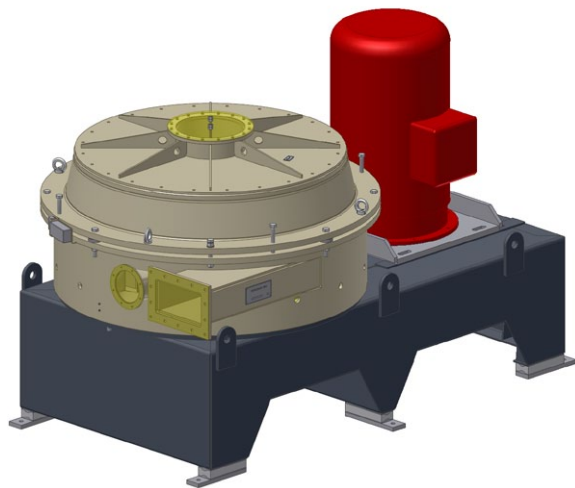


# Mechanical Process



## Whirlwind Mill

### Function

Whirlwind Mills are screenless, high-speed beater mills for pulverising and micro-pulverising. The product to be processed is fed to the mill centrally via an inlet box at the top and is precrushed by primary beater tools when reaching the top of the rotor. The beaters also accelerate the product, moving it into the milling zone, at the side of the rotor. There, the grinding stock fluidised in the air flow is comminuted by the grinding tools (rotor, stator). The stator is formed by a cover enclosing the rotor. The inside of this cover is provided with toothed grooves running vertical, i.e. crosswise to the rotation of the rotor. The outside of the rotor is covered by numerous U-shaped sections which form a deep cassette-type structure. This geometry creates extreme air whirls in the rotor's grinding zone which induce intense secondary comminution processes due to the particles crashing into each other and due to friction and shearing forces. The final particle size can be adjusted over a wide range by changing the rotor clearance, air flow and rotor speed.

### Design features

The major components of Grenzebach BSH Whirlwind Mills are the mill base, the stator (mill cover), and the rotor. They are welded constructions made of standard steel or stainless steel. The mills can also be supplied as 10 bar shock-pressure resistant units. The conical design of the mill allows the grinding rotor clearance to be infinitely varied within a range of 0.6 – 5 mm simply by raising or lowering the mill cover (by means of shims). The mill cover, which can be completely removed, allows unrestricted access to the mill inside. Standard lifting gear is used for lifting the cover and also for replacement of the grinding tools. The preassembled grinding tools (on two grinding rings with two grinding stages each) can be easily and quickly replaced without removal of the rotor. Grinding tools and tracks made of wear-resistant special cast material have proven to be reliable and successful in practical use. The lateral outlet connector is tangentially (around the rotor axis) adjustable in seven steps of 45° each (0° – 270°). The mill can thus be flexibly adapted to fit almost any plant arrangement. Part of the overall air flow required for grinding and pneumatic conveying of the product can be supplied separately downstream from the grinding gear via a patented secondary air connector. The grinding air flow can thus be optimally adjusted, independent from the conveying air flow.

### Advantages

The Whirlwind Mill demonstrates its advantages at its best in pulverising and micro-pulverising soft to medium-hard products (up to Mohs hardness 5). It achieves very fine powder grades with a narrow particle size distribution and excellent upper fines limit. For a large number of applications a Whirlwind Mill can be a cost-saving alternative to the complex and expensive systems (with sifter mills or conventional beater mills with downstream sifter) used so far. The design and construction of the mill as well as its function are basically very simple and sturdy. It allows the milling energy to be used very effectively. Grenzebach BSH Whirlwind Mills usually have 2 to 2.5 times the throughput rate of conventional mills with the same power drain. The low thermal load on the grinding stock during treatment in the Whirlwind Mill is also beneficial to many processes.

## Typical Applications

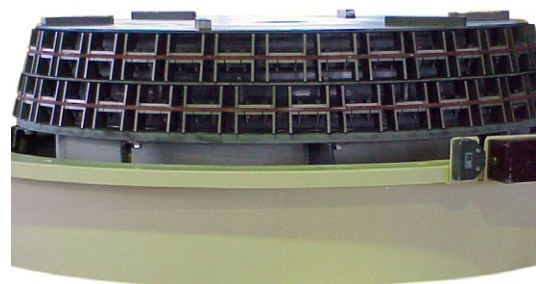
In addition to (micro) pulverisation in the < 100 µm range, the Grenzebach BSH Whirlwind Mill has proven to be very reliable and efficient in defibrating organic substances (paper, cardboard, cellulose, etc.), grinding-coating, cryogenic grinding, combined grinding / blending and grinding / drying. Below are some typical examples from various industries:

- Chemical industry: Pulverisation of organic and inorganic substances, such as dye and pigments, as well as products for pharmaceutical and cosmetic purposes. Grinding of basic materials for the production of pesticides and detergents.
- Building materials industry: Defibration of organic fibre materials, such as paper, wood and hemp, for use as filler materials and thermal insulation of residential buildings.
- Non-metallic minerals industry: Pulverisation of gypsum, lime, limestone and heavy spar. In many cases, intensive whirlwind milling with uniform fineness of the end product eliminates the need for a separate sifting system.

- Plastics industry: Pulverisation of duroplastics and thermoplastics in cold air / cryogenic processes. Production of powdery and fibrous filler materials, such as wood or powdered rock, whose uniform fineness is utilised to save plastic raw material and to improve the characteristics of the final products.
- Food processing industry: Milling of grain and legumes, such as rice, corn, peas and lentils. Pulverisation of sugar, to reduce the processing times in the production of chocolate coatings, chocolate products. Combined grinding and blending of sugar with pectin or gelatine. Pulverisation of dried potato flour, dried onions, spices ...

## Limits of Application

Grenzebach BSH Whirlwind Mills achieve throughput rates of 50 kg/h to 20,000 kg/h. They are suitable for pulverising and micro-pulverising soft to medium-hard products (up to Mohs hardness 5) with product feed temperatures up to 200°C. The maximum feed particle size depends on the respective product which is usually around 30 mm.



Type	HW 200	HW 400	HW 800	HW 1200	HW 1600
Rotor diameter (mm)	200	400	800	1,200	1,600
Drive power (kW)	7.5 – 18.5	22 – 45	55 – 90	90 – 200	132 – 250
Maximum speed (1/min)	12,000	6,600	3,000	2,000	1,400
Air flow (m <sup>3</sup> /h)	500 – 1,000	1,800 – 2,500	3,600 – 5,000	5,000 – 8,000	7,500 – 9,600
Weight without motor (kg)	450	1,100	2,500	4,000	5,500

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