



## ОСЦИЛИРАЩА ТОПКОВА МЕЛНИЦА MM 500 NANO

Comfortable production of particles in the nanometer range

### 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.**



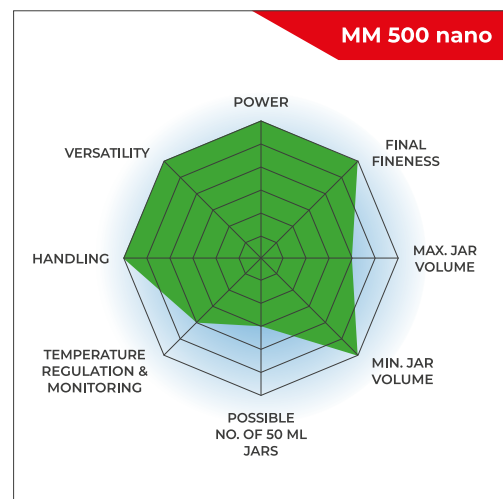
The robust high-performance drive makes the mill suitable for long-term grinding processes up to 99 hours and thus very interesting for research and mechanochemistry.

[Click to view video](#)

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.
- | Aeration 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



## 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

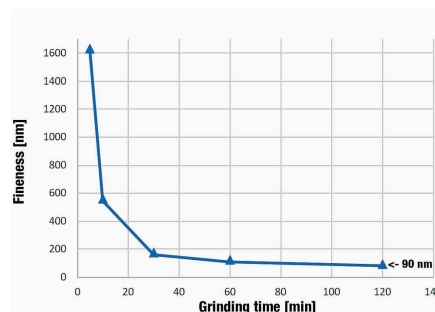
ОСЦИЛИРАЩА ТОПКОВА МЕЛНИЦА MM 500 NANO

## 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% NaPO<sub>4</sub> solution. A particle size of 90 nm was achieved after 120 minutes of grinding.*

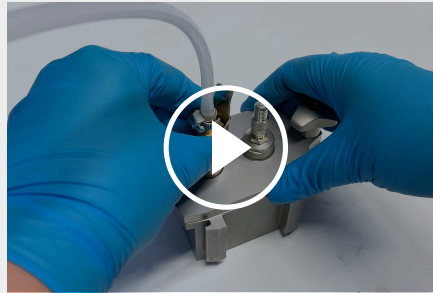
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## ACCESSORIES FOR MAXIMUM FLEXIBILITY



### 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.

## 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.

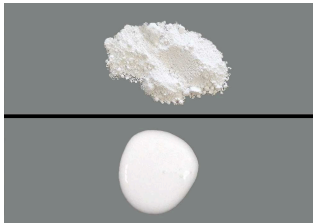


Adapter for 18 x 2 ml safe-lock reaction vials or 9 x 2 ml steel tubes, made of aluminum

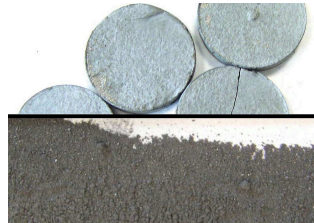
ОСЦИЛИРАЩА ТОПКОВА МЕЛНИЦА ММ 500 NANO

## ТИПИЧНИ ОБРАЗЦИ НА МАТЕРИАЛИ

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



кока  
dry grinding

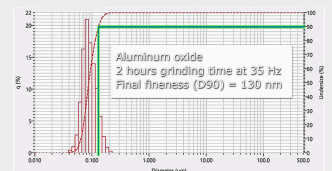


tyre rubber  
cryogenic grinding

ОСЦИЛИРАЩА ТОПКОВА МЕЛНИЦА ММ 500 VARIO

## NANO GRINDING OF ALUMINUM OXIDE IN THE MM 500 NANO

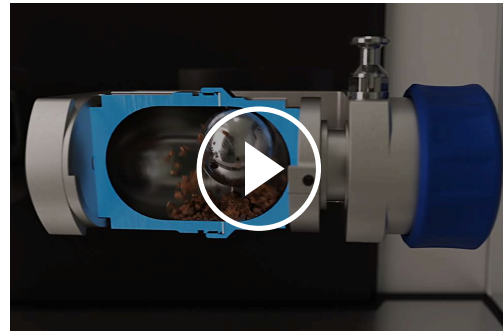
Narrow particle size distribution of aluminium oxide after grinding (Nano grinding of 30 g aluminum oxide in a 125 ml grinding jar zirconium oxide with 275 g balls 0.1 mm, 33 ml 0.5% NaPO<sub>4</sub> solution)



ОСЦИЛИРАЩА ТОПКОВА МЕЛНИЦА MM 500 NANO

## ПРИНЦИП НА РАБОТА

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](#)

## TECHNICAL DATA

<b>Приложения</b>	механохимия, механично легиране, намаляване на размера, смесване, хомогенизиране, криогенно смилане
<b>Област на приложение</b>	биология, геология / металургия, инженеринг / електроника, медицина / фармация, околната среда / рециклиране, селското стопанство, строителни материали, стъкло / керамика, химия / пластмаси, храна
<b>Материали</b>	твърд, средно твърди, мек, крехък, еластични, влакнести
<b>Принцип на смилане</b>	удар, триене
<b>Максимален размер на захранващият продукт</b>	<= 10 мм
<b>Големина след смилане*</b>	~ 0.1 µm
<b>Размер на партидата / количество на пробата*</b>	max. 2 x 45 мл
<b>Брой на смилачните станции</b>	2
<b>Vibrational frequency</b>	3 - 35 Hz (180 - 2100 min <sup>-1</sup> )
<b>Най-често използвано време за смилане</b>	30 с - 2 мин
<b>Сухо смилане</b>	да
<b>Мокро смилане</b>	да
<b>Криогенно смилане</b>	да
<b>Разрушаване на клетки</b>	не
<b>Видове смилачни цилиндри</b>	screw-lock jar with integrated safety closure devices, multi cavity jar, adapter for safe-lock reaction vials
<b>Материал на смилачните части</b>	закалена стомана, неръждаема стомана, волфрамов карбид, циркониев оксид
<b>Обем на смилачната камера</b>	10 ml / 25 ml / 50 ml / 80 ml / 125 ml
<b>Настройване времето за смилане</b>	digital, 10 s - 8 h
<b>Общо време на смилане</b>	99 h
<b>Запаметяване на настройки</b>	12
<b>Брой програми за съхранение на цикъл</b>	4 (с 99 повторения)
<b>Данни за електрозахранването</b>	100-120 V, 50/60 Hz; 200-230 V, 50/60Hz
<b>Захранване</b>	еднофазово
<b>Защита</b>	IP 30
<b>Енергийна консумация</b>	750 Wata

<b>Размери затворена</b>	690 x 375 x 585 mm
<b>Нетно тегло</b>	~ 60 kg
<b>Стандарти</b>	CE

\* в зависимост от захранващият материал и настройките на инструмента\*

[www.retsch.bg/mm500-nano](http://www.retsch.bg/mm500-nano)

## ДАНИИ ПОРЪЧКА

### 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

01.462.0479



80 ml

#### ZIRCONIUM OXIDE

01.462.0464



50 ml

01.462.0417



80 ml

01.462.0471



125 ml

## MULTI CAVITY GRINDING 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

## AERATION LID FOR SCREW-LOCK GRINDING JARS

## 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)
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## 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
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 FOR MIXER MILLS

**incl. sensors and transmitter unit, case, opening aid and cleaning accessories for MM 500 control / nano / Emax (please order lid insert and grinding jar separately)**

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

## ACCESSORIES FOR MM 500 CONTROL/NANO GRINDCONTROL

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

22.864.0001



Valve set M8x1 for GrindControl and aeration lids

## GRINDING BALLS

### HARDENED STEEL

05.368.0029



5 mm Ø

05.368.0030



7 mm Ø

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

#### 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

05.368.0096  12 mm Ø

05.368.0113  15 mm Ø