DRUM MILL TM 300

The TM 300 Drum Mill is utilized for preparing granules and powders through a grinding process conducted in either dry or wet conditions. This versatile grinder can function as either a Ball or a Rod Mill by employing the corresponding module. To ensure an efficient grinding process, it is essential to use a sufficient number of balls or rods. Depending on the sample material, a final fineness below 20 microns can be achieved.

The drum mill comprises a gear motor mounted on a robust steel frame, a set of separation grids, and a sample collector. The TM 300 is designed with a yoke and locking mechanism that facilitates easy access to the sample. Cleaning is made convenient by a quick-release locking mechanism, allowing effortless removal of the drum cover.

The TM 300 accepts sample volumes up to 20 l and is therefore also suited for upscaling processes.

Click to view video

DRUM MILL TM 300

BENEFITS AT A GLANCE

DRUM MILL TM 300

SAFE AND CONVENIENT OPERATION

The TM 300 stands out for its user-friendly features. The easy tilt mechanism facilitates the swift and uncomplicated emptying of the grinding jar. The removable sample collector simplifies the sample retrieval process, making it convenient for operators to access their collected materials.

The solid noise-protection hood contributes to a quieter and more comfortable working environment.

The TM 300 is equipped with an emergency switch, providing a quick

and reliable means to halt the milling process in case of unforeseen circumstances, underscoring the commitment to user safety.

The redesigned drums and drum covers of the TM 300 feature improved handling, allowing the lid to be secured with just one screw for a perfect seal, even during wet grinding.

PARAMETER SETTING

Process parameters like grinding time or start/stop are conveniently set via the TM 300's large display interface. Settings include:

- Variable speed from 1 to 80 rpm
- Grinding time of up to 99:59:59 h:min:s
- Rotation direction, e. g. to reduce caking effects
- Programmable interval & break options for temperature-sensitive samples
- Delayed start function

DRUM MILL TM 300

ACCESSORIES FOR EFFECTIVE GRINDING PROCESSES

Catering to various application needs, the TM 300 offers standard **grinding drums** ranging from 5 to 43.4 liters. This ensures that the mill is adaptable to a wide spectrum of processing tasks.

An optional **separation grid** provides convenient separation of balls and sample after the grinding process. It is suitable for grinding balls sized 10, 20 or 30 mm. A connection for dust extraction prevents release of dust.

The grinding jar comes equipped with a **gasket**, ensuring a secure seal for loss-free milling operations. This feature not only enhances the efficiency of the process but also minimizes the risk of material waste.

5-liter Grinding drum

21.7-liter Grinding drum

Separation grid

DRUM MILL TM 300

DRUM FILLING LEVEL FOR GRINDING BALLS AND RODS

While the maximum sample feed size depends on properties like hardness and breaking behaviour, a particle size of approximately 5 mm is ideal for the TM 300. Larger sizes are acceptable but should not exceed 15 mm. For sample lumps which break very easily or for deagglomeration effects, a feed size between 20 and 30 mm is feasible. For such easy-to-process samples, the sample filling level may be increased to 20 l.

If special drums of stainless steel 1.4404 in sizes 21.7 / 10 / 5 l together with grinding balls of steel 1.4404 are employed, it is possible to carry out **wet grinding** in the TM 300. The total filling volume for wet grinding may exceed the recommended amount for dry grinding. It may be helpful to use a large number of small grinding balls to increase friction.

Grinding drum	Mass of grinding balls	Grinding ball size (mm)	Number of rods	Optimum sample volume (l)
5 l	10 kg	<5 | 10 | 20 | 30	-	1 - 1.5
10 l	up to 20 kg	<5 | 10 | 20 | 30	-	2 - 2.5
21.4 l	40 kg	<5 | 10 | 20 | 30	-	4 - 5
43.4 l	-	-	8	9 - 20

DRUM MILL TM 300

FIVE DRUM POSITIONS FOR CONVENIENT HANDLING

The user can set the grinding drums in five different positions which are secured by a screw. This ensures easy filling and emptying of the drum but also improves the mixing and grinding process. The largest rod module of 43.4 l cannot be brought into the mixing position due to lack of space.

Filling position

Mixing position

Grinding position

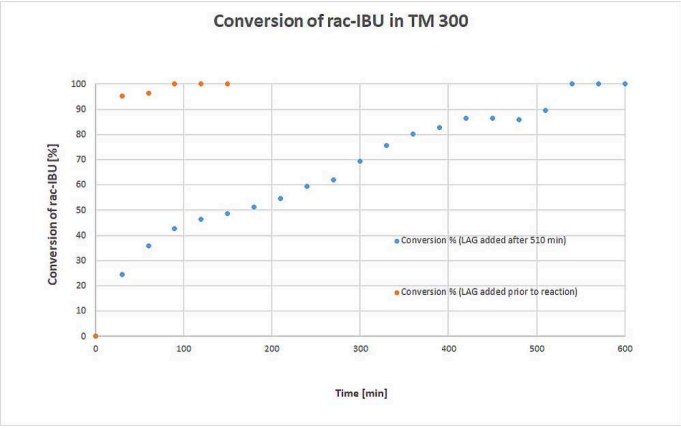
Emptying position

Complete emptying position

DRUM MILL TM 300

THE SOLUTION FOR EFFICIENT AND SUSTAINABLE CO-CRYSTAL SYNTHESIS

The TM 300 is capable of meeting the demands of modern pharmaceutical manufacturing. This can be demonstrated by the example of the mechanochemical synthesis of rac-Ibuprofen:Nicotinamide co-crystals. The TM 300 is an environmentally friendly alternative to conventional solution-based methods. In just 90 minutes, 3.2 kg of co-crystals with a yield of 99 % were produced, using only minimal amounts of solvent in the so-called liquid assisted grinding (LAG) process. This reduces energy consumption compared to conventional methods and drastically minimizes environmental impact.



Conversion of rac-IBU. Blue plot: neat grinding approach with addition of 10 kg of balls (d = 10 mm) after 270 min and 10 kg of balls (d = 30 mm) after 360 min; addition of LAG additive EtOH after 510 min. Orange plot: LAG-assisted approach with EtOH added prior to the reaction and 20 kg balls 10 mm.

Results presented by the research group of Michael Felderhoff [1]

TM 300 enables mechanochemical processes to be carried out on a kilogram scale, opening up new possibilities for sustainable industrial manufacturing processes. Particularly interesting is the minimal metal abrasion – the measured values were well below concerning levels and significantly lower than, for example, in eccentric vibratory mills. The table shows the minimal abrasion values in the TM 300 during the test run.

Sample	Al [ppm]	Cr [ppm]	Co [ppm]	Fe [ppm]	Ni [ppm]
Raw material IBU	11.3	39.0	25.7	71.9	34.9
Raw material Nicotinamid	8.9	33.3	26.7	40.0	33.3
Co-crystals after 30 min	10.8	35.9	30.8	51.3	38.5
After 60 min	11.0	37.0	31.7	63.4	39.6
After 90 min	17.2	43.8	35.9	64.6	45.3

SETUP:

- 2,03 kg rac IBU; 1,20 kg NIC
- 10 l drum for wet grinding, 20 kg 10 mm grinding balls stainless steel
- LAG Ethanol 0.1 ml/g
- 60 rpm for 90 min
- 99 % yield

SPECIAL APPLICATION: BOND INDEX TEST

Another application area of the TM 300 is Bond Index Testing. The Bond Work Index is used to assess the grinding efficiency and to calculate the necessary grinding power when choosing comminution equipment in the design phase of, for example, a mining plant. Precise determination of BWI is crucial for the accurate design and estimation of costs linked to the comminution process in industries like cement, mining or steel.

Both the Ball Mill and the Rod Mill module can be used for the process. At least 15 to 20 kg sample material is required to simulate a closed grinding circuit.

BALL MILL MODULE

The Ball Mill Work Index (BWI) is used for the range from 2.1 mm down to 100 µm. The sample needs to be pre-crushed to particle sizes as defined below.

- Minerals: < 3.35 mm and sieved
- Drillcore: < 3.35 mm and sieved
- Half Drillcore: < 3.35 mm and sieved

The optimum number of grinding balls is 285. With the ball diameters varying due to wear, the overall number should be adjusted from time to time to ensure a total mass of 20.125 grams.

The grinding jar of the Bond Index Ball Mill measures 12'' x 12'' and has well-rounded corners.

ROD MILL MODULE

The Rod Mill Work Index (RWI) is used for particle size determination in a size range from 25 mm down to 2.1 mm. The sample needs to be pre-crushed to particle sizes as defined below.

- Minerals: < 12.50 mm and sieved
- Drillcore: < 12.50 mm and sieved
- Half a drillcore: < 12.50 mm and sieved

The grinding jar for the Bond Index Rod Mill is 12" x 24" in size and has a wave-shaped design.

TYPICAL SAMPLE MATERIALS

RETSCH drum mills are true allrounders. They homogenize, for example: activated carbon, alloys, bentonite, bones, carbon fibers, catalysts, cellulose, cement clinker, ceramics, chemical products, clay minerals, coal, coke, compost, concrete, electronic scrap, fibers, gypsum, glass, hair, hydroxyl apatite, kaolin, lime stone, metal oxides, minerals, ores, paint and varnish, paper, pharmaceutical products, pigments, plants, polymers, quartz, seeds, semi-precious stones, sewage sludge, slag, soil, tissue, tobacco, waste, wood, etc.

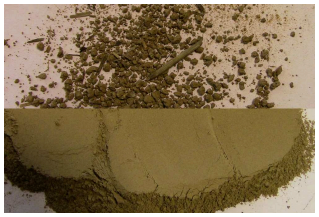
HARD-BRITTLE: CERAMICS

5 l sample
21.7 l ball module
Pre-grinding:
40 kg x 20 mm grinding balls
4 h at 60 rpm
Fine grinding:
40 kg x 10 mm grinding balls
5 h at 60 rpm

HARD-BRITTLE: PLASTICS

4.5 l sample
21.7 l ball module
Pre-grinding:
40 kg x 30 mm grinding balls
3 h at 60 rpm
Fine grinding:
40 kg x 10 mm grinding balls
4 h at 60 rpm

MEDIUM-HARD: SOIL



25 kg sample
43.4 l rod module
8 grinding rods
1 h at 80 rpm

FIBROUS-TOUGH: SAWDUST

4.2 l sample
21.7 l ball module
40 kg x 30 mm grinding balls
5 h at 70 rpm

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

FUNCTIONAL PRINCIPLE

In a drum mill the sample (usually pre-crushed material) is placed inside the drum with the grinding balls and subjected to external forces.
The Ball Mill is used for fine grinding of solid matter by impact and friction in dry condition. The drum, which contains the sample and grinding balls, rotates around a horizontal axis. Whereas particles break more easily when larger grinding ball diameters are used, smaller diameters lead to a substantially higher final fineness.

The ball and the rod mill basically have the same concept comprising either a 12''x12'' jar with grinding balls or a 12''x24'' jar with grinding rods.

The jar is attached to a rotating yoke which is driven by a motor and can be placed in three different positions: Upwards for loading, horizontal for grinding, downwards for discharging.

To carry out the Bond Index test the pre-defined number of grinding balls or grinding rods is required. The electronic control integrated in the drive is equipped with an overload protection and permits and controls different speeds.

During the grinding process the difference in speeds between the balls / rods and grinding jar produces an interaction between frictional and impact forces, which releases the required comminution energy. The interplay between these forces produces a very effective degree of size reduction.

TECHNICAL DATA

Applications	pulverizing, mixing used as Bond Index Tester: quantification of grindability of ores and minerals
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	friction
Material feed size*	< 20 mm used as Bond Index Tester: < 3.35 mm with ball module / 12.50 mm with rod module
Final fineness*	< 20 µm used as Bond Index Tester: < 100 µm with ball module / 2,100 µm with rod module
Batch size / feed quantity*	minimum 1 l / maximum 20 l used as Bond Index Tester: min. 15 kg with ball module / min. 20 kg with rod module
Rotation speed	1 - 80 min-1 used as Bond Index Tester: 70 min-1 with ball module / 46 min-1 with rod module
No. of grinding stations	1
Material of grinding tools	hardened steel, stainless steel used as Bond Index Tester: hardened steel
Grinding drum sizes	5 l / 10 l / 21.7 l / 43.3 l used as Bond Index Tester: 21.7 l with ball module / 43.3 l with rod module
Setting of grinding time	digital
Drive	3-phase asynchronous motor with frequency converter
Drive power	0.75 kW
Electrical supply data	different voltages
Power connection	1-phase
Protection code	IP 41
Power consumption	~ 1800 VA
W x H x D closed	1500 x 1200 x 700 mm

Net weight	~ 306 kg
Standards	CE

*depending on feed material and instrument configuration/settings

REFERENCES

[1] Jan-Hendrik Schöbel, Frederik Winkelmann, Joel Bicker, and Michael Felderhoff; Mechanochemical kilogram-scale synthesis of rac:ibuprofen:nicotinamide co-crystals using a drum mill; RSC Mechanochemistry, 2025, DOI: 10.1039/D4MR00096J

www.retsch.com/tm300

ORDER DATA

DRUM MILL TM 300

DRUM MILL TM 300 FOR DRY GRINDING
COMPLETE INCL. DRUM, BASE FRAME, COLLECTING UNIT WITH SEPARATING SCREENS FOR 20 MM BALLS
(PLEASE ORDER BALL FILLING/ROD FILLING SEPARATELY)

				Drum		
21.301.2001		TM 300	230 V, 50/60 Hz	21,7 l	for grinding balls	steel 1.0037
21.301.2002		TM 300	230 V, 50/60 Hz	10 l	for grinding balls	steel 1.0037
21.301.2003		TM 300	230 V, 50/60 Hz	5 l	for grinding balls	steel 1.0037
21.301.2004		TM 300	230 V, 50/60 Hz	43.4 l	for grinding rods	steel 1.0037

other electrical versions available for the same price

DRUM MILL TM 300 FOR WET GRINDING
COMPLETE INCL. DRUM, BASE FRAME, COLLECTING UNIT WITH SEPARATING SCREENS FOR 20 MM BALLS
(PLEASE ORDER BALL FILLING/ROD FILLING SEPARATELY)

				Drum		
21.301.2005		TM 300	230 V, 50/60 Hz	21,7 l	for grinding balls	stainless st. 1.4404
21.301.2006		TM 300	230 V, 50/60 Hz	10 l	for grinding balls	stainless st. 1.4404
21.301.2007		TM 300	230 V, 50/60 Hz	5 l	for grinding balls	stainless st. 1.4404

other electrical versions available for the same price

DRUM MILL TM 300 FOR BOND INDEX TESTING
INCL. DRUM, BASE FRAME, COLLECTING UNIT WITH SET OF SEPARATING SCREENS FOR BALLS/RODS
(PLEASE ORDER BALL FILLING/ROD FILLING SEPARATELY)

				Drum		
21.301.2008		TM 300	230 V, 50/60 Hz	21.7 l	with rounded corners	for grinding balls

21.301.2009		TM 300	230 V, 50/60 Hz	43.4 l	with wave form	for grinding rods

other electrical versions available for the same price

ACCESSORIES TM 300 FOR DRY GRINDING

BALL FILLINGS/ROD FILLING FOR DRY GRINDING, ,

23.455.0018	Ball filling, 30 mm Ø	(20 kg)	steel 1.3505
23.455.0015	Ball filling, 20 mm Ø	(20 kg)	steel 1.3505
23.455.0019	Ball filling, 10 mm Ø	(20 kg)	steel 1.3505
23.455.0020	Ball filling, 5 mm Ø	(20 kg)	steel 1.3505
23.455.0035	Ball filling, 30 mm Ø	(8 kg), 20 mm Ø (6 kg), 10 mm Ø (6 kg)	steel 1.3505
23.455.0016	Rod filling (for drum 43.4 l only)	(8 pcs.)	steel 1.3505

DRUMS FOR DRY GRINDING, ,

23.462.0056	Drum 5 l	for grinding balls	Stahl 1.0037
23.462.0058	Drum 10 l	for grinding balls	Stahl 1.0037

23.462.0060	Drum 21.7 l	for grinding balls	Stahl 1.0037
23.462.0062	Drum 43.4 l	for grinding rods	Stahl 1.0037

ACCESSORIES TM 300 FOR WET GRINDING

BALL FILLINGS FOR WET GRINDING, ,

23.455.0021	Ball filling, 30 mm Ø	(20 kg)	stainless steel 1.4404
23.455.0022	Ball filling, 20 mm Ø	(20 kg)	stainless steel 1.4404
23.455.0023	Ball filling, 10 mm Ø	(20 kg)	stainless steel 1.4404
23.455.0024	Ball filling, 5 mm Ø	(20 kg)	stainless steel 1.4404
23.455.0036	Ball filling, 30 mm Ø	(8 kg), 20 mm Ø (6 kg), 10 mm Ø (6 kg)	stainless steel 1.4404

DRUMS FOR WET GRINDING, ,

23.462.0057	Drum 5 l	for grinding balls	stainless steel 1.4404
23.462.0059	Drum 10 l	for grinding balls	stainless steel 1.4404
23.462.0061	Drum 21.7 l	for grinding balls	stainless steel 1.4404

ACCESSORIES TM 300 FOR BOND INDEX TESTING

BALL FILLINGS/ROD FILLING FOR BOND INDEX TESTING				
73.455.0018	Ball filling	steel 1.3505	for drum 12" x 12"/21,7 l	
73.455.0019	Rod filling	steel 1.0037	for drum 12" x 24"/43,4 l	

other steel materials on request

DRUMS FOR BOND INDEX TESTING				
23.462.0063	Drum 21.7 l	with rounded corners	for grinding balls	steel 1.0037
23.462.0064	Drum 43.4 l	with wave form	for grinding rods	steel 1.0037

other steel materials on request

ACCESSORIES TM 300 FOR DRY GRINDING AND WET GRINDING

SEPARATING SCREENS	
03.407.0144	Separating screens 28 mm, for balls 30 mm Ø
03.407.0141	Separating screens 15 mm, for balls 20 mm Ø
03.407.0142	Separating screens 8 mm, for balls 10 mm Ø