
# HIGH ENERGY BALL MILL $E_{MAX}$

the revolution in ultrafine grinding

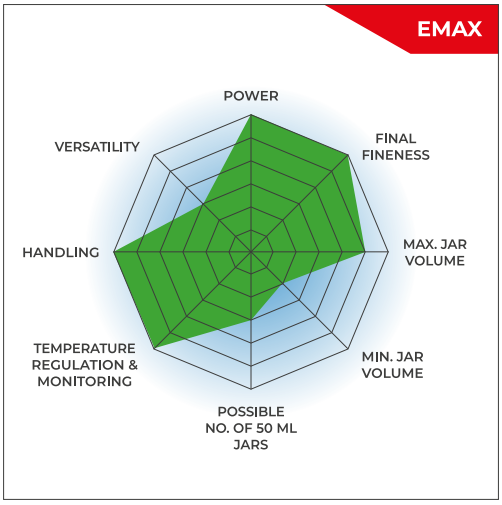
**The $E_{max}$ is an entirely new type of ball mill for high energy milling. The unique combination of high friction and impact results in extremely fine particles within the shortest amount of time.**

- faster and finer grinding than any other ball mill
- speed of 2000 $min^{-1}$ allow for ultra-fast pulverization of the sample
- water cooling permits continuous operation without cool down breaks
- temperature-controlled grinding
- narrow particle size distribution thanks to special jar design which improves mixing of the sample


Click to view video

## FASTER - FINER - COOLER - THE MOST POWERFUL BALL MILL

- Max. speed 2000 rpm
- Up to 5 mm feed size and 0.08 µm final fineness
- Two grinding stations for jars of min. 50 ml and max. 125 ml
- GrindControl to measure temperature and pressure inside the jar.
- Aeriation lids to control the atmosphere inside the jar
- Temperature monitoring and temperature-controlled grinding, water-cooling of jars
- Storable SOPs and cycle programs, 4 different jar materials for dry and wet grinding



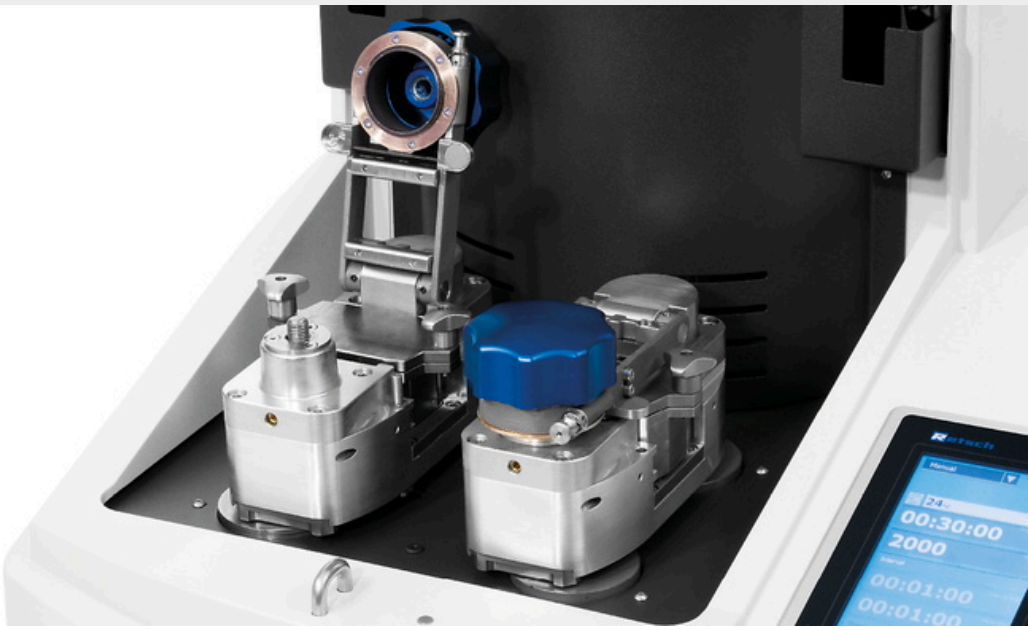
## APPLICATION EXAMPLES

alloys, bones, carbon fibres, catalysts, cellulose, cement clinker, ceramics, chemical products, clay minerals, coal, coke, concrete, fibres, glass, gypsum, iron ore, kaolin, limestone, metal oxides, minerals, ores, paper, pigments, plant materials, polymers, quartz, semi-precious stones, sewage sludge, slag, soils, tea, tobacco, waste samples, wood, ...

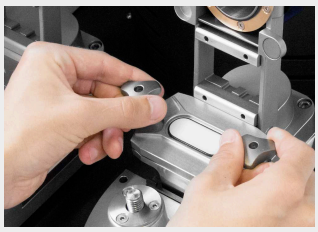
To find the best solution for your sample preparation task, visit our application database.

# UNIQUE GRINDING JAR GEOMETRY

The High Energy Ball Mill Emax combines high-frequency impact, intensive friction, and controlled circular jar movements to a unique and highly effective size reduction mechanism.



# INTUITIVE OPERATION



INSERTING THE GRINDING JAR

CLOSING THE JAR CLAMP

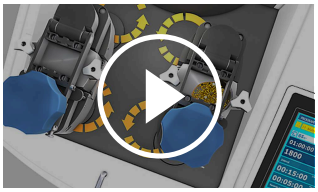
OPERATING THE TOUCHSCREEN

FUNCTION PRINCIPLE

## GRIND SIZES IN THE SUBMICRON RANGE

The High Energy Ball Mill Emax combines high-frequency impact, intensive friction, and controlled circular jar movements to a unique and highly effective size reduction mechanism. The grinding jars have an oval shape and are mounted on two discs respectively which move the jars on a circular course without changing their orientation.

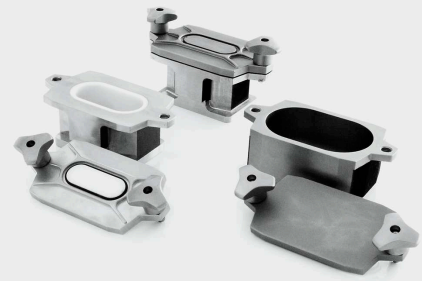
The interplay of jar geometry and movement causes strong friction between the grinding balls, sample material and jar walls as well as a rapid acceleration which lets the balls impact with great force on the sample at the rounded ends of the jars. This significantly improves the mixing of the particles resulting in smaller grind sizes and a narrower particle size distribution than is possible to achieve in ball mills.



Click to view video

FOR SAFE AND EFFECTIVE GRINDING PROCESSES

# 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. Grinding balls are available in sizes from 0.1 mm to 25 mm, depending on the material.

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.

## TECHNICAL DATA

| | |
|---|---|
| **Applications** | nano grinding, size reduction, homogenizing, mechanical alloying, colloidal milling, high energy comminution |
| **Field of application** | agriculture, biology, chemistry, construction materials, engineering / electronics, environment / recycling, geology / metallurgy, glass / ceramics, medicine / pharmaceuticals |
| **Feed material** | medium-hard, hard, brittle, fibrous - dry or wet |
| **Size reduction principle** | impact, friction |
| **Material feed size*** | < 5 mm |
| **Final fineness*** | < 80 nm |
| **Batch size / feed quantity*** | max. 2 x 45 ml |
| **Speed at 50 Hz (60 Hz)** | 300 - 2000 min-1 |
| **Cooling** | controlled integrated water cooling / option: external chiller |
| **Temperature control** | yes (min and max temperature may be defined) |
| **No. of grinding stations** | 2 |
| **Type of grinding jars** | with integrated safety closure devices |
| **Material of grinding tools** | stainless steel, tungsten carbide, zirconium oxide |
| **Grinding jar sizes** | 50 ml / 125 ml |
| **Setting of grinding time** | 00:01:00 to 99:59:59 |
| **Interval operation** | yes, with optional direction reversal |
| **Interval time** | 00:01:00 to 99:59:59 |
| **Pause time** | 00:01:00 to 99:59:59 |
| **Storable SOPs** | 10 |
| **Interface** | USB / LAN ( RJ45) |
| **Drive** | 3-phase asynchronous motor with frequency converter |
| **Drive power** | 2600 W |
| **Electrical supply data** | 200-240 V, 50/60 Hz |
| **Power connection** | 1-phase |
| **Protection code** | IP 30 |
| **Power consumption** | ~ 3100W (VA) |
| **W x H x D closed** | 625 x 525 x 645 mm |
| **Net weight** | ~ 120 kg |
| **Standards** | CE |
| **Patent / Utility patent** | Inclined Grinding bowls (US 8,042,754 B2) |

*depending on feed material and instrument configuration/settings

**www.retsch.com/emax**

# ORDER DATA

## HIGH ENERGY BALL MILL EMAX

**(please order grinding jars and balls [up to 15 mm] separately)**

| | | |
|---|---|---|
| 20.510.0001 |  | Emax, 200–240 V, 50/60 Hz, High energy ball mill with 2 grinding stations |

## SCREW-LOCK GRINDING JARS EMAX

| | | |
|---|---|---|
| **STAINLESS STEEL** | | |
| 01.462.0305 | | 50 ml |
| 01.462.0313 |  | 125 ml |
| **TUNGSTEN CARBIDE** | | |
| 01.462.0317 |  | 50 ml |
| **ZIRCONIUM OXIDE** | | |
| 01.462.0312 | | 50 ml |
| 01.462.0307 |  | 125 ml |

## AERATION LIDS FOR GRINDING JARS EMAX

**incl. o-rings and sintered filter (please order lid and grinding jar separately)**

| | |
|---|---|
| 22.107.0638 | Aeration lid for grinding jars Emax 50ml |
| 22.107.0640 | Aeration lid for grinding jars Emax 125ml |
| | Lid insert for grinding jars Emax |
| 03.474.0258 | Aeration lid insert for grinding jars Emax 50ml, rostfreier Stahl |
| 03.107.0570 | Aeration lid insert for grinding jars Emax 50ml, Zirkonoxid |
| 03.474.0131 | Aeration lid insert for grinding jars Emax 50ml, Wolframcarbid |

| | | |
|---|---|---|
| 03.474.0260 | | Aeration lid insert for grinding jars Emax 125ml, rostfreier Stahl |
| 03.107.0565 | | Aeration lid insert for grinding jars Emax 125ml, Zirkonoxid |

## PRESSURE AND TEMPERATURE MEASURING SYSTEM GRINDCONTROL

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

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

## GRINDCONTROL LID INSERTS

| | | |
|---|---|---|
| 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 GRINDING JARS EMAX

| | | |
|---|---|---|
| 02.486.0051 | | Jar wrench for grinding jars |
| 22.186.0007 | | Sintered filter with O-ring, set of 10 pieces |
| 22.864.0001 |  | Valve set M8x1 for GrindControl and aeration lids |
| 05.114.0057 |  | O-ring for grinding jars 50 ml, 1 piece |
| 05.114.0122 |  | O-ring for grinding jars 125 ml, 1 piece |
| 03.362.0036 | | Cooling lubricant, 100 ml |
| 99.200.0029 | | IQ/OQ Documentation for Emax |

## GRINDING BALLS

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) |
| 22.455.0001 |  | 4 mm Ø, 200 pieces (approx. 14 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 |

| TUNGSTEN CARBIDE | | |
|---|---|---|
| 22.455.0006 |  | 3 mm Ø, 200 pieces (approx. 6 ml) |
| 22.455.0005 |  | 4 mm Ø, 200 pieces (approx. 14 ml) |
| 22.455.0004 |  | 5 mm Ø, 200 pieces (approx. 25 ml) |
| 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 |

| 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) |
| 05.368.0146 | | 7 mm Ø |
| 05.368.0094 |  | 10 mm Ø |
| 05.368.0096 |  | 12 mm Ø |
| 05.368.0113 |  | 15 mm Ø |