

Hair



Plastics



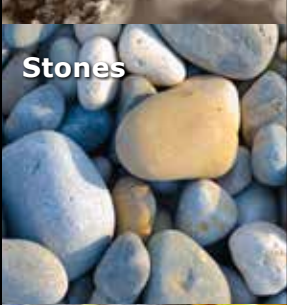
Slag



Soil



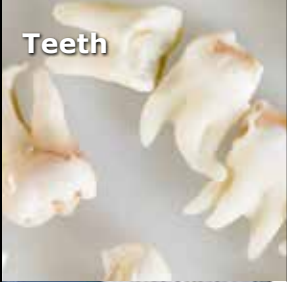
Stones



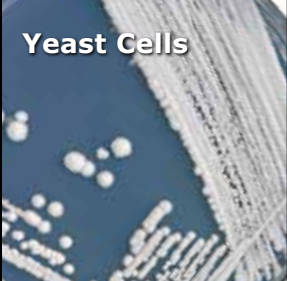
Tablets



Teeth



Yeast Cells



Retzsch®

Solutions in Milling & Sieving

For every application a suitable ball mill

With 11 different models the RETSCH ball mill range is the most extensive in the world offering a high degree of flexibility when it comes to milling samples down to the submicron range.

**Widest
Range of
Ball Mills
Worldwide**
RETSCHE



part of **VERDER**
scientific

For every application a suitable ball mill



Solutions in Milling & Sieving

The widest ball mills in



RETSCH's comprehensive range of ball mills comprises High Energy Ball Mills, Planetary Ball Mills and Mixer Mills. Whereas the Mixer Mills are used for dry/wet/cryogenic grinding and homogenizing small sample volumes, the Planetary Ball Mills meet and exceed all requirements for fast and reproducible

Wet grinding Mechanical
 Dry grinding
 Grind size Adapters for disposable vials
 Energy input Cool
 Cryogenic grinding
 Sample throughput
 Neutral-to-analysis Materials



Performance Data

	Mixer Mill MM 200	Mixer Mill MM 400	CryoMill	High Energy Ball Mill Emax	Planetary Ball Mill PM 100 CM	Planetary Ball Mill PM 100
No. of Grinding Stations	2	2	1	2	1	1
Grinding Speed	3-25 Hz	3-30 Hz	5-30 Hz	300-2000 rpm	100-650 rpm Speed ratio 1:-1	100-650 rpm Speed ratio 1:-2
Batch Size max	2 x 10 ml	2 x 20 ml	2 x 20 ml	2 x 45 ml	1 x 220 ml max. 2 x 20 ml	1 x 220 ml max. 2 x 20 ml
Final Fineness*	~ 10 µm	~ 5 µm	~ 5 µm	<1 µm , <80 nm**	<1 µm / <0.1 µm**	<1 µm / <0.1 µm**
	Push-fit grinding jars for high throughput	Dry, wet and cryogenic grinding	Continuous cryogenic grinding	Water cooling, temperature control	For more gentle grinding	Powerful grinding suitable for most applications

* depending on feed material and instrument configuration/settings **for colloidal grinding

range of n the world

grinding down to the submicron range as well as mechanical alloying. The High Energy Ball Mill E_{max} provides grind sizes in the nanometer range in a very short time and is also used for mechanical alloying and colloidal grinding. Whatever your requirements may be - RETSCH has the perfect ball mill for your application!

alloying inert atmosphere
Colloidal grinding
Sample volume
Grinding jar volumes Gentle on material
Grinding time
Nano grinding
of jars and balls



Planetary Ball Mill PM 200	Planetary Ball Mill PM 400/2	Planetary Ball Mill PM 400	Planetary Ball Mill PM 400 MA	
2	2	4	4	
100-650 rpm Speed ratio 1:-2	30-400 rpm Speed ratio 1:-2	30-400 rpm Speed ratio 1:-2	30-400 rpm Speed ratio 1:-2.5	30-400 rpm Speed ratio 1:-3
2 x 50 ml max. 4 x 10 ml	2 x 220 ml max. 4 x 20 ml	4 x 220 ml max. 8 x 20 ml	4 x 220 ml max. 8 x 20 ml	
<1 µm / <0.1 µm**	<1 µm / <0.1 µm**	<1 µm / <0.1 µm**	<1 µm / <0.1 µm**	
Two grinding stations in a benchtop model	Two grinding stations in a robust floor model	High capacity floor model	Extended speed ratios for more energy input e.g. for mechanical alloying	

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Application Examples



MIXER MILL MM 200 AND MM 400

Sample	Feed quantity	Final fineness
Back tooth	2-3 pieces	<100 µm
Cr-Alloy	20 g	<250 µm
Frog tissue	10 g	homogenized
Human hair	500 mg	<63 µm
Moss	1 g	<150 µm
Parts of insects	1-2 pieces	homogenized
Tablets	15 g	<150 µm
Wood	1 piece	<200 µm
Yeast cells disruption	8 x 4 g wet cells in 12 g buffer	12 µg/ml protein



CRYOMILL

Sample	Feed quantity	Final fineness
Caoutchouc	4 g	<1 mm
Chocolate	1 piece	<0.5 mm
Paper	4 g	<400 µm
PET granulate	10 g	<350 µm
Shoe sole	6 g	<400 µm



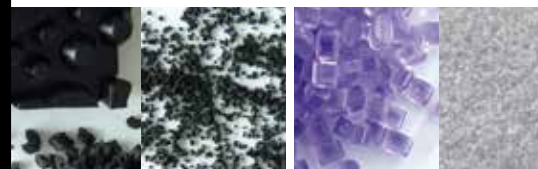
HIGH ENERGY BALL MILL E_{max}

Sample	Feed quantity	Final fineness
Al ₂ O ₃	23 g 20% by weight suspension	<0.14 µm
Coal	26 g	<17 µm
Graphite	5 g	<1.7 µm
Plant material	3 g	<85 µm
Pigment TiO ₂	10 g	<0.087 µm
Quartz	66 g	<16 µm
Tungsten carbide	60 g	<0.7 µm



PLANETARY BALL MILLS

Sample	Feed quantity	Final fineness
Ash	100 g	<1.3 µm
Catalysts	130 ml	<63 µm
Ceramics	250 g	<20 µm
Effluent sludge	172 g	<110 µm
Mangan-oxide	40 g	<0.7 µm
Mineral	150 g	<45 µm
Semi-crystalline Polymer	2 g	<0.6 µm
Straw	50 g	<50 µm
Super-absorber	100 g	<50 µm



Grinding jars and grinding balls

The grinding jars and balls for RETSCH ball mills are available in a variety of materials and sizes. The grinding jars provide safe, convenient and leak-free handling and ensure optimum grinding results with a minimum of abrasion. Accessories for grinding under inert atmosphere and GrindControl are available.



Jar materials

	Mixer Mill MM 200	Mixer Mill MM 400	CryoMill	High Energy Ball Mill E _{max}	Planetary Ball Mills
Hardened steel	✓	✓	✓	-	✓
Stainless steel	✓	✓	✓	✓	✓
Zirconium	✓	✓	✓	✓	✓
Tungsten carbide	✓	✓	-	✓	✓
Agate	✓	✓	-	-	✓
Sintered aluminum oxide	-	-	-	-	✓
Silicon nitride	-	-	-	-	✓
PTFE	✓	✓	✓	-	-
Single-use reaction vessels 0.2/1.5/2.0 ml	Up to 20 in one step	Up to 20 in one step	Up to 6 in one step	-	-
Single-use reaction vessels 50 ml	-	Up to 8 in one step	-	-	-

RETSCH grinding jars offer unique benefits:

- O-ring for gas-tight and dust-proof seal
- User-friendly gripping flanges
- Protective stainless steel jacket



Adapters for single-use reaction vessels

Put us to the test!



Are you looking for a suitable ball mill to meet your sample preparation requirements? Then send us your sample for a **free-of-charge test grinding by our application specialists.**

You will receive a detailed test report including process parameters and recommendations for the most suitable mill and grinding tools.

For more information please visit our website www.retsch.com/testgrinding.