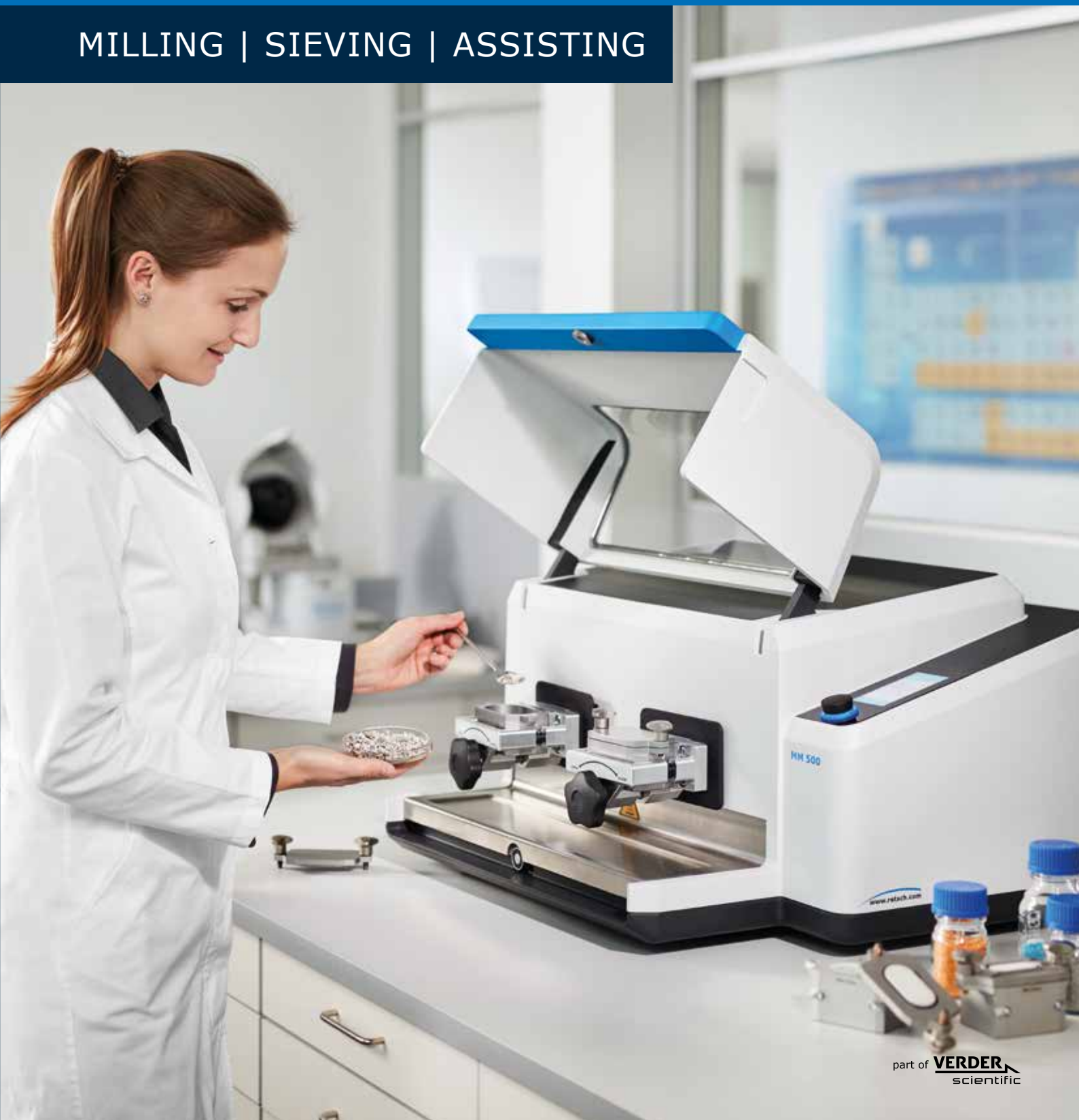
Retsch®

MILLING SIEVING ASSISTING

MILLING | SIEVING | ASSISTING



part of VERDER scientific

VERDER scientific

SCIENCE FOR SOLIDS

HEAT TREATMENT
ELEMENTAL ANALYSIS
MATERIALOGRAPHY &
HARDNESS TESTING
MILLING & SIEVING
PARTICLE CHARACTERIZATION

As part of the VERDER Group, the business division VERDER SCIENTIFIC sets standards in the development, manufacture and sales of laboratory and analytical equipment. The instruments are used in the areas of quality control, research and development for sample preparation and analysis of solids.

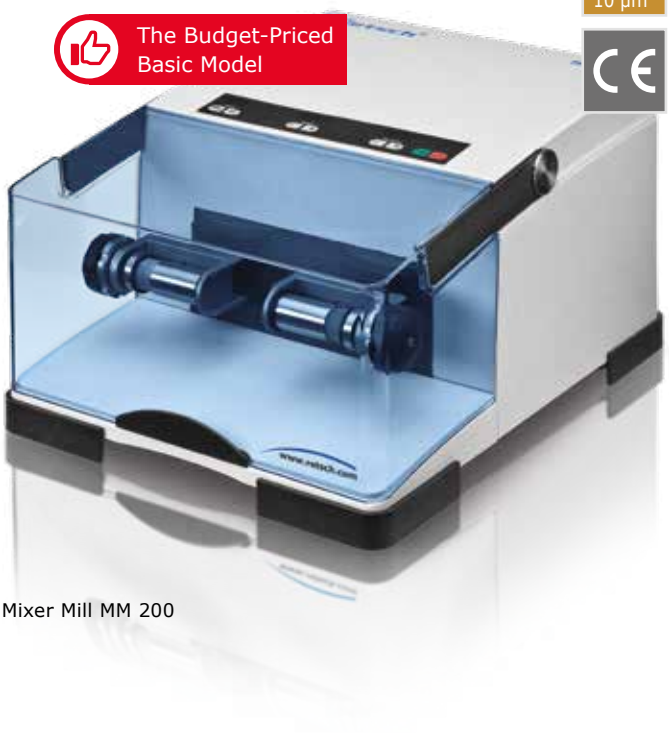
MM 200 – Grinding and Mixing of Dry Samples

The Mixer Mill MM 200 is a versatile and compact benchtop instrument designed for dry grinding of small sample volumes. It mixes and homogenizes powders within seconds.

For neutral-to-analysis pulverization the standard grinding jars with push-fit lid are available in 6 materials and 4 sizes. This basic model may be used for biological cell disruption and for DNA/RNA recovery, just like the MM 400. Various reaction vials and adapters are on offer for this type of application.

6 mm
10 µm*

The Budget-Priced Basic Model



Mixer Mill MM 200

Benefits

- Reproducible, efficient grinding, mixing and homogenization in seconds
- Powerful grinding by impact and friction, up to 25 Hz for up to 20 samples per run
- Memory for 9 Standard Operating Procedures (SOP)
- Wide range of accessories including various jar and ball sizes, adapter racks, grinding tool materials

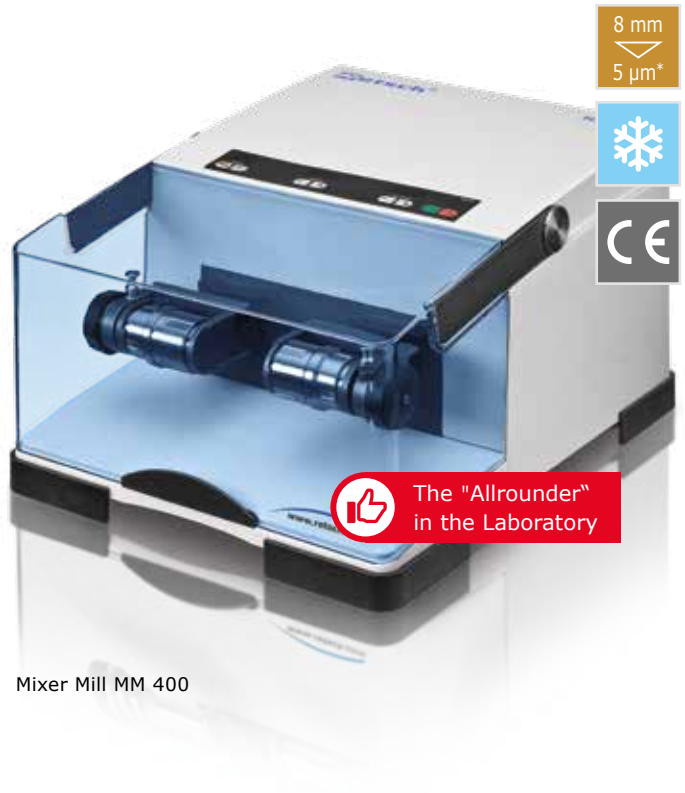
Video on www.retsch.com/mm200

MM 400 – Grinding, Mixing, Disrupting Small Sample Amounts

The Mixer Mill MM 400 is a true multipurpose talent in the lab. It has been developed specifically for dry, wet and cryogenic grinding of small sample amounts. The powerful ball mill grinds, mixes and homogenizes powders and suspensions with up to 30 Hz within a few seconds, providing grind sizes in the submicron range.

The mixer mill simultaneously pulverizes two samples from 0.2 to 20 ml. Thanks to the self-centering mechanism of the grinding jars and the self-locking clamping device handling of the grinding jars is extraordinarily safe and convenient. The MM 400 is perfectly suitable for the disruption of up to 20 samples of biological cells in one working run as well as for DNA/RNA and protein extraction. The MM 400 can also be used for wet grinding due to the screw-top grinding jars; these may also be embrittled in liquid nitrogen for cryogenic applications.

The mill operates so effectively that the sample is hardly warmed due to the very short grinding time. Thus most materials can be pulverized and mixed at ambient temperature, without any cooling. Thanks to the effective homogenization process, the MM 400 is also perfectly suited to mix powdered sample and binder in plastic vessels prior to pelletizing, for example for XRF analysis.



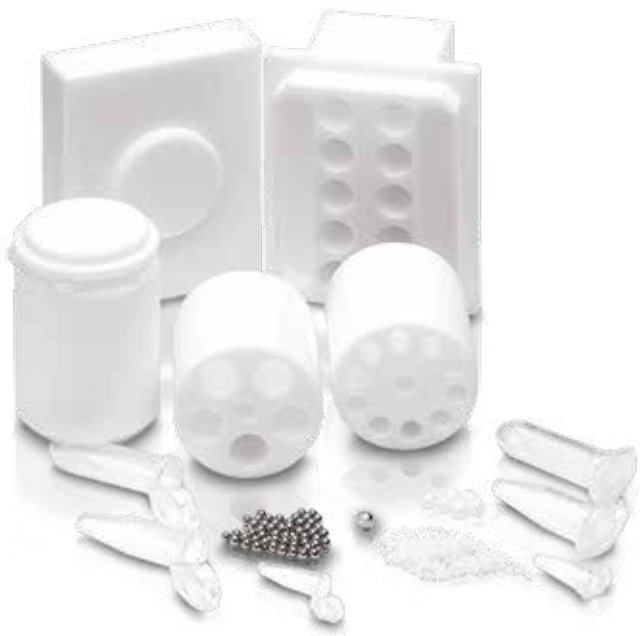
Mixer Mill MM 400

Benefits

- Suitable for dry, wet and cryogenic grinding
- High sample throughput due to two grinding stations and short grinding times
- Digital parameter setting ensures reproducible results
- Memory for 9 Standard Operating Procedures (SOP)
- Adapter for single-use vials, simultaneous preparation of up to 20 biological samples
- Suitable for cell disruption of up to 240 ml (8 x 30 ml) cell suspension
- Suitable for mixing up to 8 samples in 50 ml centrifuge tubes

Video on www.retsch.com/mm400

Accessories for MM 400



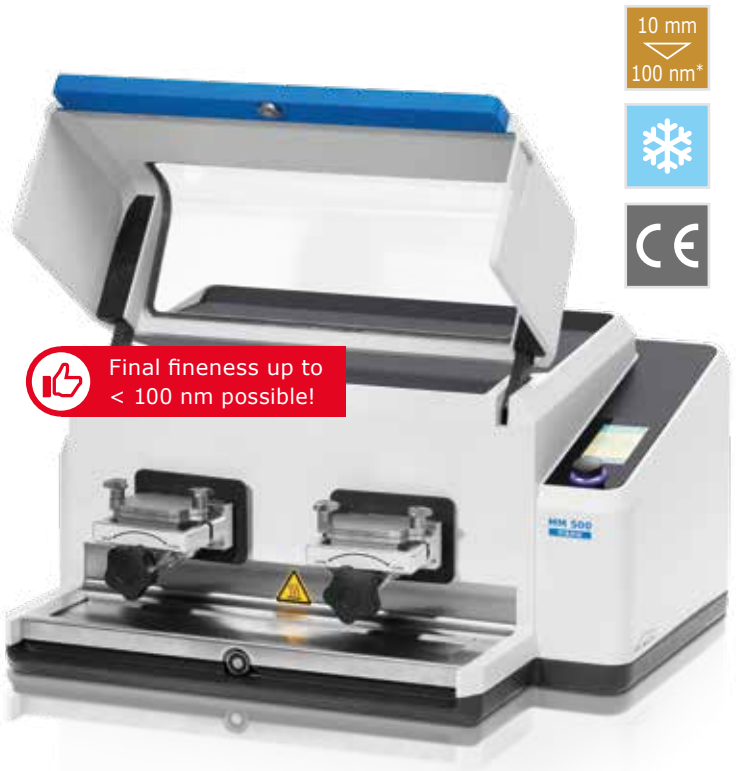
MM 500 – From Fast Pulverization to Long-term Grinding

The MM 500 is the first mixer mill worldwide with a frequency of 35 Hz which produces enough energy for efficient wet grinding of samples down to the nanometer range - with only minor warming effects.

Performance, handling, application fields and design of the MM 500 make it the perfect combination of a classic mixer mill and a planetary ball mill. It is perfectly suited for long-term grinding processes of several hours with high energy input to obtain particles sizes <1 µm, e. g. for mechanical alloying or chemical reactions. The MM 500 offers the benefit of not requiring cooling breaks due to a very moderate temperature increase during grinding. It is also more easy to handle than a planetary ball mill.

The user-friendly clamping system facilitates safe operation. For periodic sample extraction, the jars remain conveniently clamped which is particularly beneficial for complex applications like mechanochemical synthesis.

The benchtop unit is also used for classic dry, wet and cryogenic grinding of sample volumes up to 2 x 45 ml in one step. This powerful mill mixes and pulverizes powders and suspensions in a matter of seconds.

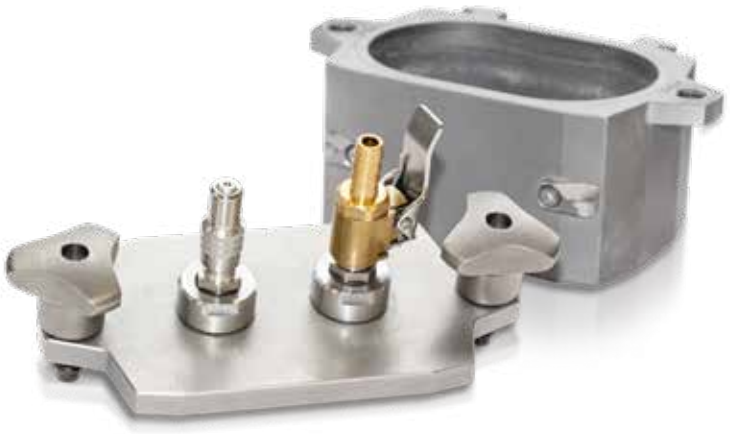


Mixer Mill MM 500

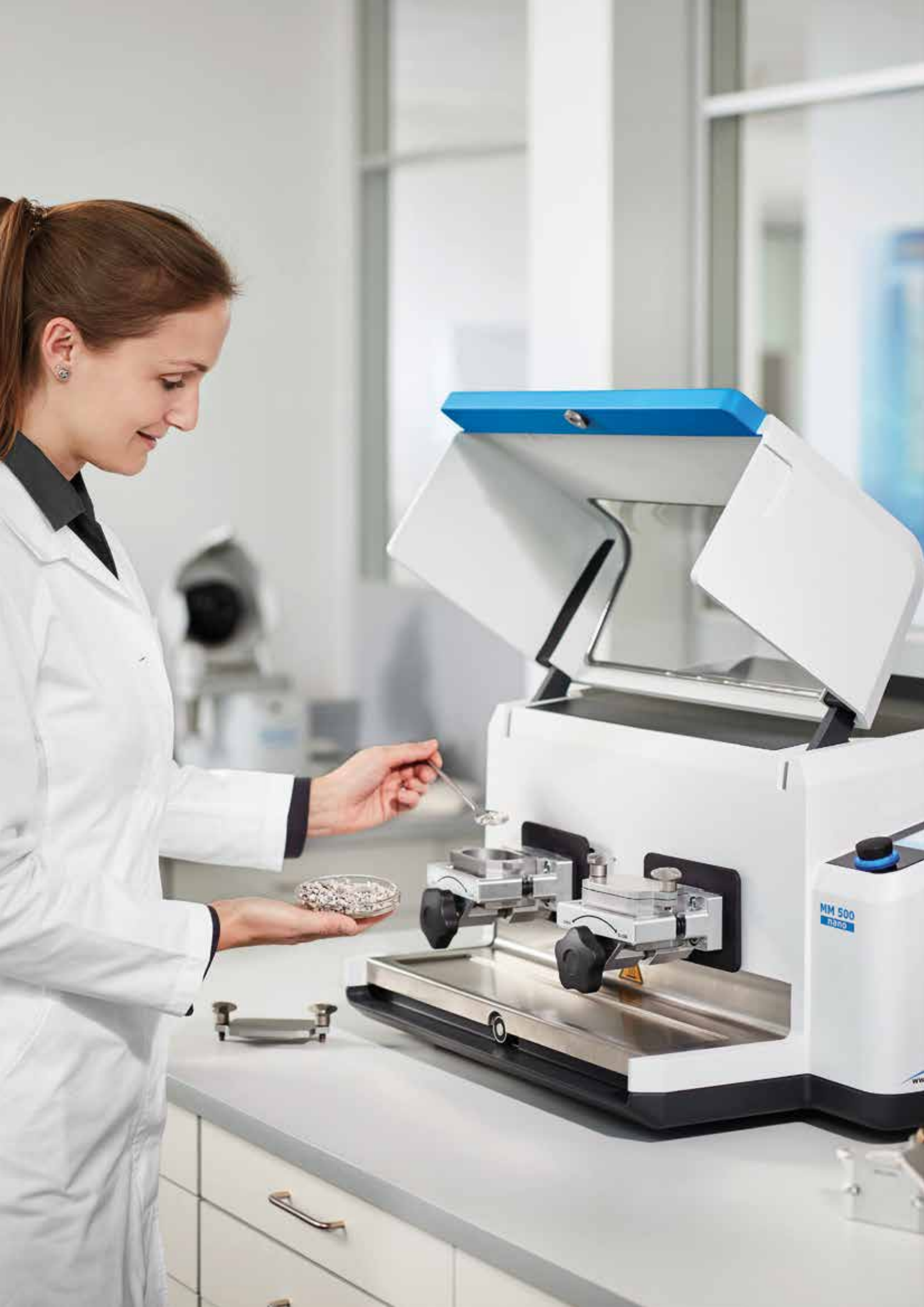
Benefits

- Suitable for continuous long-term grinding and efficient pulverization with high energy input
- Powerful grinding with up to 35 Hz
- 3 different grinding modes (dry, wet or cryogenic)
- Grinding jar volumes 50 ml, 80 ml, 125 ml, pressure-tight up to 5 bar
- Jar design allows full use of the volume, also for wet grinding
- Jars remain conveniently clamped for periodic sample extraction
- Grinding jars available in 4 materials
- Can be controlled via optional RETSCH App
- 12 Standard Operating Procedures (SOP) and 4 program cycles with up to 99 repititions may be stored

Video on www.retsch.com/mm500



Screw-Lock grinding jar with integrated safety closure device and aeration lid.


MM 500
nano

Accessories and Options

The MM 400 can be equipped with screw-top grinding jars from 1.5 ml to 50 ml. Available materials include hardened steel, stainless steel, tungsten carbide, agate, zirconium oxide, PTFE.

RETSCH offers various adapters to accommodate 0.2 - 50 ml single-use vials for cell disruption and DNA/RNA as well as protein extraction. These are also perfectly suited for simultaneously mixing a number of samples.

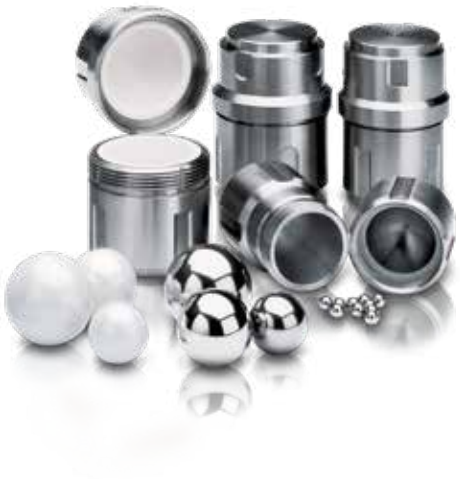
Benefits of screw-top grinding jars for MM 400:

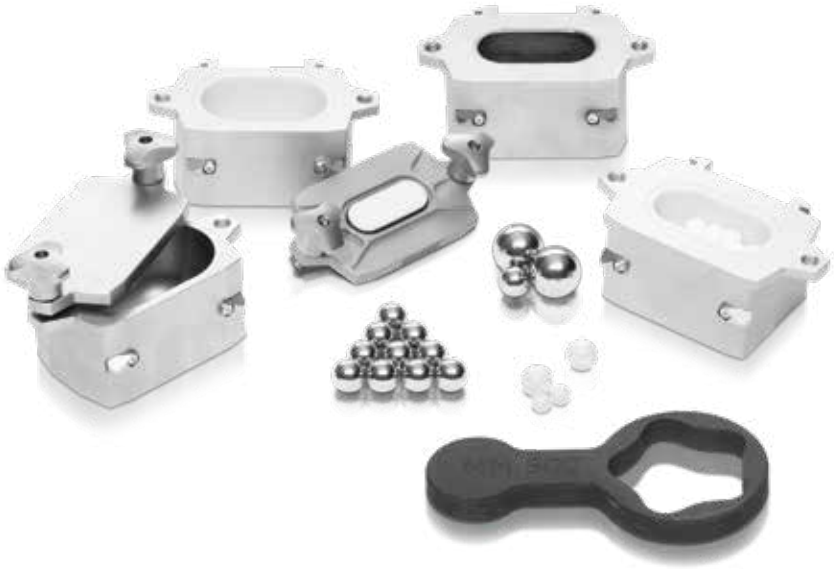
- 3 different grinding modes (dry, wet or cryogenic)
- Ultimate reproducibility by automatic centering and uniform jar design
- Ergonomic gripping flanges on jar and lid
- Stainless steel protective jacket (for agate, zirconium oxide and tungsten carbide jars)

For the MM 500 Screw-Lock grinding jars are available in 3 different sizes (50 ml, 80 ml and 125 ml) and in 4 materials (hardened steel, stainless steel, zirconium oxide and tungsten carbide).

Benefits of Screw-Lock grinding jars:

- Suitable for dry, wet and cryogenic grinding
- High-impact and high-friction mode
- Pressure-tight up to 5 bar
- Flat jar lid allows for full use of jar volume which is particularly beneficial for wet grinding and pulverization of fibrous samples





CyroKit

The CryoKit is a cost efficient solution for occasional cryogenic grinding. This set of insulated containers, tongs and safety glasses is used for pre-cooling the grinding jar in liquid nitrogen.

- The CryoKit for the MM 400 consists of 2 insulated containers (1 and 4 liter), 2 pairs of grinding jar tongs and 1 pair of safety glasses.
- The CryoKit for the MM 500 consists of 1 insulated container (4 liter), 2 grinding jar holders and 1 pair of safety glasses.

Mixer Mills at a Glance

	Mixer Mills		
			
Model	MM 200	MM 400	MM 500
Application	mechanochemistry, mechanical alloying, size reduction, mixing, homogenization, cell disruption, cryogenic grinding		
Fields of application	agriculture, biology, chemistry / plastics, construction materials, engineering / electronics, environment / recycling, food, geology / metallurgy, glass / ceramics, medicine / pharmaceuticals, materials science		
Feed material	hard, medium-hard, soft, brittle, elastic, fibrous		
Performance data			
Feed size*	< 6 mm	< 8 mm	≤ 10 mm
Final fineness*	d_{90} < 10 µm	d_{90} < 5 µm	~ 0.1 µm
Batch size/sample volume*	2 x 10 ml	2 x 20 ml	max. 2 x 45 ml
Typical grinding time	30 s – 2 min	30 s – 2 min	30 s – 2 min
Possible applications			
Dry grinding	✓	✓	✓
Wet grinding	–	✓	✓
Cryogenic grinding	–	✓	✓
Cell disruption in single-use vials	max. 10 x 2.0 ml	max. 20 x 2.0 ml or 10 x 5.0 mll or 8 x 30 ml / 50 ml	–
Mixing with conical centrifuge tubes	–	✓	–
Suitable grinding jars			
Grinding jar with push-fit lids	1.5 – 25 ml	–	–
Grinding jars with screw-top lids	–	1.5 – 50 ml	50 ml / 80ml / 125 ml
Self-centering clamping device	–	✓	✓
No. of grinding stations	2	2	2
Digital pre-selection of vibrational frequency	3 – 25 Hz (180 – 1,500 min^{-1})	3 – 30 Hz (180 – 1,800 min^{-1})	3 – 35 Hz (180 - 2,100 min^{-1})
Digital pre-selection of grinding time	10 s – 99 min	10 s – 99 min	10 s–99 h
Memory for Standard Operating Procedures (SOP)	9	9	12
Storable program cycles with up to 99 repititions	–	–	✓
Control via optional RETSCH App	–	–	✓
Technical data			
Drive power	85 W	120 W	750 W
W x H x D	371 x 266 x 461 mm	371 x 266 x 461 mm	690 x 375 x 585 mm
Net weight	approx. 25 kg	approx. 26 kg	approx. 60 kg
More information on	**www.retsch.com/mm200**	**www.retsch.com/mm400**	**www.retsch.com/mm500**

*depending on feed material and instrument configuration

Typical Sample Materials

RETSCH mixer mills are true allrounders. They homogenize, for example, waste, soil, chemical products, coated tablets, drugs, ores, grain, tissue, glass, hair, ceramics, bones, plastics, alloys, minerals, oil seeds, plants, sewage sludge, pills, textiles, wool etc.

Application example: Hair

WolfLabs

Pricing on any accessories shown can be found by keying the part number into the search box on our website.

The specifications listed in this brochure are subject to change by the manufacturer and therefore cannot be guaranteed to be correct.
If there are aspects of the specification that must be guaranteed, please provide these to our sales team so that details can be confirmed.

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