Crushers				Rotor Mills				Knife / Cutting Mills					Disc Mills		Mortar Grinders	Ball / Mixer Mills					
	BB 51	BB 100	BB 200	BB 300	ZM 200	SK 100	SR 200	SR 300	GM 200	GM 300	SM 100	SM 200	SM 300	RS 200	DM 200	RM 200	PM 100	PM 200	PM 400	MM 200	MM 400	Cryo-Mill
Feed size* approx. (mm)	35	50	90	130	10	15	15	15	10-40	130	80x60			15	20	8	10	4	10	6	8	8
Final fineness* approx. (mm)	0.5	4	2	5	0.04	0.1	0.08	0.05	0.3	0.3	0.25-20			0.04	0.1	0.01	0.001	0.001	0.001	0.01	0.005	0.005
Construction materials	✓	✓	✓	✓		o								✓	✓	✓	✓	✓	✓	✓	✓	✓
Soils, sewage sludge	o	o	o	o	o	o			o	o				✓	✓	✓	✓	✓	✓	✓	✓	✓
Chemicals products	o	o	o	o	✓	o	✓	✓	o	o	o	o	o	o	o	✓	✓	✓	✓	✓	✓	✓
Electronic scrap, circuit boards					✓	o					✓	✓	✓	o			✓	✓	✓	o	✓	✓
Feedstuff					✓	o	✓	✓	✓	✓	✓	✓	✓		o		o	o	o	✓	✓	✓
Glass, ceramics	✓	✓	✓	✓		o								✓	✓	✓	✓	✓	✓	✓	✓	✓
Wood, bones, paper	o				✓						✓	✓	✓	o		o	✓	✓	✓	✓	✓	✓
Coal, coke	✓	✓	✓	✓	✓	✓	✓	o			✓	o	o	✓	✓	✓	✓	✓	✓	✓	✓	✓
Plastics, cables, rubber					✓						✓	✓	✓							o	✓	✓
Food					✓		✓	✓	✓	✓	✓	✓	✓			✓	o	o	o	o	✓	✓
Leather, textiles					✓	o	o	o			✓	✓	✓				o	o	o	✓	✓	✓
Minerals, ores, stones	✓	✓	✓	✓	o	✓	o	o						✓	✓	✓	✓	✓	✓	✓	✓	✓
Pharmaceutical products					✓	o	✓	✓	✓	✓	o	o	o	o		✓	✓	✓	✓	o	✓	✓
Plants, hay, straw					✓		o	o	o	o	✓	✓	✓	✓		o	✓	✓	✓	✓	✓	✓
Secondary fuels					✓	o					✓	✓	✓				o	o	o	o	✓	✓

✔ suitable **o** suitable to a limited extent *depending on sample and grinding time

This chart serves only for orientation purposes. The selection of the appropriate mill depends on a variety of parameters of the actual application. Please contact us to discuss the best solution.

www.retsch.com/bb100
www.retsch.com/bb200
www.retsch.com/bb300

Jaw Crushers

Main areas of application

Cement clinker, coal, construction materials, granite, metal alloys, quartz, ores, oxide ceramics, silicon, slag, tungsten alloys

Jaw Crushers BB 100 / BB 200 / BB 300

The powerful RETSCH Jaw Crushers are designed for the rapid, gentle coarse and primary crushing of hard, brittle and tough materials. The breaking jaws are available in a variety of materials which include heavy-metal-free steel. Their efficiency and safety makes these pulverizers ideal for sample preparation in laboratories and industrial plants. Four basic models are available: from the compact bench-top model BB 51 to the biggest floor model, BB 300 which allows for feed sizes up to 130 mm. RETSCH jaw crushers combine increased operating convenience with maximum working safety.

BB 100, BB 300

BB 200

The robust floor models BB 100, BB 200 and BB 300 feature:

- **Powerful size reduction with high throughput**
- **High final fineness (down to d_{90} < 2 mm)**
- **Wear compensation due to zero point adjustment**
- **Batch-wise and continuous operation**
- **Wide selection of breaking jaw materials**
- **Safe and simple handling and cleaning**

RETSCH Jaw Crushers are primarily used in laboratories and pilot plants, often under rough conditions. For applications such as the quality control of raw materials the BB 200 and BB 300 can be integrated into the process line for continuous operation.

www.retsch.com/bb51

Jaw Crusher BB 51

The BB 51 jaw crusher is particularly useful in reducing small laboratory samples with a large feed size down to < 0.5 mm in one easy step. Samples such as stone, minerals, ores, glass, synthetic resins and many other hard or brittle substances are ground without contamination, using grinding tools of manganese steel, stainless steel, wear-resistant tungsten carbide, zirconium oxide or heavy metal-free steel. The grind size is controlled through a digital gap width setting. The BB 51 features a zero-point-adjustment to compensate for wear and assure reproducible samples at all times. With its small footprint and dust-tight housing, this unique jaw crusher easily fits on any laboratory bench.

- **High final fineness (d_{90} < 0.5 mm)**
- **Digital gap width setting**
- **Breaking jaws in 5 different materials**
- **No-rebound feed hopper**
- **Dust-tight, no maintenance required**

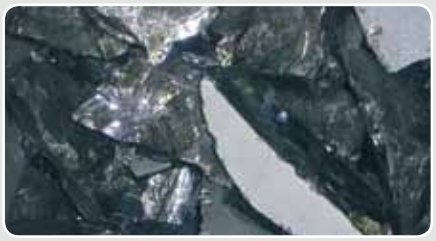
BB 51

Performance data	*BB 51*	*BB 100*	*BB 200*	*BB 300*
Application:	*Coarse and pre-crushing*			
Type of material:	*medium-hard, hard, brittle, tough*			
Feed size:*	*< 35 mm*	*< 50 mm*	*< 90 mm*	*< 130 mm*
Final fineness:*	*< 0.5 mm*	*< 4 mm*	*< 2 mm*	*< 5 mm*

** depending on feed material and instrument configuration/settings*

Main areas of application

Cement clinker, coal, construction materials, granite, metal alloys, quartz, ores, oxide ceramics, silicon, slag, tungsten alloys



www.retsch.com/zm200

Rotor Mills

Main areas of application

Chemicals, drugs, fertilizers, feed pellets, grains, plastics, pharmaceutical products, powder coatings, secondary fuels, spices

Ultra Centrifugal Mill ZM 200

The powerful and versatile ZM 200 offers the ultimate in performance and operating comfort. This widely used mill pulverizes a great variety of substances extremely fast, thus allowing for a high sample throughput. The grinding sets can be cleaned easily without any tools which helps to avoid cross contamination from frequently changing samples.

The 2-step grinding process by shearing and impact effects ensures particularly gentle but fast grinding to sizes typically between 100 and 500 microns. Thanks to the wide range of accessories with different rotors, ring sieves and collectors, the ZM 200 can be easily adapted to suit a wide range of applications. In many industries, such as animal feeds or powder coatings, it has become the standard for sample preparation.

Performance Data ZM 200

Application:	*fine grinding*
Feed material:	*soft, medium-hard, brittle, fibrous*
Feed size:*	*< 10 mm*
Final fineness:*	*< 40 µm*

**depending on feed material and instrument configuration/settings*

ZM 200

- **Robust high torque motor with speed range from 6,000 to 18,000 rpm**
- **Rapid and gentle size reduction by 2-step rotor / screen system**
- **Easy to operate and clean**
- **Great versatility thanks to wide range of accessories**
- **Motor compartment and electronics protected against material penetration**

www.retsch.com/sr200
www.retsch.com/sr300
www.retsch.com/sk100

Rotor Beater Mills SR 200 and SR 300

Due to their robust design and their ability to process large amounts of sample, the Rotor Beater Mills SR 200 and SR 300 are ideal for small-scale production and are also suitable for installation into automated preparation systems. The SR 300 is the leader among the Rotor Beater Mills. Its high speed allows a high sample throughput. Grinding chamber, feed hopper and material inlet and outlet are completely made from high-quality stainless steel.

SR 300

- **High throughput**
- **Final fineness down to 50 µm**
- **Easy handling and cleaning**
- **Exchangeable grinding and sieve inserts**
- **Distance rotor for thermally sensitive samples**
- **Quick-action door lock and motor brake**

Main areas of application

Chemicals, coal, construction materials, drugs, spices, feed pellets, fertilizers, grains, seeds, pharmaceuticals, soils

Performance Data SR 200 / SR 300	
Application:	*size reduction, deagglomeration*
Feed material:	*soft, medium-hard*
Feed size:*	*< 15 mm*
Final fineness:*	*< 80 µm / < 50 µm*

**depending on feed material and instrument configuration/settings*

Cross Beater Mill SK 100

Like the Rotor Beater Mills, the Cross Beater Mill SK 100 is suitable for coarse and fine size reduction, either in batches or continuously. This robust mill is used in the laboratory as well as under rough conditions in production facilities. Due to its powerful drive, it is often possible to achieve a fineness < 100 µm in a single working step. Moreover, the SK 100 offers the highest possible degree of operating safety.

- **High throughput**
- **Final fineness down to 100 µm**
- **Easy handling and cleaning**
- **Wide range of accessories**

SK 100

Main areas of application

Cement clinker, coke, glass, gravel, minerals, ores, oxide ceramics, slags, soils

Performance Data SK 100	
Application:	*size reduction*
Feed material:	*medium-hard, brittle*
Feed size:*	*< 15 mm*
Final fineness:*	*< 100 µm*

**depending on feed material and instrument configuration/settings*

www.retsch.com/sm100
www.retsch.com/sm200
www.retsch.com/sm300

Cutting Mills

Main areas of application

Bones, cables, cardboard, computer and electronic waste, drugs, feeds, foils, leather, light metal scrap, lignite, non-ferrous metals, organic and inorganic waste, paper, plant materials, plastics, rubber, spices, straw, secondary fuels, wood

Cutting Mill SM 100

The Cutting Mill SM 100 is equipped with a parallel section rotor which is especially suitable for soft, elastic and fibrous materials. Many samples can be comminuted in a single process without any preliminary size reduction. A special version of the SM 100 is available for heavy-metal-free size reduction.

Heavy-Duty Cutting Mill SM 200 and SM 300

The RETSCH Cutting Mills SM 200 und SM 300 excel especially in the tough jobs where other cutting mills fail. They provide highly efficient primary size reduction of such heterogeneous materials as waste or electronic components but are also suitable for many other types of samples. The mills offer a high level of operational safety and a long service life of the grinding tools. A wide selection of screens, hoppers and collection systems allows for easy adaptation to the individual application task. These models are also available in a special version for heavy-metal-free size reduction.

- **Powerful size reduction, even of heterogeneous materials**
- **SM 300 with variable speed**
- **Defined final fineness**
- **Low heat build-up**
- **Quick and easy cleaning**
- **Wide range of accessories**

SM 300

Performance Data
SM 100 / SM 200 / SM 300

Application:	*size reduction*
Feed material:	*soft, medium-hard, tough, elastic, fibrous*
Feed size:*	*max. 60 x 80 mm*
Final fineness:*	*0.25 - 20 mm*

**depending on feed material and instrument configuration/settings*

www.retsch.com/gm200
www.retsch.com/gm300

Knife Mills

Knife Mills Grindomix GM 200 and GM 300

The Grindomix Knife Mills set new standards in food sample preparation. The cutting effect produced by the steel blades in conjunction with the patented gravity lid results in the size reduction and perfect homogenization of samples high in water or oil content. It is possible to take a random, yet representative sub-sample from any location in the grinding chamber and still obtain a meaningful analysis result. The GM 200 and GM 300 produce representative samples with a minimum standard deviation in as little as 30 seconds thus beating any household mixer or conventional knife mill by far. A wide range of containers and lids makes it easy to adapt the mill to various applications.

The GM 300 is suitable for the fast and reproducible grinding and homogenizing of sample volumes up to 4,500 ml. Moreover, all parts of the GM 300 which come into contact with the sample material are autoclaveable.

- **Rapid and gentle size reduction and homogenization**
- **Variable speed**
- **For sample volumes up to 4,500 ml**
- **Autoclaveable grinding tools**
- **Results with minimum standard deviation**
- **Special lids for volume adaptation of grinding chamber**
- **Accessories for heavy-metal-free grinding**

GM 300

Main areas of application

Cheese, deep-frozen products, feed pellets, fish, fruit, ham, meat, sausages, seeds, spices, vegetables

Performance Data GM 200 / GM 300	
Application:	*size reduction and homogenization*
Feed material:	*soft, medium-hard, elastic, high water, oil or fat content, dry*
Feed size:*	*< 40 mm / < 130 mm*
Final fineness:*	*< 0.3 mm*

**depending on feed material and instrument configuration/settings*

www.retsch.com/rs200
www.retsch.com/dm200

Disc Mills

Main areas of application

Cement, cement clinker, ceramics, coal, coke, concrete, corundum, glass, metal oxides, minerals, ores, plant material, silicates, slag, soils

Performance Data RS 200

Application:	size reduction, mixing, triturating
Feed material:	medium-hard, hard, brittle, fibrous
Feed size*:	< 15 mm
Final fineness*:	< 40 µm

*depending on feed material and instrument configuration/settings

Vibratory Disc Mill RS 200

No grinder can beat the speed of a Vibratory Disc Mill when it comes to preparing samples for spectral analyses. The RETSCH RS 200 with its powerful stabilized plane drive achieves grind sizes between 40 and 100 microns within seconds and with excellent reproducibility. The powerful instrument runs steadily and smoothly, even with heavy grinding sets and at maximum speed. Thanks to grinding sets in various materials and sizes, this mill can be used for a wide range of sample materials.

RS 200

- **Analytical fineness in seconds**
- **Excellent reproducibility**
- **Powerful stabilized-plane-drive**
- **Easy 1-button operation with graphics display**
- **10 parameter combinations can be stored**

Main areas of application

Bauxite, clinker, coal, coke, dental ceramics, dried soil, glass, gypsum, ores, quartz, sewage, sintered ceramics, sludge slag, steatite

Performance Data DM 200

Application:	size reduction, pre-crushing
Feed material:	medium-hard, hard, brittle
Feed size*:	< 20 mm
Final fineness*:	< 100 µm

*depending on feed material and instrument configuration/settings

Disc Mill DM 200

The Disc Mill DM 200 allows for the fine grinding of larger batches of hard, abrasive substances. The rugged design permits use under rough conditions in laboratories and pilot plants as well as in-line for quality control of raw materials. The Disc Mill achieves an average final fineness of approximately 100 microns often in a single grinding process.

- **Short grinding times, high final fineness**
- **Accurate gap setting ensures reproducible grinding**
- **Grinding discs made of 4 different materials**

DM 200

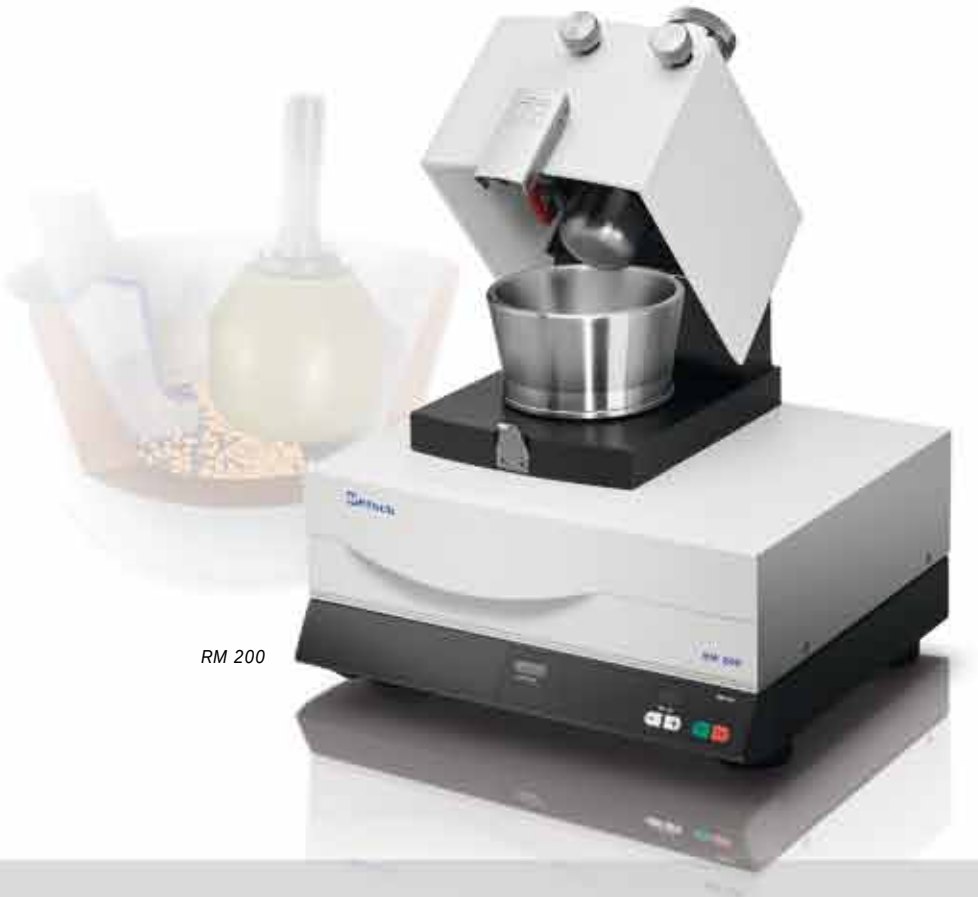
www.retsch.com/rm200

Mortar Grinders

Mortar Grinder RM 200

The RM 200 is the latest generation of the classic “RETSCH Mill” which replaced manual mortars and pestles more than 80 years ago. It is widely used for reproducible sample preparation in R&D, materials testing and especially in pharmaceutics and homeopathy. Many different materials can be easily and efficiently processed in wet or dry condition. The grinding sets of the RM 200 can be selected out of 7 different materials which allows for neutral-to-analysis sample preparation. The new generation of mortar grinders is exceptionally powerful, safe and easy to operate.

- **Reproducible dry and wet grinding**
- **Easy exchange of pestle and mortar without tools**
- **Closed, dust-tight grinding chamber with windows**
- **Grinding sets in 7 different materials**
- **High-performance drive with electronic control**



RM 200

Main areas of application

Ashes, cement clinker, chemicals, cocoa beans, drugs, food, frozen yeast cells, oil seeds, salts, pharmaceutical and homeopathic raw materials and products, silicates, slag, soil, spices

Performance Data RM 200

Application:	*size reduction, mixing, triturating*
Feed material:	*soft, hard, brittle, pasty, dry and wet*
Feed size:*	*< 8 mm*
Final fineness:*	*< 10 µm*

**depending on feed material and instrument configuration/settings*

www.retsch.com/mm200
www.retsch.com/mm400

Mixer Mills

Main areas of application

Alloys, bones, cereal grains, ceramics, chemicals, drugs, glass, hair, minerals, oil seeds, ores, plant materials, plastics, sludge, soils, coated and uncoated tablets, textiles, tissue, waste samples, wool

Mixer Mill MM 400

The RETSCH Mixer Mill MM 400 is a true laboratory “all-rounder”. It has been developed specially for dry, wet and cryogenic grinding of small sample amounts. This high-performance ball mill usually grinds and homogenizes powders and suspensions in only a few seconds and achieves grind sizes down to the nano range. It is also perfectly suitable for the disruption of biological cells as well as for DNA/RNA recovery. Due to its great versatility, the MM 400 is used in many different industries ranging from pharmaceutics and biology to mineralogy, environment or plastics.

MM 400

- **Rapid and efficient pulverization and homogenization**
- **Reproducible results due to digital parameter setting**
- **Grinding jars in various sizes and materials**
- **9 parameter combinations can be stored**
- **Simultaneous preparation of up to 20 samples**

Mixer Mill MM 200

The Mixer Mill MM 200 is also used for efficient size reduction and homogenization of 2 samples simultaneously. It works with the same functional principle as the MM 400. This mill is highly suitable for grinding dry samples in small quantities and offers a favourably priced alternative to the MM 400 for routine applications. The grinding jars for the MM 200 have a push-fit lid.

Performance data	*MM 200*	*MM 400*	*CryoMill*
Application:	*Size reduction, mixing, homogenization, cell disruption*		
Type of material:	*soft, medium-hard, hard, brittle, elastic, fibrous*		
Feed size:*	*< 6 mm*	*< 8 mm*	*< 8 mm*
Final fineness:*	*< 10 µm*	*< 5 µm*	*< 5 µm*

** depending on feed material and instrument configuration/settings*

www.retsch.com/cryomill

CryoMill

The CryoMill has been specially designed for cryogenic grinding. It features an integrated cooling system which continually cools the grinding jar with liquid nitrogen before and during the grinding process. Thus the sample is embrittled and volatile components are preserved. The liquid nitrogen circulates through the system and is continually replenished from an autofill system in the exact amount which is required to keep the temperature at –196 °C. The automatic cooling system guarantees that the grinding process is not started before the sample is thoroughly cooled. This results in reduced consumption and guarantees reproducible grinding results.

The size reduction principle is the same as that of the MM 400. With a vibrational frequency of 25 Hz the CryoMill grinds most materials very effectively in a few minutes. The combination of impact and friction leads to substantially finer grind sizes compared to other cryogenic mills.

The CryoMill is equipped with one grinding station for grinding jar volumes of 25 ml, 35 ml and 50 ml. It is also possible to use adapters for 4 grinding jars of 5 ml each as well as for reaction vials.

- **Fast, efficient cryogenic grinding at -196 °C**
- **Ideal for plastics, temperature-sensitive materials and samples with volatile components**
- **Particularly safe due to autofill system for liquid nitrogen**
- **Highly reproducible grinding results**
- **Programmable cooling and grinding cycles**
- **Also suitable for dry and wet grinding**

Main areas of application

Animal feed, bones, chemical products, hair, oil seeds, paper, plant materials, plastics, sewage sludge, soils, tablets, textiles, tissue, waste samples, wood, wool

CryoMill

www.retsch.com/pm100
www.retsch.com/pm100cm

Planetary Ball Mills

Main areas of application

Alloys, ceramics, chemicals, glass, minerals, ores, plant materials, sewage sludge, soils, household and industrial waste

The innovative Planetary Ball Mills meet and exceed all requirements for fast and reproducible grinding down to the nano range. They are used for the most demanding tasks, from routine sample processing to colloidal grinding and mechanical alloying. The grinding parameters are easily selected and stored with one single button. All planetary mills feature programmable starting time, power failure backup with storage of remaining grinding time and a built-in fan which cools the grinding jars during operation.
The comfort grinding jars are dust-tight and unusually simple and safe to handle.

- **Extreme speed, final fineness down to the nano range**
- **Reproducible results due to energy and speed control**
- **1-button operation with graphics display**
- **10 parameter combinations can be stored**
- **Smooth and stable operation**
- **Automatic grinding chamber ventilation**
- **Suitable for long-term trials and continuous use**

Planetary Ball Mill PM 100

This single station ball mill pulverizes and mixes a wide range of materials and can be operated with grinding jars from 12 ml to 500 ml. It is especially safe to operate on a laboratory bench thanks to the new FFCS technology which helps to compensate vibrations.

PM 100

Planetary Ball Mill PM 100 CM

This ball mill offers all the performance and convenience of the classic PM 100, only the speed ratio of sun wheel to grinding jar is 1:-1 instead of 1:-2. This results in a different ball movement so that the sample is not so much crushed by impact effects but more gently ground by pressure and friction. This not only leads to less abrasion but also reduces the heat build-up inside the jar.

www.retsch.com/pm200
www.retsch.com/pm400

PM 200

Planetary Ball Mill PM 200

The PM 200 is equipped with two grinding stations and accepts grinding jars up to 125 ml. It is used for the pulverization and mixing of smaller sample volumes.

Planetary Ball Mill PM 400

The robust floor model features four grinding stations and accepts jars from 12 ml to 500 ml. It can process up to 8 samples simultaneously thus generating a high sample throughput. The PM 400 is also available with 2 grinding stations and different speed ratios. The model “MA-type” was especially developed for mechanical alloying of hard-brittle materials.

PM 400

Main areas of application

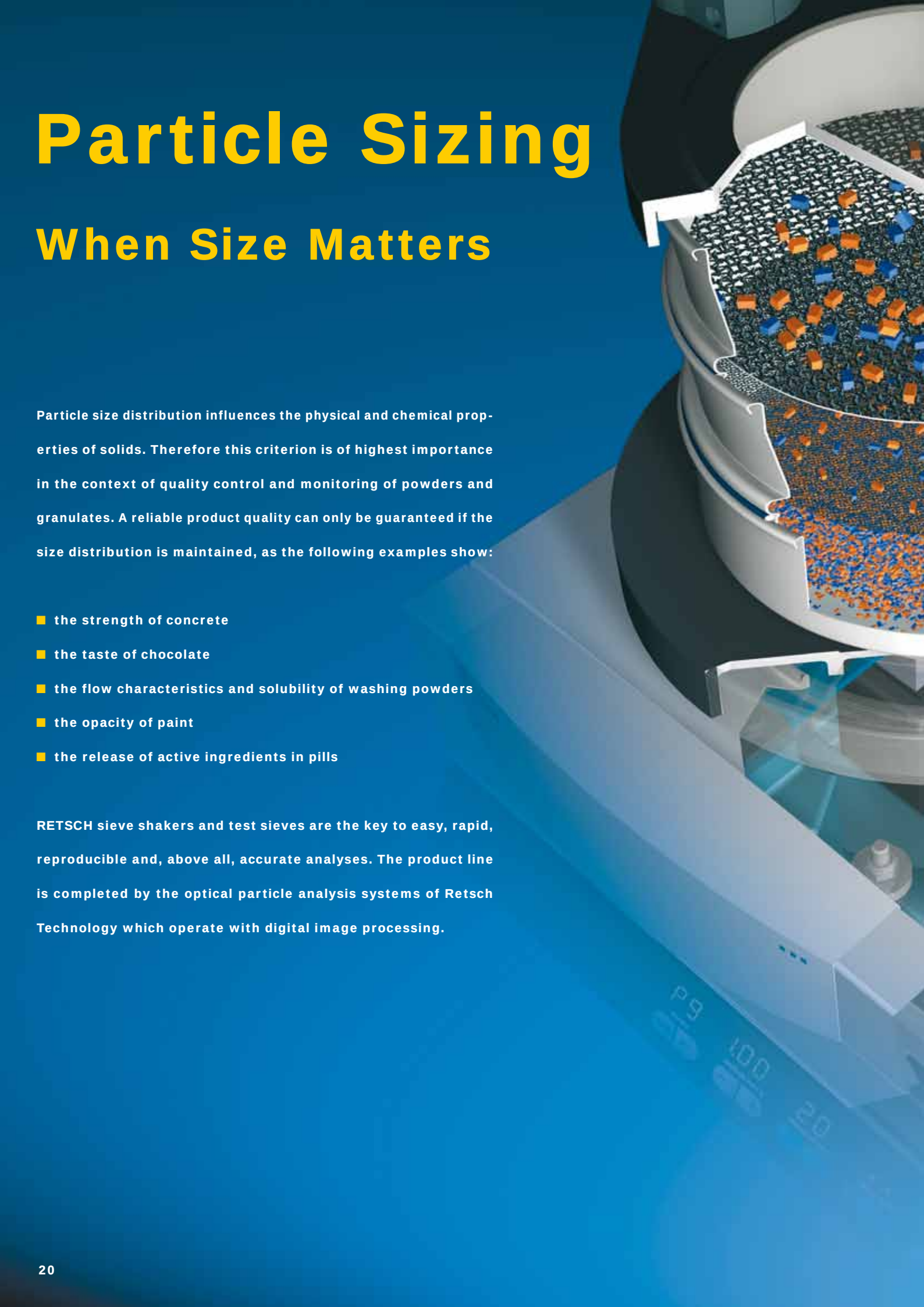
Alloys, ceramics, chemicals, glass, minerals, ores, plant materials, soils, sewage sludge, household and industrial waste

Performance data	PM 100	PM 100 CM	PM 200	PM 400
Application:	Size reduction, mixing, homogenization, colloidal grinding, mechanical alloying			
Type of material:	soft, medium-hard, hard, brittle, fibrous, dry and wet			
Feed size*:	< 10 mm	< 10 mm	< 4 mm	< 10 mm
Final fineness*:	< 0.1 µm	< 0.1 µm	< 0.1 µm	< 0.1 µm

* depending on feed material and instrument configuration/settings

Particle Sizing

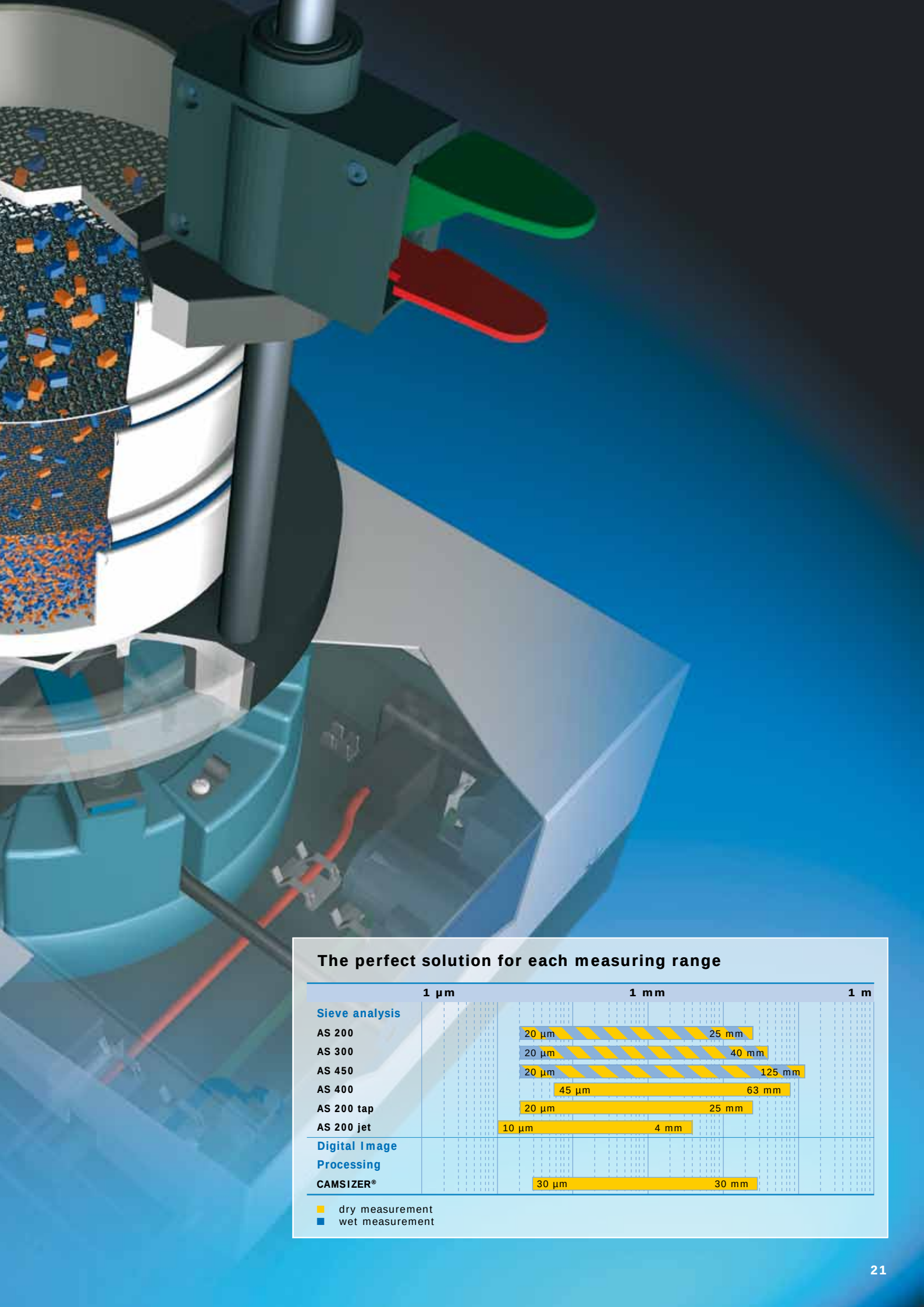
When Size Matters



Particle size distribution influences the physical and chemical properties of solids. Therefore this criterion is of highest importance in the context of quality control and monitoring of powders and granulates. A reliable product quality can only be guaranteed if the size distribution is maintained, as the following examples show:

- the strength of concrete
- the taste of chocolate
- the flow characteristics and solubility of washing powders
- the opacity of paint
- the release of active ingredients in pills

RETSCH sieve shakers and test sieves are the key to easy, rapid, reproducible and, above all, accurate analyses. The product line is completed by the optical particle analysis systems of Retsch Technology which operate with digital image processing.



The perfect solution for each measuring range

dry measurement
wet measurement

www.retsch.com/as200

Sieve Shakers

Main areas of application

Chemicals, coal, coffee, fertilizers, fillers, flour, metal powders, minerals, sand, seeds, soils, washing powder, cement clinker

Sieving with a three-dimensional effect

RETSCH analytical sieve shakers are used in research and development, quality control and production monitoring.
The patented electromagnetic drive of the sieve shakers AS 200 control, AS 300 control and AS 450 control 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. These instruments feature digital amplitude adjustment which allows for sharp fractionizing of the sample even after very short sieving times. All sieve shakers of the series “control” come with an inspection certificate and can be calibrated. They are suitable as measuring instruments according to DIN EN ISO 9000 ff.

- **Sieving with 3-D effect**
- **For dry and wet sieving**
- **9 parameter combinations can be stored**
- **All-digital controls**
- **Independent of power frequency, loading, age when working in sieve acceleration mode**
- **Comparable and reproducible sieving results worldwide**
- **Integrated interface**
- **Low noise, no maintenance required**

AS 200 basic

AS 200 digit

AS 200 control

Sieve Shaker AS 200 control

The AS 200 control is designed for sieves with a diameter up to 203 mm (8”). It covers a measuring range from 20 µm to 25 mm. The AS 200 control offers a decisive advantage: Instead of the vibration height, the sieve acceleration, which is independent of the power frequency, can be set. Thus, comparable and reproducible sieving results world-wide are guaranteed. The AS 200 is also available as “basic” version with analogue parameter setting and as “digit” version with digital time control and interval operation.

www.retsch.com/as300
www.retsch.com/as450

AS 300 control

Sieve Shaker AS 300 control

The AS 300 control accepts sieves with a diameter up to 315 mm (12”). The measurement range lies between 20 µm and 40 mm. Due to the greater sieving surface, the average sieving time can be considerably reduced with this model. Another advantage is the high feed quantity of 6 kg which can be separated in one working run.
Just like the AS 200 control, this siever allows for the setting of the sieve acceleration instead of the vibration height.

Sieve Shaker AS 450 control

The AS 450 control is designed for 400 mm and 450 mm sieves. The measurement range lies between 20 µm and 125 mm. Due to the powerful electromagnetic drive, this sieve shaker achieves an amplitude of up to 2.2 mm which renders the separation process much more effective than with other sieve shakers of this type. The AS 450 control can separate sample amounts of up to 20 kg in one working run.

- **Excellent separation efficiency even with short sieving times**
- **For high sieve loads (up to 20 kg)**
- **Sieve stack up to 963 mm height, Ø 400 / 450 mm**
- **Mobile operation panel for comfortable handling**

AS 450 control

Main areas of application

AS 450 control:
Cement clinker, chemicals, coal, coke, construction materials, fillers, minerals, ores, plastics, sand, soils

Performance data	AS 200 basic	AS 200 digit	AS 200 control	AS 300 control	AS 450 control
Applications:	separation, fractioning, particle size determination				
Feed material:	powders, bulk materials, suspensions				
Measuring range*:	20 µm to 25 mm	20 µm to 25 mm	20 µm to 25 mm	20 µm to 40 mm	20 µm to 125 mm
Max. batch / feed capacity:	3 kg	3 kg	3 kg	6 kg	20 kg
Adjustment of amplitude:	analog 0 - 3 mm	analog 0 - 3 mm	digital 0.2 - 3 mm	digital 0.2 - 2 mm	digital 0.2 - 2.2 mm
Suitable sieve diameters:	100 mm to 200 mm / 8”	100 mm to 200 mm / 8”	100 mm to 200 mm / 8”	100 mm to 315 mm	400 mm to 450 mm

*depending on feed material and used sieve set

www.retsch.com/as400
www.retsch.com/as200tap

Sieve Shakers

Main areas of application

AS 400:
Building materials, compost, flour, grained moulding materials, milled grain, seeds, wood chippings

Horizontal circular sieving motion

The horizontal circular sieving motion is preferably used for long or fibrous, needle-shaped or flat materials. The horizontal orientation of the particles allows for better reproducibility of the sieving results.

Sieve Shaker AS 400 control

The AS 400 control accepts sieve stacks from 100 to 400 mm (4" - 16") diameter which allows for versatile use. The horizontal, circular sieving motion ensures exact separation of fine and coarse-grained products. The AS 400 is the only horizontal sieve shaker with all digital controls.

- **Measuring range 45 µm to 63 mm**
- **All-digital controls**
- **Easy operation**
- **Low-noise, no maintenance required**

AS 400 control

Main areas of application

AS 200 tap:
Abrasives, activated carbon, cement, diamonds, metal powder, spices

Sieve Shaker AS 200 tap

The AS 200 tap sieve shaker combines horizontal circular sieving with vertical tapping motions which reproduces the principle of hand sieving as is specified in various standards for particle size analysis. The uniform mechanical sieving motion produces reliable and reproducible measurement results.

AS 200 tap

- **Measuring range 20 µm to 25 mm**
- **Robust, no maintenance required**
- **Digital timer**
- **Integrated interface**

www.retsch.com/as200jet

Air Jet Sieving

The sieving material is moved solely by an air flow. The method is fast and very gentle on the material and is preferably used for very fine samples which tend to agglomerate. The air jet disperses the powder and also purges the sieve mesh continuously.

Sieving machine AS 200 jet

The air jet sieving machine AS 200 jet is particularly suitable for the sieving of light materials with particle sizes down to 10 microns. An industrial vacuum cleaner generates a jet of air which blows through a rotating slotted nozzle against the sieve mesh. The particles on the sieve are dispersed and distributed all over the sieve surface. Each sieving process provides one fraction. The sieved particles can be collected in a cyclone for further treatment. A special feature of the AS 200 jet is the Open Mesh Function. This procedure guarantees that the number of near-mesh particles is greatly reduced thus allowing for optimum separation efficiency and reproducibility. The AS 200 jet is designed for operation with RETSCH's 203 mm (8") high-quality sieves.

- **Measuring range 10 µm to 4 mm**
- **Fast and gentle procedure**
- **Reproducible results due to Open Mesh Function**
- **Digital parameter setting**
- **Integrated interface**

AS 200 jet

Main areas of application

Construction materials, spices, catalysts, plastics, flour, pharmaceuticals

Performance Data	*AS 400 control*	*AS 200 tap*	*AS 200 jet*
Applications:	*separation, fractioning, particle size determination*		
Feed material:	*powders, bulk materials*		
Measuring range:*	*45 µm to 63 mm*	*20 µm to 25 mm*	*10 µm to 4 mm*
Max. batch / feed capacity:	*5 kg*	*3 kg*	*0.1 kg*
Adjustment of Amplitude / speed:	*digital, 50 - 300 min^{-1}*	*fixed, 280 min^{-1}, 150 taps*	*digital, 5 - 55 min^{-1}*
Suitable sieve diameters:	*100 - 400 mm*	*200 mm / 8"*	*203 mm (8")*

**depending on feed material and used sieve set*

www.retsch.com/sieves
www.retsch.com/easysieve

Test Sieves

Highest precision for accurate results

RETSCH test sieves are manufactured using a unique, fully automatic production process which results in a superior product quality. RETSCH's quality test sieves are available in the four most widely used frame sizes:

200 x 50 mm • 200 x 25 mm • 203 x 50 mm (8″ x 2″) • 203 x 25 mm (8″ x 1″)

- **One piece construction and fabric-transition without any grooves to prevent cross contamination (no solder, no epoxy, no residues, etc.)**
- **A high degree of corrosion resistance and ease of cleaning due to high-alloy stainless steel**
- **15 % lighter than traditional sieves while at the same time increasing the free sieve area**
- **Excellent product quality due to fully automatic production and extensive optical inspection with optimum design**
- **Permanently tight sieve fabric thanks to innovative resistance welding technology**
- **Maximum stability and optimum sealing when used in sieve stacks**
- **Individualized laser engraving allows for clear labeling of the sieves with full traceability**

Quality control at the highest level

At RETSCH each sieve is subjected to a final quality check. This includes the optical measurement of the sieve mesh and recording the data on a high tech measuring system. The method and its results can be followed on a monitor. The instrument reads off the barcode on the sieve; this is programmed with the particular sieve standard which is valid for the sieve. Depending on the customer's requirements, sieves can be supplied with a test report, inspection certificate or calibration certificate. The sieve and its accompanying documents are packed in an individually marked cardboard box, which is then sealed in plastic film to protect it against environmental influences.
Thanks to the high inventory level in our warehouse, RETSCH high-quality sieves are available for our worldwide customers at any time.

Tested quality – with certificates

Every Retsch high-quality sieve receives **a test report** before it is delivered.

On request, an **inspection certificate** according to DIN ISO 3310-1 is available, too, which documents the measuring results in tabular and graphical form. The **calibration certificate** provides even more statistical details.

As a special service RETSCH offers **recalibration** of the test sieves. After the standard measuring process of the sieves, all relevant data are recorded and confirmed in the certificate.

Production process

1. *Data entry*
2. *Welding*
3. *Lasering*
4. *100% optical inspection*

Evaluation Software EasySieve®

EasySieve®, the software for particle size analyses, exceeds manual evaluation in many aspects, due to the fact that the software is able to automatically control the necessary measurement and weighing procedures – from the registration of the weight of the sieve up to the evaluation of the data.

www.retsch-technology.com/camsizer

CAMSIZER®

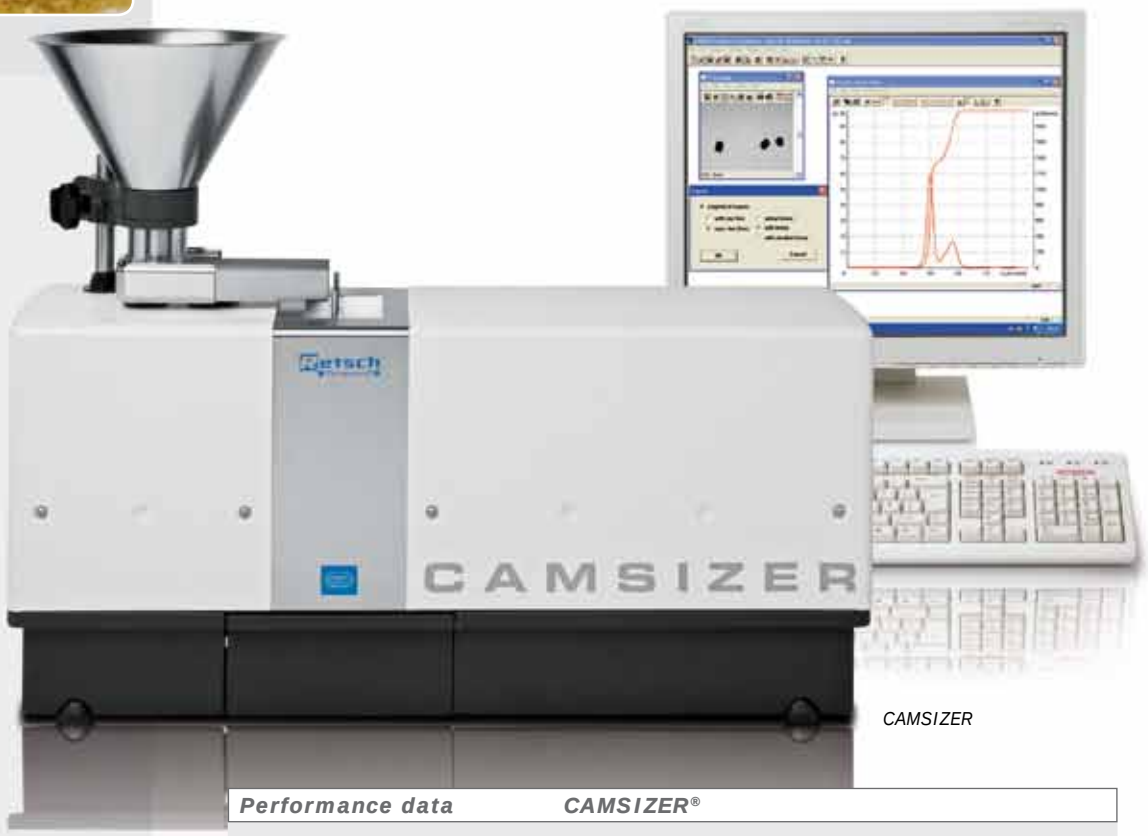
Main areas of application

Abrasives, carbon products, pelletized carbon black, coffee, catalysts, fertilizers, foodstuffs, glass, ceramics, metal powder, pharmaceuticals, plastics, polystyrene, refractory products, salt, sugar, sand

Particle size and particle shape analysis with digital image processing

The CAMSIZER is a compact laboratory instrument for simultaneous measurement of particle size distribution and particle shape of powders and granules. Based on digital image processing by the unique, patented two-camera system pourable solids in a range from 30 µm to 30 mm can be measured. Thanks to the unique scanning of all particles and the newly developed fitting algorithms, measuring results are 100% compatible to those of sieve analysis. This makes the CAMSIZER the ideal time- and cost-saving alternative to sieving.

- **Simultaneous analysis of particle size, shape, number and density**
- **Very short measuring time (2-3 min.)**
- **Results are 100 % compatible to sieve analysis**
- **Greatest possible accuracy and reproducibility**
- **Self-cleaning, wear-free, maintenance-free**



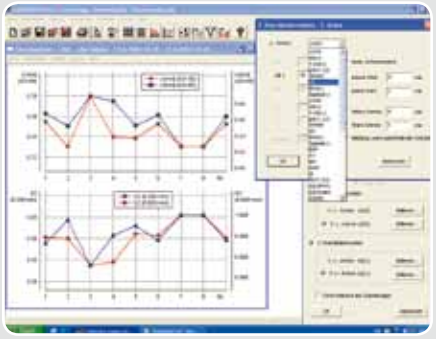
CAMSIZER

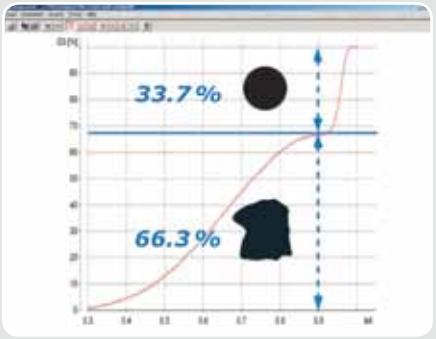
Performance data	*CAMSIZER®*
Measuring range:	*30 µm - 30 mm*
Measuring principle:	*Digital image processing*
Measuring time:	*Approx. 2 – 3 min depending on the desired measuring statistics*
Measurements:	*60 images with more than 780,000 measuring points (corresponds to more than 45 million measuring points per second)*
Options:	*AutoSampler; Online-Version*

Measurement principle

The CAMSIZER uses the principle of digital image processing. The sample is transported to the measurement field via a vibratory feeder where the particles drop between an extended light source and two CCD cameras. The projected particle shadows are recorded at a rate of more than 60 images per second and analyzed. In this way every single particle in the bulk material flow is recorded and evaluated. Thus, it is possible to measure a wide range of particles from 30 µm to 30 mm extremely accurately, without having to switch measuring ranges or make adjustments.
With the **unique, patented two-camera system** a great depth of sharpness, and therefore maximum precision across the entire measuring range, is obtained. The zoom camera provides maximum resolution down to the fine range, while the basic camera also records larger particles and guarantees a high statistical certainty in the results. This ensures the excellent reproducibility of the CAMSIZER measuring results, even if only a relatively small sample amount is available. The results are saved in at least 1,000 size classes.

Camsizer® with AutoSampler





CAMSIZER® AutoSampler

The use of the optional AutoSampler maximizes the efficiency of the CAMSIZER. No matter whether varying sample materials are to be analyzed or series measurements need to be carried out, the AutoSampler adapts itself perfectly to the defined measuring routine.

CAMSIZER® Online

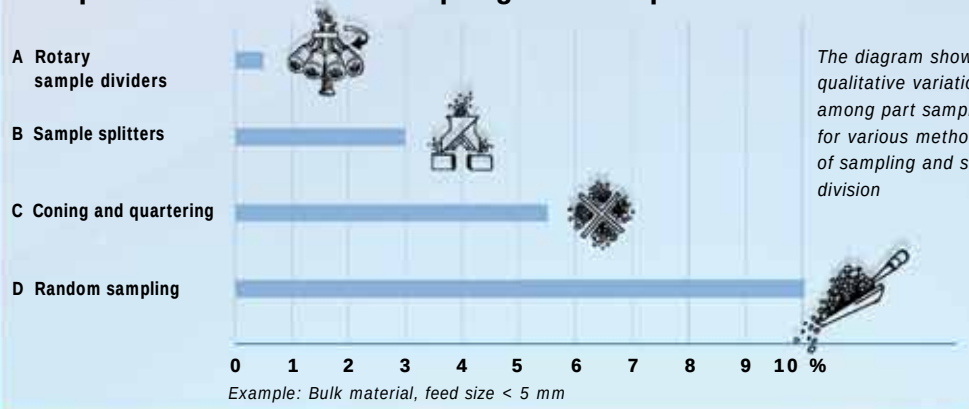
Due to its robust construction and interference-free measuring principle, the CAMSIZER is particularly suitable for integration in the production line in online operation. In such applications, the online version of the CAMSIZER is optimally matched to the specific “on-site” needs.

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 offer a comprehensive program of useful and cost-effective assistants which enhances the performance of our mills and sieve shakers even further.

Comparison of different sampling and sample division methods



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

Example: Bulk material, feed size < 5 mm

www.retsch.com/pt100
www.retsch.com/pk1000
www.retsch.com/rt
www.retsch.com/dr100

Assisting

Sample Dividers
PT 100, PK 1000, RT 6.5 - RT 75

Sample dividers are essential for the exact and representative division of pourable bulk goods in the laboratory. The Rotary Sample Divider PT 100 uses the most exact division method which produces the smallest qualitative variations. In addition to the PK 1000, which divides larger amounts up to 30 l per run, RETSCH offer the sample splitter RT for manual division.

Performance data	PT 100	PK 1000	RT
Application:	Sample division	Sampling, sample division	Sample division
Feed material:	Bulk materials	Bulk materials	Bulk materials
Number of part samples:	6, 8 or 10	1-3	2
Feed size:	< 10 mm	< 10 mm	< 4 - 50 mm
Collector volume:	100, 250, 500 ml	500 ml, 30 l	2.5 l, 8 l

Vibratory Feeder DR 100

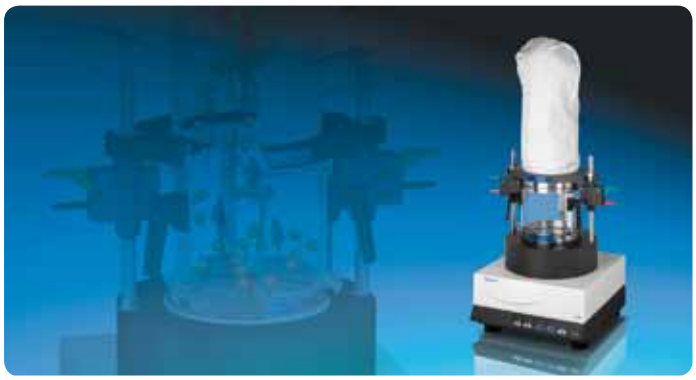
The Vibratory Feeder DR 100 is ideal for the uniform, continuous feed of pourable bulk materials and fine powders. It is used in combination with RETSCH mills and sample dividers and is also suitable for balances and particle measurement systems. Thanks to the wide range of accessories, the Vibratory Feeder DR 100 can be used for a variety of applications.

Performance data	DR 100
Application:	Feeding, conveying
Feed material:	Bulk materials
Feed size:	2 - 12 mm
Time setting:	1-99 min. digital, continuous operation
Flow rate:	0-5 l/min, continuously adjustably

www.retsch.com/tg200
www.retsch.com/ur
www.retsch.com/pp25
www.retsch.com/pp40

Fluid Bed Dryer TG 200

The Fluid Bed Dryer TG 200 is used in the laboratory for the gentle drying of bulk materials without localized overheating. The average drying time lies between 5 to 20 minutes which represents a substantial saving in time compared to other drying methods. Typical materials include coal, plastics, soils, pharmaceutical products or plant materials. The TG 200 can also be used for drying test sieves.



Performance data	TG 200
Application:	Drying
Feed material:	Bulk materials and solids, > 63 µm
Temperature control:	40 - 150 °C, continuously adjustable
Time setting:	0 - 99 min. continuously adjustable
Container volume:	1 x 6 l or 3 x 0.3 l

Ultrasonic Baths UR 1, UR 2, UR 3

RETSCH ultrasonic baths are used for the gentle and efficient cleaning of test sieves, glass and metal parts, metallographic and geological samples and many others. Further areas of application are sample preparation of suspensions (e.g. for wet sieving), dispersions in chromatography or the degassing of solutions.

Performance data	UR 1	UR 2	UR 3
Application:	Cleaning, dispersion, degassing		
Feed material:	Test sieves, glass and metal components, suspensions		
Volume:	5.7 l	42 l	45 l

Pellet Presses PP 25, PP 40

For the preparation of solid samples for XRF analysis RETSCH offer 2 types of pellet presses. The automatic press PP 40 is a floor model which features an individual pressure force regulation of up to 40 t. The pellets are pressed into steel rings with an outer diameter of 40 and 51.5 mm. It is also possible to use aluminum cups. The manual hydraulic Pellet Press PP 25 is a compact bench-top model with pressing tools for 32 mm and 40 mm pellets.

Performance data	PP 25	PP 40
Application:	Preparation of pellets for spectral analyses	
Feed material:	Minerals, slag, ores, cement, raw materials etc.	
Max. pressure:	25 t	40 t
Pellet diameters:	32 mm, 40 mm	40 mm, 51.5 mm
Parameter combinations:	–	32

www.retsch.com

RETSCH Online Services

As a global market leader, RETSCH strive to provide information to customers worldwide 24 hours a day, 7 days a week. The website www.retsch.com is the ideal tool to get first-hand details on products, applications, contact persons, dates and events. The site, which is available in 10 languages, is updated on a daily basis.

Product Pages

Each product is presented in great detail. In addition to features, technical data and order information, a whole range of useful documents and files can be downloaded:

- **Brochures**
- **Operation & Application Videos**
- **Selection Guide**
- **Application Reports**
- **Material Analyses of Grinding Tools**

Function & Features	Versions & Accessories	Product Information
– Product advantages – Function principle	– NEW: Picture of each price list article – Order data	– Videos – Brochures – Application reports – Tips & Tricks – Operating instructions and many more

Application Data Base

In order to find the best possible solution for your sample preparation task RETSCH offer free-of-charge test grindings and particle analyses which are carried out by our application specialists. The results are collected in a database which currently contains more than 1,000 test reports. For the online database we selected the most frequently occurring applications.

The application data base is an excellent tool to get a first orientation as to which instrument may be suitable for a particular application or sample material.

www.retsch.com/applicationdatabase

Test Grindings

The “application” menu offers the possibility to download the questionnaire for milling and sieving which you need to send in your sample for a free test grinding or particle size analysis.

www.retsch.com/testgrinding

What's New?

The “News” section of the website provides the latest press releases, a survey of the international trade shows in which RETSCH participates and details about seminars and workshops.
Those who are interested in receiving information on a regular basis can subscribe to our bimonthly newsletter or to the customer magazine “the sample” free-of-charge.

www.retsch.com/news

RETSCH PRODUCT RANGE

Visit us at www.retsch.com and you will find further information such as news, product info, brochures, videos for download, search for applications and much more.

MILLING

Jaw Crusher
BB 51

Jaw Crushers
BB 100 / BB 200 / BB 300

Ultra Centrifugal Mill
ZM 200

Rotor Beater Mills
SR 200/SR 300

Cross Beater Mill
SK 100

Knife Mills
GRINDOMIX GM 200 / GM 300

Heavy-Duty Cutting Mills
SM 100/SM 200/SM 300

Mortar Grinder
RM 200

Disc Mill
DM 200

Vibratory Disc Mill
RS 200

CryoMill

Mixer Mills
MM 200/MM 400

Planetary Ball Mills
PM 100 CM/PM 100/PM 200

Planetary Ball Mill
PM 400

Measuring System
PM GrindControl

SIEVING

Sieve Shakers
AS 200/AS 300/AS 400/AS 450

Tap Sieve Shaker
AS 200 tap

Air Jet Sieving Machine
AS 200 jet

Test Sieves
Evaluation Software EasySieve®

Optical Particle Analyzer
CAMSIZER®

ASSISTING

Sample Dividers
PT 100 / PK 1000

Vibratory Feeder
DR 100

Rapid Dryer
TG 200

Ultrasonic Baths
UR 1/UR 2/UR 3

Pellet Presses
PP 25/PP 40

Retsch®
Solutions in Milling & Sieving
www.retsch.com
a VERDER company

Retsch GmbH
Rheinische Straße 36
42781 Haan · Germany

Phone +49 (0) 21 29 / 55 61-0
Fax +49 (0) 21 29 / 87 02

E-mail info@retsch.com
Internet www.retsch.com

Printed in Germany • Subject to technical modification and errors • 99.001.0011/E-02-2010