Size reduction with Rotor Mills

Retsch®

Solutions in Milling & Sieving

Ultra Centrifugal Mill ZM 200

The powerful drive of the innovative Ultra Centrifugal Mill ZM 200 ensures rapid grinding results. Together with its extremely efficient operation the ZM 200 can prepare 100 samples or more per day for analysis.
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The **rotor mill series** includes ultra centrifugal mills, rotor beater mills and cross beater mills. Depending on the particular instrument **they are suitable for the preliminary and fine size reduction of soft, fibrous and also hard materials**. A final fineness of down to 40 µm can often be achieved in the first working step. The maximum feed size depends on the mill and ranges from 10 to 15 mm. Material which is larger than this must first undergo preliminary size reduction.

Preliminary size reduction

For the coarse and preliminary size reduction of hard, brittle or hard-tough materials the **RETSCH jaw crushers** have proven themselves in practice. In contrast, **bulky, soft, fibrous or tough materials are best processed in RETSCH cutting mills**.

Sample dividers

Sample dividers, rotary tube sample dividers, sample splitters – with RETSCH sample dividers you will obtain **representative part samples** from pourable powders and bulk goods **for meaningful analysis results**.

The main areas of application for ultra centrifugal mills are:

Agriculture
Fertilizers, plant materials, seeds, straw, tobacco, wood

Biology
Animal tissue, bones, collagen, dried larvae

Chemicals and plastics
Activated charcoal, plastics (PET, PP, ABS, polystyrole, polycarbonate etc.), powder coatings, rubber granulate, super-absorbent polymers, synthetic resins

Environmental research
Electronic components (circuit boards), fossil and secondary fuels, waste

Food and feeds
Coffee beans, corn, feed pellets, dried fruit and vegetables, rice, spices, sweets, tea leaves

Geology and metallurgy
Bentonite, coal, coke, limestone

Medicine and pharmaceuticals
Pharmaceutical raw materials and finished products

and many more...

Applications Ultra Centrifugal Mill

The powerful and versatile ZM 200 offers **the ultimate in performance and operating comfort**. The mill pulverizes a great variety of soft to medium-hard and fibrous substances extremely fast, thus allowing for a high sample throughput. The ultra centrifugal mill is used in both quality control and R&D. Thanks to its high efficiency and superior results the Ultra Centrifugal Mill ZM 200 has established itself as a **standard laboratory device** in the feeds industry as well as for chemical and agricultural applications. It is frequently used for **sample preparation to NIR and ICP analyses**.

Free test grinding

As part of RETSCH's professional customer support we offer our customers the individual advice required to find the optimum solution for their sample preparation task. To achieve this our application laboratories process and measure samples free-of-charge and provide a recommendation for the most suitable method and instrument.

For more information please visit our website www.retsch.com/testgrinding.

Application examples

Ultra Centrifugal Mill	Accessories / grinding aids	Rotor	Ring sieve aperture size	Feed size	Sample amount	Grinding time	Speed	Final fineness
Bentonite	Cyclone, Vibratory Feeder	12 teeth	0.25 mm	0-5 mm	1,500 g	15 min.	18,000 rpm	90% <63 µm
Coal	Cyclone, Vibratory Feeder	12 teeth	0.2 mm	1-15 mm	550 g	5 min.	18,000 rpm	99% <100 µm
Corn	Cyclone	12 teeth	1 mm	5 mm	100 g	15 s	18,000 rpm	90% <500 µm
Feed pellets		12 teeth	2 mm	10x30 mm	200 g	2 min.	18,000 rpm	80% <500 µm
Fertilizer		12 teeth	0.25 mm	1-4 mm	80 g	2 min.	18,000 rpm	<100 µm
Licorice (a) / Wine gum (b)	Dry ice, talc	12 teeth	2 mm* (a) / 0.5 mm* (b)	1-15 mm	15 g	3 min.	18,000 rpm	homogeneous <300 µm
Powder coating	Cyclone, Vibratory Feeder	12 teeth	0.08 mm*	1-15 mm	120 g	2 min.	18,000 rpm	80% <53 µm
PP granules	Pre-cooling with LN_2	12 teeth	0.75 mm	1-3 mm	40 g	7 min.	18,000 rpm	90% <500 µm
Rice	Cyclone, Vibratory Feeder	12 teeth	0.5 mm	2-8 mm	400 g	2.5 min	18,000 rpm	80% <200 µm
Saffron fibres		6 teeth	0.5 mm	1-15 mm	5-10 g	10 s	18,000 rpm	<200 µm
Secondary fuels	Cyclone, dry ice	12 teeth	1 mm	1-10 mm	200 g	5 min.	18,000 rpm	80% <500 µm
Tablets		24 teeth	0.08 mm	10-20 mm	25 g (20 tablets)	30 s	18,000 rpm	80% <40 µm

*Distance sieve
This chart serves only for orientation purposes.

RETSCH's application database contains more than 1,000 application reports. Please visit www.retsch.com/applicationdatabase.

Ultra Centrifugal Mill ZM 200

Versatile and efficient

ZM 200

Benefits at a glance

- Powerdrive with optimally matched frequency converter and 3-phase motor
- Wide speed range, adjustable from 6,000 to 18,000 rpm
- Patented cassette system for maximum sample recovery and easy cleaning
- Defined final fineness
- Comfortable safety housing with automatic cover closure
- Comfortable parameter setting via display and ergonomic 1-button operation
- Wide range of accessories

High-speed power for excellent grinding results

With the Ultra Centrifugal Mill ZM 200 RETSCH offers a mill with previously unmatched performance. The heart of the ZM 200 is the **innovative Powerdrive** which ensures higher performance with increased torque. The perfectly matched frequency converter and 3-phase motor provide a considerably higher throughput when compared with other rotor mills. Temporary overloads are easily balanced at continued output which ensures particularly effective grinding.

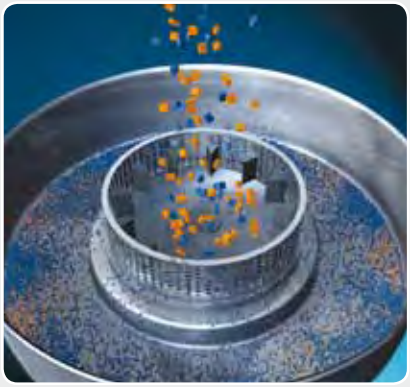
The extremely quick size reduction process increases sample throughput while the **2-step rotor-ring sieve system** ensures that the sample characteristics remain unaltered.

Soft, elastic products such as plastics, which do not process well at room temperature, can be fed into the mill after **embrittlement with liquid nitrogen or dry ice**.

Because of the efficient size reduction technique and the comprehensive range of accessories **the ZM 200 ensures the gentle preparation of analytical samples in a very short time.**

ZM 200 technology

In the ultra centrifugal mill size reduction takes place by impact and shearing effects between the rotor and the fixed ring sieve. The feed material passes through the hopper (with splash-back protection) onto the rotor. Centrifugal acceleration throws it outward with great energy and it is pre-crushed on impact with the wedge-shaped rotor teeth moving at a high speed. The particles are then finely ground between the rotor and the ring sieve. This 2-step grinding ensures particularly gentle but fast processing. The feed material only remains in the grinding chamber for a very short time, which avoids the risk of overheating and ensures that the characteristics of the sample to be analyzed remain unaltered. The ground sample is collected in the cassette surrounding the grinding chamber or in the downstream cyclone or paper filter bag.



ZM 200 – powerful, safe, flexible

(1) Standard ring sieve
(2) Ring sieve with reinforced rim
(3) Distance sieve

Rotors and ring sieves

The selection of the push-fit rotor and ring sieve depends on the properties of the sample, the required final fineness and the subsequent analysis.

The ring sieve aperture size is primarily chosen according to the required final fineness and the feed material. With most materials approx. **80 % of the total sample achieves a fineness of less than half the aperture size of the ring sieve used**.

Rotors and ring sieves are available in various materials and types. The **reinforced rims** provide the ring sieves with greater stability.

Temperature-sensitive, brittle materials such as powder coatings and resins are particularly easy to grind with the **distance sieves** that have been specially developed for this purpose.

Rotors and ring sieves with an **abrasion-resistant coating** are used for reducing the size of abrasive substances such as fertilizers.

For **heavy-metal-free size reduction** of non-abrasive materials we recommend the use of rotors and ring sieves made from titanium together with cassette and covers with a titanium-niobium coating.

Thanks to the wide range of accessories with rotors, ring sieves and different types of collection systems, the ZM 200 can be easily adapted to suit a wide variety of applications.

Rotor selection guide

Rotor	Field of application
6-tooth rotor	coarse, bulky, fibrous goods such as feed pellets, hay and straw
12-tooth rotor	medium-coarse goods such as wheat, oats, corn, tablets, powder coatings and plastics
24-tooth rotor	fine goods such as chemicals, coal and sugar
8-tooth mini-rotor	specially for size reduction of small sample amounts up to 20 ml

New technology with maximum operating comfort

The ZM 200 is very simple and safe to use. The parameters are easily set via a graphics display and 1-button operation. All relevant data can be comfortably entered or called up, e.g.

- speed
- drive load
- operating hours
- service intervals
- clear text error messages

With manual feeding of the sample, the performance display allows to monitor the load of the drive and to adjust the feed rate for optimized results.
The electronic safety and diagnosis system **virtually rules out operating errors**.

Suitable for almost any task

Its wide range of accessories and the possibility to individually select the rotor speed make the ZM 200 easily adaptable to any size reduction task.

The feed material is introduced either manually or via an optional load-controlled Vibratory Feeder DR 100 which is connected to the mill through an interface. **The automatic, regular sample feed maximizes the throughput without any risk of overloads and ensures uniform grinding results**. The ground sample is collected in the cassette. The innovative cassette principle ensures easy and loss-free material removal and avoids cross-contamination.

When using a **cyclone** or paper filter bag, the sample material is additionally cooled by the air stream and more rapidly discharged from the grinding chamber via the cassette pan with outlet. This effect can be increased by **connecting a vacuum cleaner**. The cyclone can be equipped with a 250 ml or 500 ml sample bottle; for **grinding larger volumes**, collecting receptacles of 3 l and 5 l are available.

All parts coming into contact with the sample can be removed, cleaned and reassembled without using any tools.

Controlled and uniform material feed: ZM 200 with Vibratory Feeder DR 100

Automatic size reduction of large amounts: ZM 200 with Vibratory Feeder DR 100 and cyclone

Performance data	ZM 200						
	www.retsch.com/zm200						
Application	fine grinding						
Field of application	agriculture, biology, chemistry/plastics, construction materials, engineering/electronics, environment, food, geology/metallurgy, medicine/pharmaceuticals						
Feed material	soft, medium-hard, brittle, fibrous						
Feed size	<10 mm						
Final fineness*	<40 µm						
Sample volume (nominal)							
	with standard cassette	with mini-cassette	with paper filter bag	with cyclone			
	up to 300 ml (900 ml)	up to 20 ml (50 ml)	up to 1.000 ml (3.000 ml)	up to 230 ml (250 ml)	450 ml (500 ml)	2.500 ml (3.000 ml)	4.500 ml (5.000 ml)
Speed range	6,000 - 18,000 rpm, freely selectable						
Rotor peripheral speed	31 - 93 m/s						
*depending on feed material and instrument configuration/settings							

Technical data	
Power consumption	approx. 1,300 W (VA)
W x H x D	410 x 515 x 365 mm
Weight, net	approx. 38 kg

Noise values (noise measurement according to DIN 45635-31-01-KL3)	
Emission value with regard to workplace	L_{pAeq} 77.5 dB(A)
Measuring conditions:	
Sample	burnt lime
Feed size	<5 mm
Rotor used	12-tooth rotor
Ring sieve used	0.5 mm trapezoid holes

Accessories for grinding small volumes

In many fields, e.g. in the pharmaceutical industry, the required sample amounts are very small. The **mini-cassette** for the ZM 200 **for sample volumes of up to 20 ml**, which is used in combination with the 8-tooth mini-rotor, is the ideal tool for such applications. The loss-free recovery of smaller amounts of sample is made easier by the reduced cassette diameter. Suitable **ring sieves** are available **with aperture sizes from 0.08 to 2.00 mm**. If the grinding tools for small volumes are used in the ZM 200 only a small labyrinth disk is required. The necessary accessories are available as a conversion kit.

All parts coming into contact with the sample, including the cassette and ring sieves, are made from corrosion-resistant steel 1.4404 (316).

Order data for Ultra Centrifugal Mill ZM 200

Ultra Centrifugal Mill ZM 200		Item No.
ZM 200 with cassette (900 ml) (please order push-fit rotor and ring sieve separately)		
ZM 200	for 200-240 V, 50/60 Hz	20.823.0001
ZM 200	for 110 V, 50/60 Hz	20.823.0002
ZM 200	for 120 V, 50/60 Hz	20.823.0003

Push-fit rotors and ring sieves for normal use													Item No.
Push-fit rotor									6-tooth		12-tooth		24-tooth
Push-fit rotor, stainless steel									02.608.0040		02.608.0041		02.608.0042
Ring sieves	Trapezoid holes									Round holes			
Aperture sizes in mm	0.08	0.12	0.20	0.25	0.50	0.75	1.00	1.50	2.00	3.00	4.00	5.00	6.00
Ring sieves, stainless steel													
Item No.: 03.647...	0231	0232	0233	0234	0235	0236	0237	0238	0239	0240	0241	0242	0243
Ring sieves, stainless steel, with reinforced rim, recommended for tough materials													
Item No.: 03.647...	0244	0245	0246	0247	0248	0249	0250	0251	0252	0272	0273	0274	0275
Distance sieves, stainless steel, recommended for temperature-sensitive materials													
Item No.: 03.647...	0253	0254	0255	0256	0257	0258	0259	0260	0304	–	0261	–	–
Distance sieves, stainless steel, square holes, 10 mm, for pre-grinding													03.647.0298

Push-fit rotors and ring sieves for abrasive products													Item No.
Push-fit rotor									6-tooth		12-tooth		24-tooth
Push-fit rotor, stainless steel, with wear-resistant coating									02.608.0043		02.608.0044		02.608.0045
Ring sieves	Trapezoid holes									Round holes			
Aperture sizes in mm	0.08	0.12	0.20	0.25	0.50	0.75	1.00	1.50	2.00	3.00	4.00	5.00	6.00
Ring sieves, stainless steel, with reinforced rim, wear-resistant coating													
Item No.: 03.647...	–	–	0262	0263	0264	0265	0266	0267	0268	0269	–	–	–

Push-fit rotors and ring sieves for heavy-metal-free grinding													Item No.
Push-fit rotor													12-tooth
Push-fit rotor, titanium													02.608.0047
Cassette, titanium-niobium coating, complete (pan, cover and gasket)													22.355.0006
Ring sieves	Trapezoid holes									Round holes			
Aperture sizes in mm	0.08	0.12	0.20	0.25	0.50	0.75	1.00	1.50	2.00	3.00	4.00	5.00	6.00
Ring sieves, titanium, with reinforced rim													
Item No.: 03.647...	0270	0271	0276	0277	0278	0279	0280	0281	0282	–	0283	–	–

Accessories for grinding small volumes													Item No.
Conversion kit for grinding small volumes, consisting of 8-tooth push-fit rotor, labyrinth disc and cassette (50 ml)													22.786.0002
8-tooth push-fit rotor, corrosion-resistant steel 1.4404 (316)													02.608.0057
Labyrinth disc													02.706.0247
Cassette (50 ml), corrosion-resistant steel 1.4404 (316), complete (pan, cover and gasket)													02.010.0039
Ring sieves	Trapezoid holes									Round holes			
Aperture sizes in mm	0.08	0.12	0.20	0.25	0.50	0.75	1.00	1.50	2.00	3.00	4.00	5.00	6.00
Ring sieves, corrosion-resistant steel 1.4404 (316)													
Item No.: 03.647...	0287	0288	0289	0290	0285	0291	0292	0293	0294	–	–	–	–

Cyclone		Item No.
Cyclone for ZM 200 incl. cassette with outlet and support	with filter bag	with connection for vacuum cleaner[1]
Cyclone with 5 l collecting receptacle	22.935.0016	22.935.0019
Cyclone with 3 l collecting receptacle	22.935.0015	22.935.0018
Cyclone with 1 sample bottle 250 ml and 1 sample bottle 500 ml	22.935.0014	22.935.0017

[1] Inner-Ø: 31.2 mm / Outer-Ø: 36 mm, for item number of vacuum cleaner see page 12

Paper filter bags	Item No.
Paper filter bags (12 pieces) with passage receptacle and flange	22.261.0003

Accessories for automatic material feed		Item No.
Feeder kit DR 100, complete with feeding kit with 40 mm push-fit feed chute, length 250 mm, hopper, stand and data cable		
DR 100	for 220-240 V, 50 Hz	22.936.0001
DR 100	for 110-120 V, 60 Hz	22.936.0002

Other accessories / Spare parts	Item No.
Spare cassette (900 ml), stainless steel, complete (pan, cover and gasket)	02.010.0037
Spare cassette cover, stainless steel, with gasket	22.355.0003

See price list for further accessories.

Applications
Cyclone Mill TWISTER

The innovative Cyclone Mill TWISTER is used for sample preparation to subsequent NIR analysis. It processes **fibrous and soft products** quickly and gently to the required analytical fineness. The mill is ideally suited for grinding **feeds, forage and cereals** as well as various types of **food**.

The main areas of application for cyclone mills are:

Agriculture
Cereals, forage, tobacco

Foods & Feeds
Corn, feed pellets, pasta, rice, soy

Medicine and pharmaceuticals
Pharmaceutical raw materials and finished products

and many more...

Free test grinding

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Application Examples

Cyclone mill TWISTER	Sieve insert	Feed size	Feed quantity	Grinding time	Speed	Final fineness
Corn	1 mm	0.1 - 5 mm	100 g	1 min	10,000 min^{-1}	homogeneous, <1 mm
Feed pellets	1 mm	5 - 15 mm	50 g	30 s	10,000 min^{-1}	homogeneous, <1 mm
Hay	1 mm	0.1 - 20 mm	10 g	1 min	10,000 min^{-1}	homogeneous, <1 mm
Rice	1 mm	2 - 10 mm	50 g	20 s	10,000 min^{-1}	homogeneous, <1 mm
Soy	1 mm	4 - 8 mm	50 g	30 s	10,000 min^{-1}	homogeneous, <1 mm
Tablets	1 mm	10 mm	20 pcs.	10 s	10,000 min^{-1}	homogeneous, <1 mm
Tobacco	1 mm	0.1 - 20 mm	10 g	15 s	14,000 min^{-1}	homogeneous, <1 mm
Unripe spelt grain	1 mm	2 - 5 mm	50 g	30 s	10,000 min^{-1}	homogeneous, <1 mm
Wheat	1 mm	3 - 8 mm	50 g	1 min	14,000 min^{-1}	homogeneous, <1 mm

This chart serves only for orientation purposes.

RETSCH's application database contains more than 1,000 application reports. Please visit www.retsch.com/applicationdatabase.

Cyclone Mill TWISTER

Ideal for feeds, forage, cereals

Reproducible sample preparation to NIR analysis

The Cyclone Mill TWISTER was specially designed for the processing of food and feeds for subsequent NIR (Near Infrared Spectroscopy) analysis.
For NIR spectroscopy the precision and reproducibility of the analysis depend to a great extent on a uniform particle size distribution of the sample. To obtain meaningful analysis results, the quick and reproducible homogenization of the sample with TWISTER is essential.

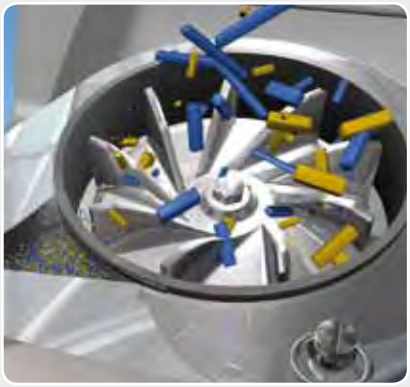
Benefits at a glance

- Ideal for grinding feeds, grains, forage and similar products
- 3 controlled speeds
- Cyclone separator with 250 ml collecting bottle for quick extraction of sample
- No cross contamination thanks to easy cleaning
- Convenient operating panel
- Professional industrial design with long lifetime

The TWISTER is equipped with a rotor and grinding ring with sieve insert. The high speed and the optimized geometry of rotor and grinding chamber generate an air stream which carries the sample through the **integrated cyclone** into the sample bottle. The cyclone provides additional cooling of the sample and the grinding tools. This **prevents loss of moisture and thermal degradation** and ensures preservation of the sample properties to be determined. The ground material is separated in the cyclone and collected in a sample bottle for complete recovery.
The provided sieves guarantee an optimum particle size distribution so that it is not necessary to recalibrate the NIR spectrometer

Cyclone mill technology

In the Cyclone Mill TWISTER size reduction is effected by **impact and friction** between the rotor and the abrasive surface of the fixed grinding ring. The feed material passes through the hopper (with splash-back protection) onto the rotor, which is rotating with high speed, and is thus submitted to preliminary size reduction. The sample is then thrown outwards by centrifugal acceleration and is pulverized between rotor and grinding ring until the particles are smaller than the aperture size of the sieve insert. The 2-step grinding ensures particularly gentle but fast processing. The feed material only remains in the grinding chamber for a very short time which **prevents the sample from getting too warm**.



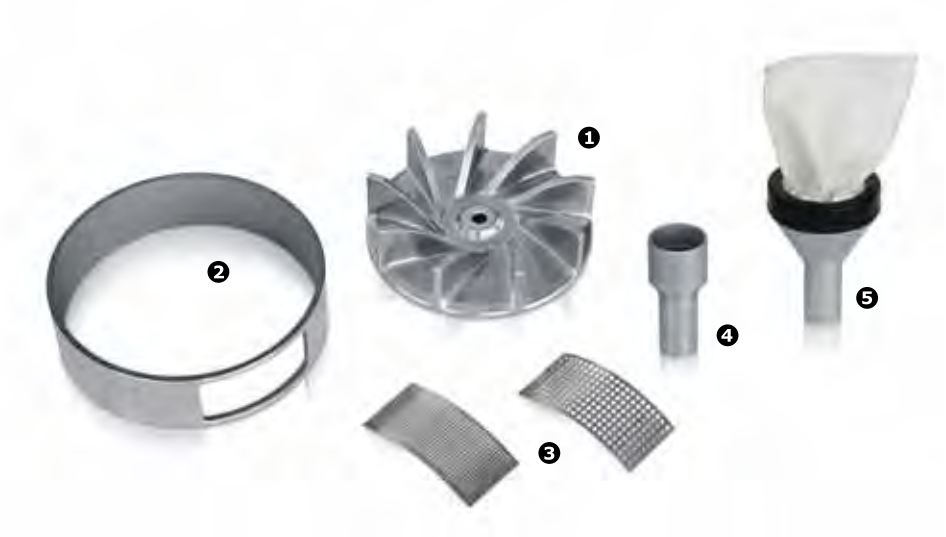
Easy operation and cleaning

Operating the cyclone mill via a clearly structured keypad is simple and safe. The user can choose between **3 preset rotor speeds** allowing for perfect adaptation to sample requirements. For most products the air stream effects a complete discharge of the material from the grinding chamber, particularly if a **vacuum cleaner** is connected, so that **hardly any cleaning is required**. This helps to avoid cross contaminations and is especially convenient when processing a series of samples. The quick and easy exchange of the sample bottles adds to the comfortable operation of the TWISTER mill.

Performance data	TWISTER
	www.retsch.com/twister
Application	sample preparation to NIR analysis
Fields of application	agriculture food & feeds, medicine/pharmaceuticals
Feed material	fibrous, soft
Feed size*	<10 mm
Final fineness*	<500 µm
Batch size/sample volume*	<250 ml
Speed	10,000 / 12,000 / 14,000 min^{-1}
Rotor peripheral speed	52 / 62 / 93 m/s
Connection for vacuum cleaner	inner Ø: 31.2 mm / outer Ø: 36 mm
*depending on feed material and instrument configuration/settings	
Technical Data	
Drive	series-characteristic motor
Drive power	900 W
W x H x D	449 x 427 x 283 mm
Weight, net	approx. 14 kg
Noise values (noise measurement according to DIN 45635-31-01-KL3)	
Emission value with regard to workplace	L_{pAeq} 67.5 dB(A)
Measuring conditions	10,000 min^{-1}, without sample material

The Cyclone Mill TWISTER is supplied with the following components:

- aluminum rotor (1)
- stainless steel grinding ring with molybdenum coating (2)
- two stainless steel sieve inserts (1 mm and 2 mm) (3)
- adapter for connection of vacuum cleaner (4)
- filter bag (5)
- ten 250 ml sample bottles

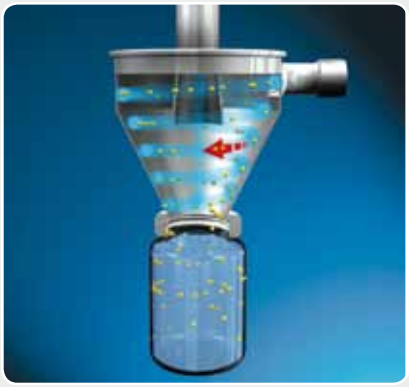


Cyclone technology and benefits

A rotating air stream is generated inside the cyclone either by a vacuum cleaner connected to the upper outlet of the cyclone and/or by the rotor revolutions of the mill to which it is attached. Due to centrifugal forces acting on the sample, the particles settle on the cyclone walls and are lead in spiraled tracks into the attached sample bottle.

By using a cyclone, the sample and grinding tools are cooled during the grinding process, the throughput is increased and the discharge of the material from the grinding chamber is improved.

The results are a complete recovery of the sample as well as reduced cleaning times.



Order data for Cyclone Mill TWISTER

Cyclone Mill TWISTER		Item No.
Complete with rotor, grinding ring, sieve inserts (1.0 mm and 2.0 mm), 10 sample bottles 250 ml, filter bag and adapter for connection of vacuum cleaner		
TWISTER	220–240 V, 50/60 Hz	20.831.0001
TWISTER	110–120 V, 50/60 Hz	20.831.0002
Industrial vacuum cleaner		
HDS 2000	230 V, 50/60 Hz	22.748.0002
HDS 2000	110 V, 50/60 Hz	22.748.0003
Filter bags for industrial vacuum cleaner HDS 2000, 5 pieces		32.524.0005
HEPA filter for industrial vacuum cleaner HDS 2000, 1 piece		32.524.0006
Spare parts TWISTER		
Sieve insert	1.0 mm	03.647.0362
Sieve insert	2.0 mm	03.647.0361
Grinding ring		03.614.0004
TWISTER rotor		03.608.0100
Filter bag for cyclone		02.186.0004
Sample bottles	250 ml, 10 pcs.	22.523.0001
Sample bottles	250 ml, 50 pcs.	22.523.0006

Applications
Rotor Beater Mills

The rotor beater mills are used to grind soft and medium-hard sample materials by impact and shearing. Due to their **robust design** and ability to process large amounts of sample they are ideal for small-scale production and suitable for **installation into automated preparation systems**.

Free test grinding

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For more information please visit our website www.retsch.com/testgrinding.

The main areas of application for rotor beater mills are:

Agriculture
Fertilizer, plant materials, seeds, soils

Chemicals and plastics
Plastics, powder coatings, resins

Construction materials
Gypsum

Food
Feed pellets, herbs, rice, spices, sugar

Geology and metallurgy
Bentonite, coal, coke, graphite

and many more...

Application examples

Rotor Beater Mills	Model	Rotor	Retaining frame	Sieve aperture size	Feed size	Sample amount	Grinding time	Final fineness
Animal feed	SR 300*	Standard rotor	360°	1.5 mm	10-12 mm	1,500 g	2.5 min.	95% <1.5 mm
Bentonite	SR 300	Standard rotor	360°	0.12 mm	1-5 mm	500 g	5 min.	95% <100 µm
Biochar	SR 300	Standard rotor	360°	0.25 mm	0-15 mm	4,000 g	10 min.	99% <300 µm
Black Coal	SR 200*	Distance rotor	180°	0.25 mm	1-5 mm	1,800 g	5 min.	98% <200 µm
Coke	SR 300	Standard rotor	360°	0.5 mm	1-10 mm	400 g	2 min.	99% <500 µm
Graphite	SR 300	Distance rotor	180°	0.75 mm	1-10 mm	200 g	15 s	95% <600 µm
Gypsum	SR 200	Distance rotor	180°	1.5 mm	10 mm	3,000 g	3 min.	95% <1 mm
Powder Coating	SR 300*	Distance rotor	360°	0.25 mm	1-10 mm	2,000 g	13 min.	95% <100 µm
Soil	SR 200	Distance rotor	180°	3 mm	0-15 mm	100 g	30 s	98% <2 mm
Spices (goldenrod)	SR 300	Standard rotor	360°	0.5 mm	1-15 mm	100 g	2 min.	90% <0.5 mm
Sugar	SR 300	Distance rotor	360°	0.08 mm	0-1 mm	500 g	5 min.	95 % <30 µm
Wheat	SR 300*	Distance rotor	360°	1 mm	0-5 mm	1,500 g	1 min.	90% <0.75 mm

*with Vibratory Feeder DR 100
This chart serves only for orientation purposes.

RETSCH's application database contains more than 1,000 application reports. Please visit www.retsch.com/applicationdatabase.

Rotor Beater Mills SR 200 and SR 300

High sample throughput

Size reduction, deagglomeration

RETSCH rotor beater mills are suitable for **coarse and fine size reduction**, either in batches or continuously, as well as for the **deagglomeration** of dry, soft and medium-hard organic and inorganic substances. Typical sample batches start with 0.5 liters. Therefore the mills can be used for sample preparation in the laboratory or in pilot plants for large sample quantities.

Grinding large volumes in no time

Rotor Beater Mills can process large sample amounts in a very short time due to the large open sieve area of the 360° ring sieves. Their range of applications is just as versatile as the wide range of accessories.

The SR 200 with a speed of 2,850 rpm (at 50 Hz) is available in gray cast iron. It has its primary uses for **medium-hard, brittle products** which can be perfectly ground with the standard rotor and the retaining frame that consists of a 180° sieve and a 180° impact insert, **without creating undesired fines**. The preparation of coal samples for calorimetric analyses is a typical application. The mill can be bench-mounted or installed on the optional base frame.

The SR 300 is the powerful comfort model. Due to the higher rotor speed (8,100 rpm at 50 Hz) and drive performance higher throughputs with a usually larger fine material fraction are obtained. For this reason the SR 300 provides **results comparable to the Ultra Centrifugal Mill ZM 200**, however, it is capable of handling larger batches. Grinding chamber, feed hopper and the material inlet and outlet are **completely made from stainless steel**. The hopper can be screwed off for easy cleaning. The mill is supplied complete with base frame.

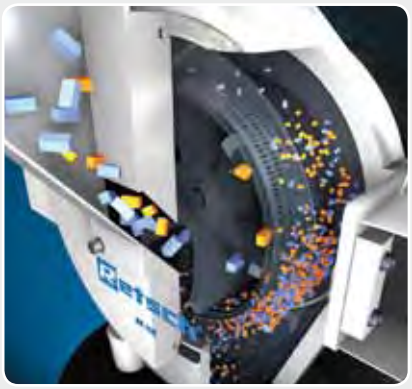
Benefits at a glance

- Suitable for batchwise operation of larger quantities
- Exchangeable grinding and sieve inserts
- Optional grinding inserts 180° for grinding of hard-brittle materials by additional impact
- Optional distance rotor to reduce frictional heat
- Quick-action door lock and motor brake
- Defined final fineness due to bottom sieves with aperture sizes from 0.08 - 10 mm

SR 200, SR 300 technology

Size reduction and deagglomeration in rotor mills are achieved by hammering, impact and shear effects. The feed material passes from the hopper into the center of the grinding chamber where it is crushed between the rotor, sieve and grinding insert. As soon as the material is smaller than the aperture size of the sieve, it enters the collecting receptacle.

The quick-acting door lock ensures easy access to the grinding chamber for cleaning. With their motor brake, safety switch, splash-back and access barrier in the inlet and outlet areas, rotor beater mills offer the highest degree of operating safety.



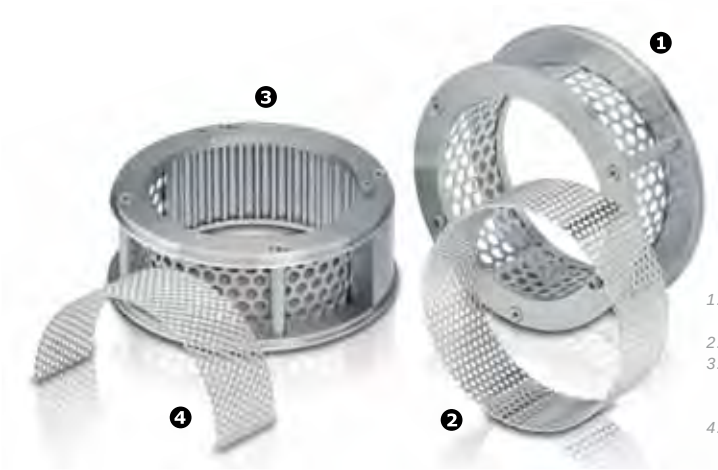
Ideal for laboratory and pilot plant

Selection of accessories

For soft, fibrous materials we recommend the **retaining frame with ring sieve 360°** (1)+(2). The **retaining frame with grinding insert 180°** (3) with the corresponding sieve (4) combines impact and shear effects and has proven itself with hard, brittle substances, especially on the low-speed SR 200.

The final fineness depends on the aperture size of the sieve, the breaking behavior of the feed material and the rotor speed. With many materials approx. 80% of the ground material is smaller than half the aperture size.

Both rotor mills include the **standard rotor** which provides good results with most products. For thermally sensitive, slightly fatty or oily or particularly soft sample materials, size reduction with the **distance rotor** is ideal. The larger grinding gap ensures a reduction in frictional heat, which prevents the sieve or the rotor from being blocked. This configuration is particularly efficient with the high-speed SR 300.



1. *Retaining frame 360° (with ring sieve 360°)*
2. *Ring sieve 360°*
3. *Retaining frame with grinding insert 180° (with sieve 180°)*
4. *Sieve 180°*

Performance data	SR 200	SR 300
	www.retsch.com/sr200	www.retsch.com/sr300
Applications	size reduction, deagglomeration	
Field of application	agriculture, chemistry/plastics, construction materials, environment, food, medicine/pharmaceuticals	
Feed material	soft to medium-hard	
Feed size*	<15 mm	<15 mm
Final fineness*	<80 µm	<50 µm
Vessel capacity	5 or 30 l	5 or 30 l
Grinding chamber material	gray cast iron	stainless steel
Technical data		
Drive	3-phase and 1-phase motors	
Brake motor	yes	yes
Drive performance	1.1 kW	2.2 kW
Motor speed at 50 Hz (60 Hz)	2,850 rpm (3,420 rpm)	8,100 rpm (9,700 rpm)
Rotor peripheral speed at 50 Hz (60 Hz)	20.5 m/s (24.5 m/s)	58 m/s (69.5 m/s)
W x H x D (with base frame)	560 x 1,150 x 700 mm	560 x 1,200 x 890 mm
Weight (with base frame)	approx. 57 kg	approx. 95 kg
Noise values (noise measurement according to DIN 45635-31-01-KL3)		
Emission value with regard to workplace	L_{pAeq} 81 dB(A)	L_{pAeq} 91 dB(A)
Measuring conditions:		
Ring sieve	0.5 mm trapezoid	0.5 mm trapezoid
Feed material	rye,	artificial fertilizer
Feed size	up to 15 mm	up to 3 mm

*depending on feed material and instrument configuration/settings

Rotor Beater Mills are supplied with a collecting receptacle (5 l) made from stainless steel and a textile filter hose. By using the **filter hose** between mill and collector the flow of air produced by the rotating rotor is discharged and back-pressure is avoided. It also **accelerates the material throughput** and ensures a gentle size reduction process.

Instead of the textile tube a **ring-type filter made of stainless steel** (aperture size 36 µm) can be installed to avoid cross contamination.

For additional convenience in cleaning, a dust filter unit is available.

For larger sample amounts we recommend the use of the **Vibratory Feeder DR 100** for uniform material feed and the **30 l collector** with the corresponding filter hose. The use of the vibratory feeder avoids overloads, improves the grinding result and allows for automatic processing of up to 3.5 liters of sample.

Order data for Rotor Beater Mills SR 200, SR 300

Rotor Beater Mills SR 200, SR 300			Item No.
Rotor Beater Mill SR 200, supplied with standard rotor, filter hose (240 mm), collecting receptacle (5 l)			
(Please order retaining frame, sieves and, if required, base frame separately)			
SR 200	for 3/N~400 V, 50 Hz,	rotor speed 2850 rpm, gray cast iron	20.732.0001
SR 200	for 230 V, 50 Hz,	rotor speed 2850 rpm, gray cast iron	20.732.0003
Rotor Beater Mill SR 300, supplied with standard rotor, filter hose (240 mm), collecting receptacle (5 l) and base frame			
(Please order retaining frame and sieves separately)			
SR 300	for 3/N~400 V, 50 Hz,	rotor speed 8100 rpm, stainless steel	20.733.1002
other electrical versions available on request			

Retaining frames and sieves for SR 200, SR 300														Item No.
Retaining frame for ring sieves 360°														
Retaining frame for ring sieves 360°, stainless steel														22.642.0001
Retaining frame for ring sieves 360°, chromium plated														22.642.0002
Ring sieves 360°, stainless steel	Trapezoid holes										Round holes			
Aperture sizes in mm	0.08	0.12	0.20	0.25	0.50	0.75	1.00	1.25	1.50	2.00	3.00	4.00	10.00	
Item No.: 02.407...	... 0057	0026	0028	0029	0030	0031	0032	0058	0033	0034	0035	0036	0040	
Retaining frame with grinding insert for sieves 180°														
Retaining frame with grinding insert for sieves 180°, stainless steel														02.143.0014
Sieves 180°, stainless steel	Trapezoid holes										Round holes			
Aperture sizes in mm	0.08	0.12	0.20	0.25	0.50	0.75	1.00	1.25	1.50	2.00	3.00	4.00	10.00	
Item No.: 03.647...	... 0081	0039	0040	0041	0042	0043	0044	0045	0046	0047	0048	0049	0053	

Rotors for SR 200, SR 300	Item No. for SR 200	Item No. for SR 300
Distance rotor, stainless steel	22.717.0003	22.717.0004
Standard rotor, stainless steel	22.717.0001	22.717.0002

Accessories for SR 200, SR 300	Item No.
Base frame	
Base frame for SR 200	01.824.0028
Set of wheels for base frame	22.609.0003
Vibratory Feeders*	
Vibratory Feeder DR 100 for 220 –240 V, 50 Hz, complete with feeding kit, 75 mm feed chute, hopper and holder	70.937.0056
Vibratory Feeder DR 100 for 110 –120 V, 60 Hz, complete with feeding kit, 75 mm feed chute, hopper and holder	70.937.0057
Stand for using DR 100 with SR 200, SR 300	22.742.0003
Filter and collecting receptacles	
Ring-type filter made of stainless steel for 5 liter collecting receptacle	22.187.0001
Dust filter clamping rings for ring-type filter, with 5 dust filters	22.748.0001
Dust filter for ring-type filter, 25 pieces	22.524.0002
Stainless steel collecting receptacle, 5 liter	01.011.0023
Filter hose for 5 liter collecting receptacle, length 240 mm, with comfort flange	22.187.0003
Spare filter hose for 22.187.0003	02.186.0027
Plastic collecting receptacle, 30 liter, incl. filter hose and comfort flange	22.003.0011
*accessories for vibratory feeders: please refer to “Assisting” brochure	

Applications
Cross Beater Mill

The cross beater mill SK 100 is suitable for coarse and fine size reduction, either in batches or continuously. It processes medium-hard and brittle materials with a hardness of up to approx. 6 on Mohs' scale. Cross Beater Mills are typically used in the **construction industry and metallurgical plants** due to their **rugged design** and simple operation.

The main areas of application for cross beater mills are:

Ceramics and glass

Construction materials
cement clinker, gypsum, lime

Geology and metallurgy
coal, coke, chamotte, granite, ores, slag

and many more...

Free test grinding

As part of RETSCH's professional customer support we offer our customers the individual advice required to find the optimum solution for their sample preparation task. To achieve this our application laboratories process and measure samples free-of-charge and provide a recommendation for the most suitable method and instrument.

For more information please visit our website www.retsch.com/testgrinding.

Application examples

Cross Beater Mill	Mill version	Bottom sieve aperture size	Feed size	Sample amount	Grinding time	Final fineness
Cement clinker	Hardened steel	4 mm	2-15 mm	500 g	3 min.	90% <1 mm
Coal	Gray cast iron	0.5 mm	1-15 mm	450 g	1 min.	95% <300 µm
Copper phosphor	Stainless steel	0.75 mm	1-3 mm	500 g	3 min.	90% <400 µm
Gravel	Stainless steel	0.5 mm	8 mm	1,000 g	5 min.	80% <2 mm
Lime	Stainless steel	0.75 mm	5-15 mm	170 g	5 min.	90% <250 µm
Magnesium carbonate	Stainless steel	2 mm	5-15 mm	400 g	3 min.	98% <1 mm
Refractories	Stainless steel	3 mm	0-3 mm	1,900 g	2 min.	90% <1 mm
Slag	Stainless steel	0.5 mm	1-15 mm	150 g	1 min.	98% <315 µm
Sodium chlorite	Stainless steel	2 mm	1-15 mm	850 g	2 min.	90% <1 mm
Tarmac	Stainless steel	3 mm	1-15 mm	1,500 g	2 min.	90% <1 mm

This chart serves only for orientation purposes.

RETSCH's application database contains more than 1,000 application reports. Please visit www.retsch.com/applicationdatabase.

Cross Beater Mill SK 100

SK 100 with base frame

Robust and safe

Hard-to-beat size reduction

The RETSCH Cross Beater Mill SK 100 is intended for **universal use**: from sample preparation in laboratories and industrial plants, through pilot installations up to preparing sample batches in production facilities.

The maximum feed size for bulk goods is 15 mm, for single-piece feed 20 mm. The final fineness and throughput depend on the breaking behavior of the feed material and the aperture size of the bottom sieve. Due to the powerful drive it is possible to achieve a fineness <100 µm in a single working step in many cases.

Benefits at a glance

- Suitable for batchwise operation of larger quantities
- Defined final fineness due to bottom sieves with aperture sizes from 0.12 - 10 mm
- Exchangeable grinding and sieve inserts
- Easy cleaning
- Quick-action door lock and motor brake

Convenient and safe operation

The SK 100 offers the highest possible degree of **operating safety**. For example, if the off-switch is pressed or the door is opened, the motor brake ensures that the rotor will come to a standstill in less than 0.5 seconds. The feed hopper, like the optimized sample outlet, is equipped with an access barrier that also **prevents sample splash-back**. The SK 100 is easy to clean which helps to reduce preparation time. The quick-action door lock allows rapid access to the grinding chamber and the high-quality sample outlet surface simplifies cleaning.

RETSCH cross beater mills are robust and maintenance-free. Their high-quality finish also guarantees that the mills will have a long working life.

SK 100 technology

Size reduction in cross beater mills takes place by hammering, impact and shearing effects. The feed material passes from the hopper directly into the center of the grinding chamber, where it is caught by the cross beater and ground between the baffle plates of the cross beater and the toothed grinding insert. As soon as the material is smaller than the aperture size of the bottom sieve used, it passes through the sieve and enters the collecting receptacle. The air drawn in through the hopper by the cross beater accelerates the discharge of the ground material. The airborne fine fraction is separated off by a downstream filter system.

Robust and efficient

Bottom sieves

Bottom sieves made from trapezoid or round hole sheet are available in 14 aperture sizes. For heavy-metal-free grinding bottom sieves made from steel 1.0344 are available in 6 aperture sizes.

Performance data	SK 100
	www.retsch.com/sk100
Application	size reduction
Field of application	agriculture, chemistry/plastics, construction materials, environment, geology/metallurgy, glass/ceramics
Feed material	medium-hard, brittle
Feed size*	<15 mm
Final fineness*	<100 µm
Collector volume	5 or 30 l
Technical data	
Drive	3-phase and 1-phase motors
Motor brake	yes
Drive performance	1.1 kW
Motor speed at 50 Hz (60 Hz)	2,850 rpm (3,420 rpm)
Rotor peripheral speed at 50 Hz (60 Hz)	22 m/s (26 m/s)
W x H x D (with base frame)	560 x 1,150 x 700 mm
Weight (with base frame)	approx. 57 kg
Noise values (noise measurement according to DIN 45635-31-01-KL3)	
Emission value with regard to workplace	L_{pAeq} 86 dB(A)
Measuring conditions: Feed material	quartz gravel, grain size <3 mm

*depending on feed material and instrument configuration/settings

Accessories

The standard equipment supplied with the SK 100 includes a **5 l stainless steel collecting receptacle** and a textile filter hose. The **filter hose** is fixed between the mill and collecting receptacle and effects a discharge of the air flow produced by the rotating rotor. An accelerated material throughput and a gentle size reduction process are further advantages.

A **ring-type filter made of stainless steel** (aperture size 36 µm) can be used with or without a dust filter unit instead of the textile tube; this is easier to clean, particularly with fine dusts.

For larger sample amounts we recommend the use of the **Vibratory Feeder DR 100** for uniform material feed and the **30 l collector** with corresponding filter hose.

The SK 100 can be bench-mounted or installed on the optional base frame.

Mill versions

The mill housing is made from cast aluminum. Depending on the application the grinding insert and grinding tools may be selected from various options. Because of its superior characteristics, **stainless steel** suits the vast majority of samples and is preferred for its ease-of-use. Grinding tools of **hardened steel** show the best resistance to abrasive materials while **gray cast iron** is considered as the inexpensive alternative. For grinding without heavy metals, a combination of **cast iron and steel 1.1740** is available. Details are shown in the table.

Versions

	Grinding insert	Cross beater	Baffle plates
SK 100, cast iron	cast iron	cast iron	hardened steel
SK 100, hardened steel	hardened steel	cast iron	hardened steel
SK 100, stainless steel	stainless steel	stainless steel	stainless steel
SK 100, heavy-metal-free	cast iron	cast iron	steel 1.1740

Order data for Cross Beater Mill SK 100

Cross Beater Mill SK 100					Item No.
Supplied with grinding insert, cross beater, baffle plates, filter hose (240 mm) and collecting receptacle (5 l)					
(Please order base frame and bottom sieve separately)					
	version:	cast iron	hardened steel	stainless steel	heavy-metal-free
SK 100	for 3/N~400 V, 50 Hz	20.735.0001	20.735.0002	20.735.0003	20.735.1001
SK 100	for 230 V, 50 Hz	20.735.0007	20.735.0008	20.735.0009	20.735.1007
SK 100	for 110 V, 60 Hz	20.735.0010	20.735.0011	20.735.0012	20.735.1010

Bottom sieves for SK 100															Item No.
Bottom sieves	Trapezoid holes								Round holes						
Aperture sizes in mm	0.12	0.20	0.25	0.50	0.75	1.00	1.50	2.00	3.00	4.00	5.00	6.00	8.00	10.00	
Bottom sieves, stainless steel															
Item No.: 02.407...	... 0059	0013	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	0011	0012	
Bottom sieves, steel 1.0344 for heavy-metal-free grinding															
Item No.: 02.407...	... 0083	0084	0085	0086	–	0087	–	0088	–	–	–	–	–	–	

Grinding tools for SK 100				Item No.
	cast iron	hardened steel	stainless steel	steel 1.1740
Grinding inserts	22.443.0001	22.443.0002	22.443.0003	–
Cross beater	22.716.0001	–	22.716.0002	–
Baffle plates (3 pieces)	–	22.526.0001	22.526.0002	22.526.0006

Accessories for SK 100	Item No.
Base frame	
Base frame for SK 100	01.824.0028
Set of wheels for base frame	22.609.0003
Vibratory Feeders*	
Vibratory Feeder DR 100 for 220 –240 V, 50 Hz, complete with feeding kit, 75 mm feed chute, hopper and holder	70.937.0056
Vibratory Feeder DR 100 for 110 –120 V, 60 Hz, complete with feeding kit, 75 mm feed chute, hopper and holder	70.937.0057
Stand for using DR 100 with SK 100	22.742.0003
Filter and collecting receptacles	
Ring-type filter made of stainless steel for 5 liter collecting receptacle	22.187.0001
Dust filter clamping rings for ring-type filter, with 5 dust filters	22.748.0001
Dust filter for ring-type filter, 25 pieces	22.524.0002
Stainless steel collecting receptacle, 5 liter	01.011.0023
Filter hose for 5 liter collecting receptacle, length 240 mm, with comfort flange	22.187.0003
Spare filter hose for 22.187.0003	02.186.0027
Plastic collecting receptacle, 30 liter, incl. filter hose and comfort flange	22.003.0011
*accessories for vibratory feeders: please refer to “Assisting” brochure	