Planetary Ball Mill PM 100

General Information

Planetary Ball Mills are used wherever the highest degree of fineness is required. In addition to well-proven mixing and size reduction processes, these mills also meet all technical requirements for colloidal grinding and provide the energy input necessary for mechanical alloying. The extremely high centrifugal forces of a planetary ball mill result in very high pulverization energy and therefore short grinding times.

The PM 100 is a convenient benchtop model with 1 grinding station.

You may also be interested in the High Energy Ball Mill Emax, an entirely new type of mill for high energy input. The unique combination of high friction and impact results in extremely fine particles within the shortest amount of time.

Application Examples

alloys, bentonite, bones, carbon fibres, catalysts, cellulose, cement clinker, ceramics, charcoal, chemical products, clay minerals, coal, coke, compost, concrete, electronic scrap, fibres, glass, gypsum, hair, hydroxyapatite, iron ore, kaolin, limestone, metal oxides, minerals, ores, paints and lacquers, paper, pigments, plant materials, polymers, quartz, seeds, semi-precious stones, sewage sludge, slag, soils, tissue, tobacco, waste samples, wood, ...

Product Advantages

- powerful and quick grinding down to nano range
- reproducible results due to energy and speed control
- suitable for long-term trials
- 2 different grinding modes (dry and wet)
- optional pressure and temperature measuring system PM GrindControl
- wide range of materials for contamination free grinding
- Safety Slider for safe operation
- perfect stability on lab bench thanks to FFCS technology
- innovative counter weight and imbalance sensor for unsupervised operation
- comfortable parameter setting via display and ergonomic 1-button operation
- automatic grinding chamber ventilation
- 10 SOPs can be stored
- programmable starting time
- power failure backup ensures storage of remaining grinding time
- jars with O-type sealing for safe operation, pressure tight

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Features

Applications	pulverizing, mixing, homogenizing, colloidal milling, mechanical alloying
Field of application	agriculture, biology, Chemistry, construction materials, engineering / electronics, environment / recycling, geology / metallurgy, glass / ceramics, medicine / pharmaceuticals
Feed material	soft, hard, brittle, fibrous - dry or wet
Size reduction principle	impact, friction
Material feed size*	< 10 mm
Final fineness*	< 1 µm, for colloidal grinding < 0.1 µm
Batch size / feed quantity*	max. 1 x 220 ml, max. 2 x 20 ml with stacked grinding jars
No. of grinding stations	1
Speed ratio	1 : -2
Sun wheel speed	100 - 650 min^{-1}
Effective sun wheel diameter	141 mm
G-force	33.3 g
Type of grinding jars	"comfort", optional areation covers, safety closure devices
Material of grinding tools	hardened steel, stainless steel, tungsten carbide, agate, sintered aluminium oxide, silicon nitride, zirconium oxide
Grinding jar sizes	12 ml / 25 ml / 50 ml / 80 ml / 125 ml / 250 ml / 500 ml
Setting of grinding time	digital, 00:00:01 to 99:59:59
Interval operation	yes, with direction reversal
Interval time	00:00:01 to 99:59:59
Pause time	00:00:01 to 99:59:59
Storable SOPs	10
Measurement of input energy possible	yes
Interface	RS 232 / RS 485
Drive	3-phase asynchronous motor with frequency converter
Drive power	750 W
Electrical supply data	different voltages
Power connection	1-phase
Protection code	IP 30
Power consumption	~ 1250W (VA)

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W x H x D closed	640 x 480 (780) x 420 mm
Net weight	~ 86 kg
Standards	CE
Patent / Utility patent	Counter weight (DE 20307741), FFCS (DE 20310654), SafetySlider (DE 202008008473)

Please note:
*depending on feed material and instrument configuration/settings

Videolink

http://www.retsch.com/pm100

Function Principle

The grinding jar is arranged eccentrically on the sun wheel of the planetary ball mill. The direction of movement of the sun wheel is opposite to that of the grinding jars in the ratio 1:-2. The grinding balls in the grinding jars are subjected to superimposed rotational movements, the so-called Coriolis forces. The difference in speeds between the balls and grinding jars produces an interaction between frictional and impact forces, which releases high dynamic energies. The interplay between these forces produces the high and very effective degree of size reduction of the planetary ball mill. Planetary mills with a single grinding station require a counterweight for balancing purposes. In the Ball Mill PM 100 this counterweight can be adjusted on an inclined guide rail. In this way the different heights of the centers of gravity of differently-sized grinding jars can be compensated in order to avoid disturbing oscillations of the machine. Any remaining vibrations are compensated by feet with some free movement (Free-Force Compensation Sockets). This innovative FFCS technology is based on the d'Alembert principle and allows very small circular movements of the machine housing that result in an automatic mass compensation. The laboratory bench is only subjected to minimal frictional forces generated in the feet. In this way the PM 100 ensures a quiet and safe operation with maximum compensation of vibrations even with the largest pulverization forces inside the grinding jars and therefore can be left on the bench unsupervised.

Order Data

Planetary Ball Mill PM 100

(please order grinding jars and balls separately)

20.540.0001	PM 100, 230 V, 50/60 Hz, with 1 grinding station, speed ratio 1 : -2

other electrical versions available for the same price

Accessories PM 100 / PM 200 / PM 400

03.025.0002	Adapter for stacking grinding jars “comfort”, 50 ml,

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	hardened steel, stainless steel, for PM 100 and PM 400
03.025.0003	Adapter for stacking grinding jars “comfort”, 50 ml, tungsten carbide, agate, sintered aluminum oxide, zirconium oxide, for PM 100 and PM 400
22.221.0002	Add-on weight for PM 100
02.728.0048	Opening aid for clamping unit
99.200.0006	IQ/OQ Documentation for PM 100 / PM 100 CM

Pressure and temperature measuring system PM GrindControl

incl. measuring transceiver, stationary transceiver, software, case and grinding jar for PM 100 and PM 400

22.782.0004	GrindControl with grinding jar “comfort” 250 ml, stainless steel
22.782.0005	GrindControl with grinding jar “comfort” 500 ml, stainless steel

Grinding jars “comfort” PM 100 / PM 200 / PM 400

Hardened steel

01.462.0145	50 ml
01.462.0144	125 ml
01.462.0224	250 ml
01.462.0229	500 ml

Stainless steel

01.462.0239	12 ml
01.462.0240	25 ml
01.462.0149	50 ml
01.462.0321	80 ml
01.462.0148	125 ml
01.462.0223	250 ml
01.462.0228	500 ml

Tungsten carbide

01.462.0156	50 ml
01.462.0392	80 ml
01.462.0155	125 ml
01.462.0222	250 ml

Agate

01.462.0139	50 ml
01.462.0197	80 ml
01.462.0136	125 ml
01.462.0220	250 ml
01.462.0225	500 ml

Sintered aluminum oxide

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01.462.0153	50 ml
01.462.0152	125 ml
01.462.0221	250 ml
01.462.0226	500 ml
Silicon nitride (other volumes upon request)	
01.462.0138	125 ml
01.462.0135	250 ml
01.462.0132	500 ml
Zirconium oxide	
01.462.0188	50 ml
01.462.0187	125 ml
01.462.0219	250 ml
01.462.0227	500 ml

Accessories for grinding jars “comfort”

for wet grinding, grinding with inert atmosphere and Mechanical Alloying (MA)

Aeration lids

22.107.0015	Aeration lid for grinding jar “comfort” 50 ml, stainless steel
22.107.0016	Aeration lid for grinding jar “comfort” 125 ml, stainless steel
22.107.0005	Aeration lid for grinding jar “comfort” 250 ml, stainless steel
22.107.0006	Aeration lid for grinding jar “comfort” 250 ml, tungsten carbide
22.107.0014	Aeration lid for grinding jar “comfort” 250 ml, zirconium oxide
22.107.0017	Aeration lid for grinding jar “comfort” 500 ml, hardened steel
22.107.0007	Aeration lid for grinding jar “comfort” 500 ml, stainless steel
22.107.0012	Aeration lid for grinding jar “comfort” 500 ml, agate
22.107.0013	Aeration lid for grinding jar “comfort” 500 ml, sintered aluminum oxide
22.107.0010	Aeration lid for grinding jar “comfort” 500 ml, zirconium oxide

Safety closure devices

22.867.0002	Safety closure device for grinding jars “comfort” 50 ml
22.867.0007	Safety closure device for grinding jars “comfort” 80 ml, agate or tungsten carbite / and for grinding jars “comfort” 125 ml
22.867.0003	Safety closure device for grinding jars “comfort” 80 ml, stainless steel
22.867.0004	Safety closure device for grinding jars “comfort” 250

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	ml
22.867.0005	Safety closure device for grinding jars “comfort” 500 ml, hardened steel, stainless steel, agate, sintered aluminum oxide, silicon nitride and zirconium oxide

Gaskets for grinding jars “comfort”

O-rings

05.114.0057	O-ring for grinding jars “comfort” 50 ml, 1 piece
05.114.0121	O-ring for grinding jars “comfort” 80 ml, tungsten carbide, 1 piece
05.114.0056	O-ring for grinding jars “comfort” 80 ml, agate and stainless steel / for grinding jars “comfort” 125 ml, 1 piece
05.114.0055	O-ring for grinding jars “comfort” 250 ml, hardened steel, stainless steel, tungsten carbide and silicon nitride, 1 piece
22.085.0010	O-ring for grinding jars “comfort” 250 ml, agate, sintered aluminum oxide and zirconium oxide, 1 set
05.114.0054	O-ring for grinding jars “comfort”, 500 ml, hardened steel and stainless steel, 1 piece
22.085.0011	O-ring for grinding jars “comfort”, 500 ml agate, sintered aluminum oxide, silicon nitride zirconium oxide and tungsten carbide, 1 set

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
05.368.0057	30 mm Ø
05.368.0056	40 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)
22.455.0001	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

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05.368.0037	12 mm Ø
05.368.0109	15 mm Ø
05.368.0062	20 mm Ø
05.368.0105	25 mm Ø
05.368.0061	30 mm Ø
05.368.0060	40 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
05.368.0070	20 mm Ø
05.368.0069	30 mm Ø
05.368.0068	40 mm Ø
Agate	
05.368.0024	5 mm Ø
05.368.0025	7 mm Ø
05.368.0067	10 mm Ø
05.368.0027	12 mm Ø
05.368.0111	15 mm Ø
05.368.0028	20 mm Ø
05.368.0065	30 mm Ø
05.368.0064	40 mm Ø
Sintered aluminum oxide	
05.368.0019	5 mm Ø
05.368.0021	10 mm Ø
05.368.0112	15 mm Ø
05.368.0054	20 mm Ø
05.368.0053	30 mm Ø
05.368.0052	40 mm Ø
Silicon nitride	
05.368.0088	10 mm Ø
05.368.0085	20 mm Ø
05.368.0086	30 mm Ø
05.368.0087	40 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)

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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)
05.368.0094	10 mm Ø
05.368.0096	12 mm Ø
05.368.0113	15 mm Ø
05.368.0093	20 mm Ø
05.368.0106	25 mm Ø
05.368.0092	30 mm Ø
05.368.0091	40 mm Ø