



## 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



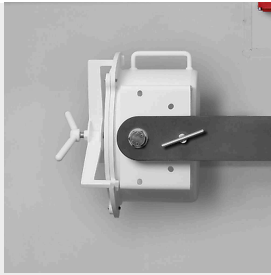
## DRUM MILL TM 300

# ACCESSORIES FOR EFFECTIVE GRINDING PROCESSES

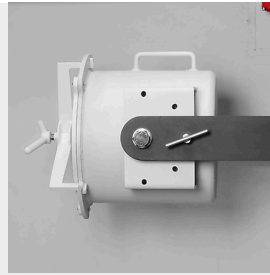
Catering to various application needs, the TM 300 offers standard **grinding drums** ranging from 5 to 43.4 liters. This ensures that the mill is adaptable to a wide spectrum of processing tasks.

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          | opp til 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                    |

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## 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*

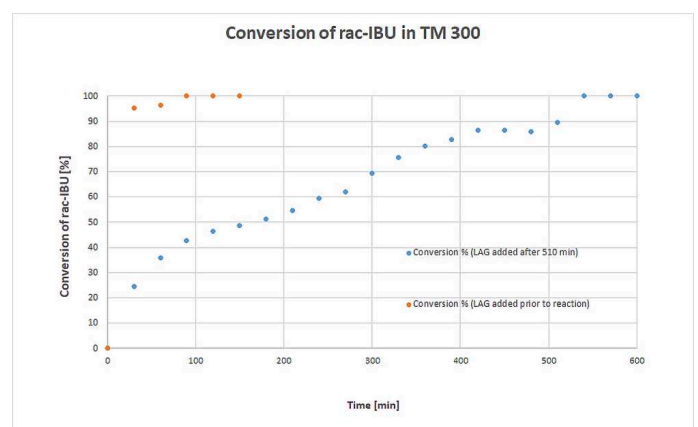


*Complete emptying position*

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

## DRUM MILL TM 300

### **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.

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## TYPICAL SAMPLE MATERIALS

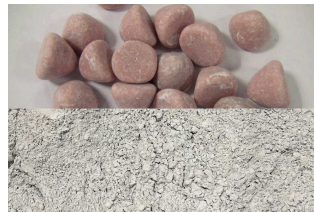
RETSCH drum mills are true allrounders. They homogenize, for example: activated carbon, alloys, bentonite, bones, carbon fibers, catalysts, cellulose, cement clinker, ceramics, chemical products, clay minerals, coal, coke, compost, concrete, electronic scrap, fibers, gypsum, glass, hair, hydroxyl apatite, 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: KERAMIKK



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: PLAST



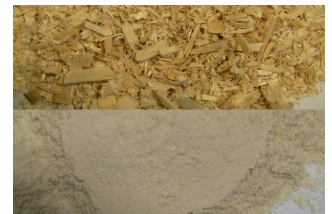
4.5 l sample  
21.7 l ball module  
Pre-grinding:  
40 kg x 30 mm grinding  
balls  
3 h at 60 rpm  
Fine grinding:  
40 kg x 10 mm grinding  
balls  
4 h at 60 rpm

### 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.

DRUM MILL TM 300

## VIRKEMÅTE

**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.

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## TECHNICAL DATA

|                                   |  |
|-----------------------------------|--|
| <b>funksjon</b>                   | pulverizing, mixing<br>used as Bond Index Tester: quantification of grindability of ores and minerals  |
| <b>bruksområde</b>                | biologi, byggematerialer, chemistry, geologi / metallurgi, glass / keramikk, landbruk, maskinbygging / elektroteknikk, medisin / legemidler, miljø / gjenvinning |
| <b>matemateriale</b>              | mykt, hardt, sprøtt, fibrøs - tørr eller våt   |
| <b>nedmalingsprinsipp</b>         | friction   |
| <b>matestørrelse*</b>             | < 20 mm<br>used as Bond Index Tester:<br>< 3.35 mm with ball module / 12.50 mm with rod module   |
| <b>sluttfinhet*</b>               | < 20 µm<br>used as Bond Index Tester:<br>< 100 µm with ball module / 2,100 µm with rod module  |
| <b>prøvevolum*</b>                | minimum 1 l / maximum 20 l<br>used as Bond Index Tester:<br>min. 15 kg with ball module / min. 20 kg with rod module   |
| <b>Rotation speed</b>             | 1 - 80 min <sup>-1</sup><br>used as Bond Index Tester:<br>70 min <sup>-1</sup> with ball module / 46 min <sup>-1</sup> with rod module                           |
| <b>antall malestasjoner</b>       | 1  |
| <b>material i maleverktøyet</b>   | herdet stål, stainless steel<br>used as Bond Index Tester:<br>hardened steel   |
| <b>Grinding drum sizes</b>        | 5 l / 10 l / 21.7 l / 43.3 l<br>used as Bond Index Tester:<br>21.7 l with ball module / 43.3 l with rod module   |
| <b>innstilling av maletid</b>     | digital  |
| <b>drift</b>                      | 3- faset asynkron motor med frekvensomformer   |
| <b>drivkraft</b>                  | 0.75 kW  |
| <b>Elektriske tilkoblingsdata</b> | ulike spenninger   |
| <b>Nettilkobling</b>              | 1-fase   |
| <b>kapslingstype</b>              | IP 41  |
| <b>kraftforbruk:</b>              | ~ 1800 VA  |
| <b>b x h x d lukket</b>           | 1500 x 1200 x 700 mm   |

|                            |          |
|----------------------------|----------|
| <b>nettovekt</b>           | ~ 306 kg |
| <b>Normer / standarder</b> | CE       |

\*avhengig av matemateriale og apparatkonfigurering /apparatinnstillinger

## 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




[/tm300](#)

## BESTILLINGSINFO

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

### DRUMS FOR DRY GRINDING, ,

|             |              |                    |              |
|-------------|--------------|--------------------|--------------|
| 23.462.0056 | Drum 5<br>l  | for grinding balls | Stahl 1.0037 |
| 23.462.0058 | Drum<br>10 l | for grinding balls | Stahl 1.0037 |

|             |                |                    |              |
|-------------|----------------|--------------------|--------------|
| 23.462.0060 | Drum<br>21.7 l | for grinding balls | Stahl 1.0037 |
| 23.462.0062 | Drum<br>43.4 l | for grinding rods  | Stahl 1.0037 |

## ACCESSORIES TM 300 FOR WET GRINDING

### BALL FILLINGS FOR WET GRINDING, ,

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

### DRUMS FOR WET GRINDING, ,

|             |                |                    |                           |
|-------------|----------------|--------------------|---------------------------|
| 23.462.0057 | Drum 5<br>l    | for grinding balls | stainless steel<br>1.4404 |
| 23.462.0059 | Drum<br>10 l   | for grinding balls | stainless steel<br>1.4404 |
| 23.462.0061 | Drum<br>21.7 l | for grinding balls | stainless steel<br>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  |