MIXER MILL MM 500 NANO

Comfortable production of particles in the nanometer range

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MORE THAN AN ALTERNATIVE TO A PLANETARY BALL MILL

The mixer mill MM 500 nano is a compact, versatile bench-top unit which has been developed specially for dry, wet and cryogenic grinding of up to 2 x 45 ml sample material within seconds. With a maximum frequency of 35 Hz, it generates enough energy to produce particles in the nanometer range.

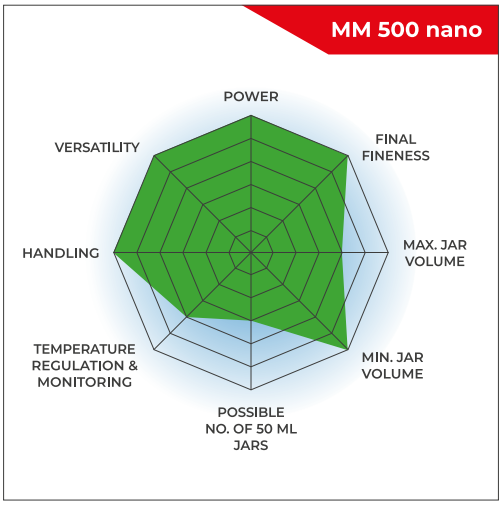
Click to view video

The robust high-performance drive makes the mill suitable for long-term grinding processes up to 99 hours and thus very interesting for research and mechanochemistry.

Hence, the MM 500 nano is a unique mixer mill in the market to provide a real alternative to grinding in a planetary ball mill – with more comfortable handling and less warming effects.

HIGH SPEED BALL MILLING WITH EASY OPERATION FOR BEST RESULTS

- Max. speed 35 Hz
- Horizontal oscillation causes strong impact effects for effective sample processing
- Up to 10 mm feed size and 0.1 µm final fineness
- 2 grinding stations for jars of min. 2 ml and max. 125 ml, adapter for 18 x 2 ml single use vials
- Steel jars can be precooled manually in liquid nitrogen
- GrindControl to measure temperature and pressure inside the jar.
- Aeriation lids to control the atmosphere inside the jar
- Bench top model, touch screen, easy jar clamping, jars can stay clamped for subsampling, storable SOPs and cycle programs, 4 different jar materials for dry and wet grinding



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ADVANTAGES THROUGH DESIGN

- Very easy, comfortable clamping and handling of the grinding jars, which are pressure-tight up to 5 bar
- Jars can stay clamped while taking a sub-sample or visual checks of fineness
- Ergonomic design with touch display for easy parameter setting
- 12 SOPs & 4 program cycles with up to 99 repeats to facilitate routine applications

FLEXIBILITY

- Equally suited for rapid pulverization <2 min and long-term grinding up to 99 hours
- Use one large grinding ball in the High Impact mode or several smaller balls in the High Friction mode
- Use the MM 500 nano for routine sample preparation applications, for nano-grinding or for research applications such as mechanochemistry and mechanical alloying

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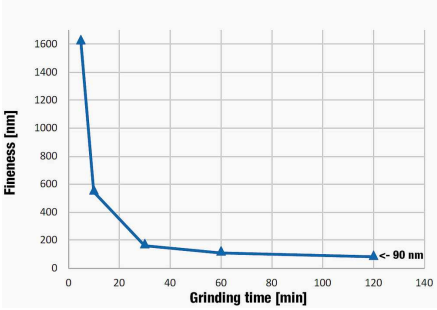
GRIND SIZES IN THE NANOMETER RANGE

- New jar design allows for optimized usage of jar volume also for wet grinding
- Final fineness < 100 nm possible thanks to maximized energy input at 35 Hz
- Less warming effects, thus grinding can usually be done without grinding breaks for cooling down

Result: You get your nano sample within the shortest time.

NANO-GRINDING OF TITANIUM DIOXIDE WITHOUT COOLING BREAKS



Nano grinding of 25 g titanium dioxide in a 125 ml grinding jar zirconium oxide with 275 g balls 0.1 mm, 30 ml 1% NaPO4 solution. A particle size of 90 nm was achievied after 120 minutes of grinding.

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MIXER MILL MM 500 NANO

ACCESSORIES FOR MAXIMUM FLEXIBILITY

GRINDING JARS IN 3 DIFFERENT MATERIALS

Available grinding jar sizes are 50 ml, 80 ml and 125 ml, materials include stainless steel, tungsten carbide and zirconium oxide, ensuring contamination-free sample preparation.

Click to view video

AERATION LID (VIDEO)

RETSCH offers a special aeration lid for the grinding jars designed for applications where a special atmosphere is to be maintained in the ball mill jar.

GRINDCONTROL

The GrindControl measures temperature and pressure inside the jar. The system includes a sensor and transmission unit as well as an analysis software.

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MULTI-CAVITY JARS & ADAPTER

Simultaneous processing of several small samples is possible with the multi-cavity jars and an adapter for reaction vials. This is a typical requirement, for example, for pharmaceutical, chemical and biochemical applications. The small cavity jars provide new opportunities for mechanochemical research activities involving small amounts of chemicals. The cavities in the jars have an oval shape which ensures effective mixing. The pouring aids allow for safe sample handling.
The adapter accommodates up to 18 disposable reaction vials of 1.5 or 2.0 ml (e.g. Eppendorf vials) or nine 2.0 ml steel tubes. With its two grinding stations, the MM 500 nano mixer mill can now process up to 36 samples in one working run. 2.0 ml steel tubes should be used, if samples need to be frozen or heated, as polymeric reaction vessels cannot withstand mechanical load at extreme temperatures.

Multi-cavity jars of 4 x 10 ml and 2 x 25 ml, made of stainless steel, incl. PTFE pouring aids.

Adapter for 18 x 2 ml safe-lock reaction vials or 9 x 2 ml steel tubes, made of aluminum

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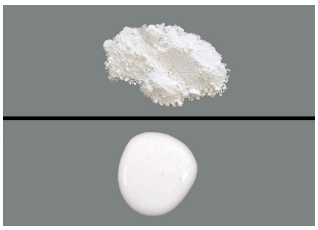
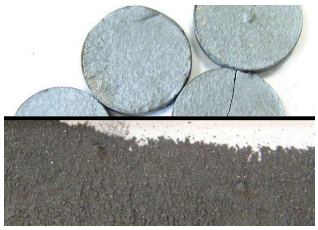
MIXER MILL MM 500 NANO

TYPICAL SAMPLE MATERIALS

RETSCH mixer mills are true allrounders. They homogenize, for example: alloys, animal feed, bones, ceramics, chemical products, coal, coke, drugs, electronic scrap, glass, grains, hair, minerals, oil seeds, ores, paper, plant materials, plastics, sewage sludge, soils, straw, tablets, textiles, tissue, tobacco, waste samples, wood, wool, etc.



titanium oxide
wet grinding



metal alloy
dry grinding

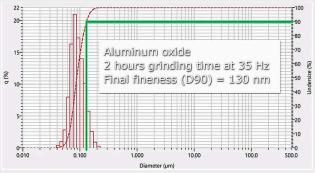
hair
dry grinding

tyre rubber
cryogenic grinding

MIXER MILL MM 500 VARIO

NANO GRINDING OF ALUMINUM OXIDE IN THE MM 500 NANO

Narrow particle size distribution of aluminium oxide after grinding (Nano grinding of 30 g aluminum oxide in a 125 ml grinding jar zirconium oxide with 275 g balls 0.1 mm, 33 ml 0.5% NaPO4 solution)



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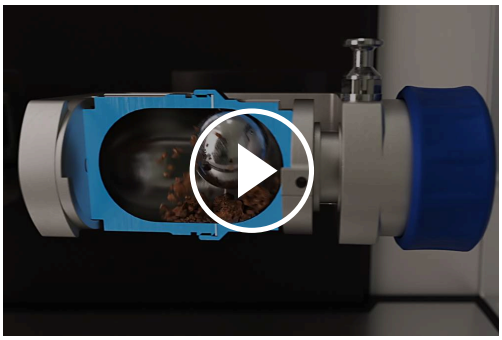
FUNCTIONAL PRINCIPLE

The grinding jars of the mixer mill MM 500 nano perform radial oscillations in a horizontal position. The inertia of the grinding balls causes them to impact with high energy on the sample material at the rounded ends of the grinding jars and pulverize it. Also, the movement of the grinding jars combined with the movement of the balls result in the intensive mixing of the sample. The degree of mixing can be increased even further by using several smaller balls.



Click to view video

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TECHNICAL DATA

Applications	mechanochemistry, mechanical alloying, size reduction, mixing, homogenization, cryogenic grinding
Field of application	agriculture, biology, chemistry / plastics, construction materials, engineering / electronics, environment / recycling, food, geology / metallurgy, glass / ceramics, medicine / pharmaceuticals
Feed material	hard, medium-hard, soft, brittle, elastic, fibrous
Size reduction principle	impact, friction
Material feed size*	<= 10 mm
Final fineness*	~ 0.1 µm
Batch size / feed quantity*	max. 2 x 45 ml
No. of grinding stations	2
Vibrational frequency	3 - 35 Hz (180 - 2100 min-1)
Typical mean grinding time	30 s - 2 min
Dry grinding	yes
Wet grinding	yes
Cryogenic grinding	yes
Cell disruption with reaction vials	no
Type of grinding jars	screw-lock jar with integrated safety closure devices, multi cavity jar, adapter for safe-lock reaction vials
Material of grinding tools	hardened steel, stainless steel, tungsten carbide, zirconium oxide
Grinding jar sizes	10 ml / 25 ml / 50 ml / 80 ml / 125 ml
Setting of grinding time	digital, 10 s - 8 h
Total grinding time	99 h
Storable SOPs	12
Number of storable cycle programs	4 (with 99 repeats)
Electrical supply data	100-120 V, 50/60 Hz; 200-230 V, 50/60Hz
Power connection	1-phase
Protection code	IP 30
Power consumption	750 W
W x H x D closed	690 x 375 x 585 mm
Net weight	~ 60 kg
Standards	CE

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*depending on feed material and instrument configuration/settings

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ORDER DATA

MIXER MILL MM 500 NANO

Mixer Mill MM 500 nano with quick release clamp
(please order grinding jars and balls separately)

20.765.0003		MM 500 nano	200–230 V, 50/60 Hz
20.765.0004		MM 500 nano	100–120 V, 50/60 Hz

SCREW-LOCK GRINDING JARS MM 500 CONTROL/NANO

HARDENED STEEL

01.462.0463		50 ml
01.462.0468		80 ml
01.462.0470		125 ml

STAINLESS STEEL

01.462.0447		50 ml
01.462.0467		80 ml
01.462.0420		125 ml

TUNGSTEN CARBIDE

01.462.0466		50 ml

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01.462.0479		80 ml

ZIRCONIUM OXIDE		
01.462.0464		50 ml
01.462.0417		80 ml
01.462.0471		125 ml

MULTI CAVITY GINDING JARS MM 500 CONTROL/NANO

01.462.0537		4 x 10 ml, 1.4112 stainless steel, incl. 3 pouring aids
22.462.0014		Pouring aid for 10 ml Multi cavity jar
01.462.0536		2 x 25 ml, 1.4112 stainless steel, incl. 1 pouring aid
22.462.0015		Pouring aid for 25 ml Multi cavity jar

ACCESSORIES FOR GRINDING IN 1.5 OR 2 ML VIALS		
22.008.0012		Adapter made of aluminum for 18 x 2.0 ml / 1.5 ml Safe-lock reaction vials or 9 x 2.0 ml reaction vials made of stainless steel 316L
22.749.0001		Safe-lock reaction vials 2.0 ml, 1000 pcs.
22.749.0002		Safe-lock reaction vials 1.5 ml, 1000 pcs.
22.749.0008		Reaction vials made of stainless steel 316L, 2.0 ml, 10 pcs.

ACCESSORIES FOR GRINDING UNDER INERT ATMOSPHERE

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AERATION LID FOR SCREW-LOCK GRINDING JARS

(order valve kit separately)

01.107.0568		Aeration lid for MM 500 control/nano grinding jar 50 ml, stainless steel
01.107.0688		Aeration lid for MM 500 control/nano grinding jar 80 ml, stainless steel
01.107.0567		Aeration lid for MM 500 control/nano grinding jar 125 ml, stainless steel
01.107.0636		Aeration lid for MM 500 control/nano grinding jar 50 ml, tungsten carbide
01.107.0693		Aeration lid for MM 500 control/nano grinding jar 80 ml, tungsten carbide
01.107.0569		Aeration lid for MM 500 control/nano grinding jar 50 ml, zirconium oxide
01.107.0689		Aeration lid for MM 500 control/nano grinding jar 80 ml, zirconium oxide
01.107.0564		Aeration lid for MM 500 control/nano grinding jar 125 ml, zirconium oxide
22.864.0001		Spare valve set for aeration lids M8x1

ACCESSORIES FOR GRINDING JARS MM 500 CONTROL/NANO

22.486.0006		Grinding jar stabilization pad
02.486.0050		Jar wrench for grinding jars
05.114.0057		O-ring for grinding jars 50 ml, 1 piece
05.114.0158		O-ring for grinding jars 80 ml, 1 piece
05.114.0122		O-ring for grinding jars 125 ml, 1 piece

ACCESSORIES FOR COLD GRINDING MM 500 CONTROL/NANO

22.354.0003	Cryo kit for cooling the grinding jars with liquid nitrogen (incl. insulated container 4-liter, 2 grinding jar holders, 1 pair of safety glasses)

ACCESSORIES MM 500 CONTROL/NANO

05.114.0197	O-ring PTFE for grinding jars 50 ml, 1 piece, for cryogenic grinding
05.114.0196	O-ring PTFE for grinding jars 80 ml, 1 piece, for cryogenic grinding
05.114.0195	O-ring PTFE for grinding jars 125 ml, 1 piece, for cryogenic grinding
05.114.0208	O-ring for multi cavity jars, 4 x 10 ml, 1 piece

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05.114.0207	O-ring for multi cavity jars, 2 x 25 ml, 1 piece
05.114.0212	O-ring for multi cavity jars, 4 x 10 ml, 1 piece, for cryogenic grinding
05.114.0213	O-ring for multi cavity jars, 2 x 25 ml, 1 piece, for cryogenic grinding
99.200.0034	IQ/OQ Documentation for MM 500 nano

PRESSURE AND TEMPERATURE MEASURING SYSTEM GRINDCONTROL

incl. lid with lid insert, sensors and transmitter, receiver, software, case, grinding jar, opening aid and cleaning accessories for MM 500 control/nano

22.782.0032	GrindControl for MM 500 control/nano/Emax grinding jar 125 ml

more upon request

ACCESSORIES

05.114.0122		O-ring for 125 ml grinding jars (MM 500 control/nano and Emax)
22.186.0007		Sintered filter with O-ring, set of 10 pieces
03.474.0242		GrindControl lid insert for MM 500 control/nano and Emax grinding jar 125 ml, stainless steel
03.474.0245		GrindControl lid insert for MM 500 control/nano and Emax grinding jar 125 ml, zirconium oxide
22.864.0001		Spare set valves M8X1 for GrindControl and aeration lids

GRINDING BALLS

HARDENED STEEL		
05.368.0029		5 mm Ø
05.368.0030		7 mm Ø

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05.368.0059		10 mm Ø
05.368.0032		12 mm Ø
05.368.0108		15 mm Ø
05.368.0033		20 mm Ø

STAINLESS STEEL		
22.455.0010		2 mm Ø, 500 g (approx. 110 ml)
22.455.0011		3 mm Ø, 500 g (approx. 120 ml)
22.455.0002		3 mm Ø, 200 pieces (approx. 6 ml)
22.455.0003		5 mm Ø, 200 pieces (approx. 25 ml)
05.368.0034		5 mm Ø
05.368.0035		7 mm Ø
05.368.0063		10 mm Ø
05.368.0037		12 mm Ø
05.368.0109		15 mm Ø
05.368.0062		20 mm Ø
05.368.0105		25 mm Ø

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TUNGSTEN CARBIDE		
05.368.0038		5 mm Ø
05.368.0039		7 mm Ø
05.368.0071		10 mm Ø
05.368.0041		12 mm Ø
05.368.0110		15 mm Ø
05.368.0070		20 mm Ø

ZIRCONIUM OXIDE		
32.368.0005		0.1 mm Ø, 0.5 kg (approx. 135 ml)
32.368.0003		0.5 mm Ø, 0.5 kg (approx. 135 ml)
32.368.0004		1 mm Ø, 0.5 kg (approx. 135 ml)
05.368.0089		2 mm Ø, 0.5 kg (approx. 135 ml)
05.368.0090		3 mm Ø, 0.5 kg (approx. 140 ml)
22.455.0007		3 mm Ø, 200 pieces (approx. 6 ml)
22.455.0009		5 mm Ø, 200 pieces (approx. 25 ml)
05.368.0146		7 mm Ø
05.368.0094		10 mm Ø

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05.368.0096		12 mm Ø
05.368.0113		15 mm Ø

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