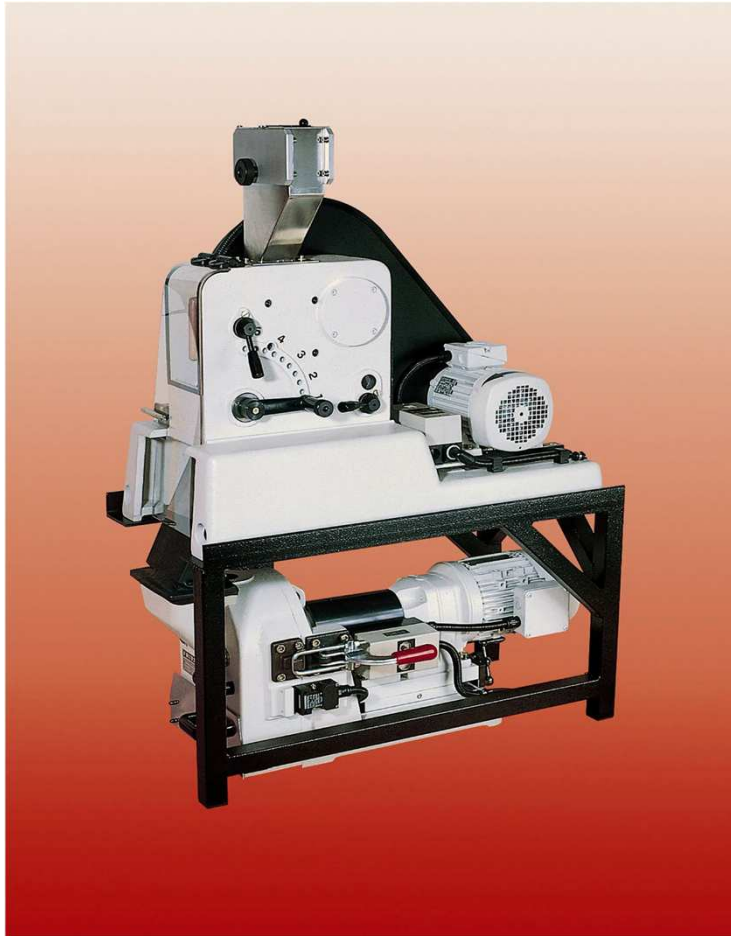
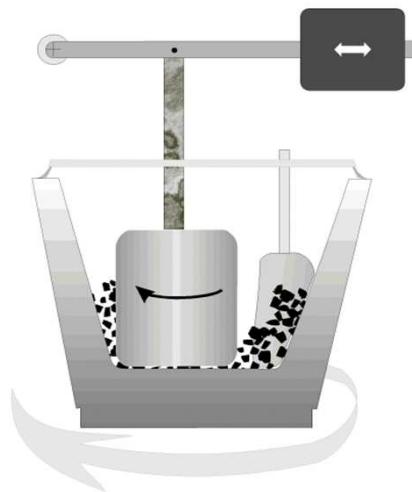


# “pulverisette 1” in combination with “pulverisette 13”



**Fine grinding from 95 mm to 0.1 mm in one working step**  
**Mounting rack and chute in combination with the Jaw Crusher „pulverisette 1“, model I + II and the Disk Mill „pulverisette 13“ makes it possible to grind 95 mm feed material down to a final product fineness of 100  $\mu$ m in a continuous single process.**

## ➤ Combined Friction and Pressure Action (i.e. Mortar Grinder)



**Mining and metallurgy:** Ores, coal, coke, ashes, slags

**Chemistry:** Fertilisers, dyes, pesticides, salts, detergents, synthetic resins, paints

**Geology and mineralogy:** Minerals (up to and including a Moh's hardness of 9), calcite's, quartz, silicates

**Glass:** Sand, frits, glass, raw materials

**Ceramics:** Porcelain, fire-clay, sintered ceramics, clay

**Agriculture:** Soil samples, fertilisers, organic plant materials

**Foodstuffs:** Confectionery, gelatine, spices, yeast, pasta, sugar

**Metallurgy:** Bauxite, slags, additives

**Pharmacy:** dragées, drugs, tablets, pastes, raw materials

**Rocks and soils:** Gypsum, lime, clinker, sand, cement

**Electrical Industry:** Graphite, semi-conductors, insulating materials

# Mortar Grinder PULVERISETTE 2



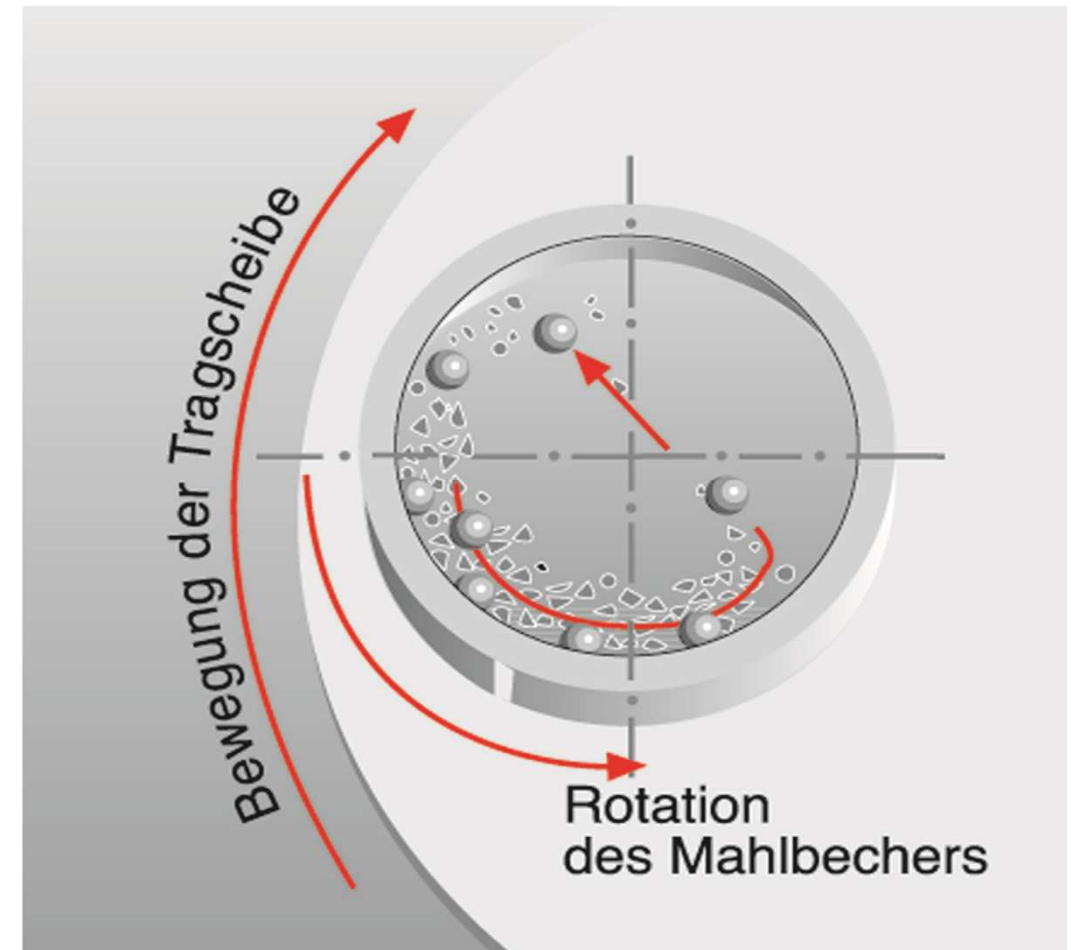
Operating principle	Pressure, friction
Max. feed size	8 mm
Max. capacity	150 ml
Final fineness	10-20 $\mu\text{m}$
Hard (abrasive)	-
Medium-hard	++
Soft	+
Brittle	++
Tough	-
Fibrous	+
Temperature-sensitive	++
Moist	++

Chemistry, pharmacy, stones and soils, bauxite, gypsum, foodstuffs

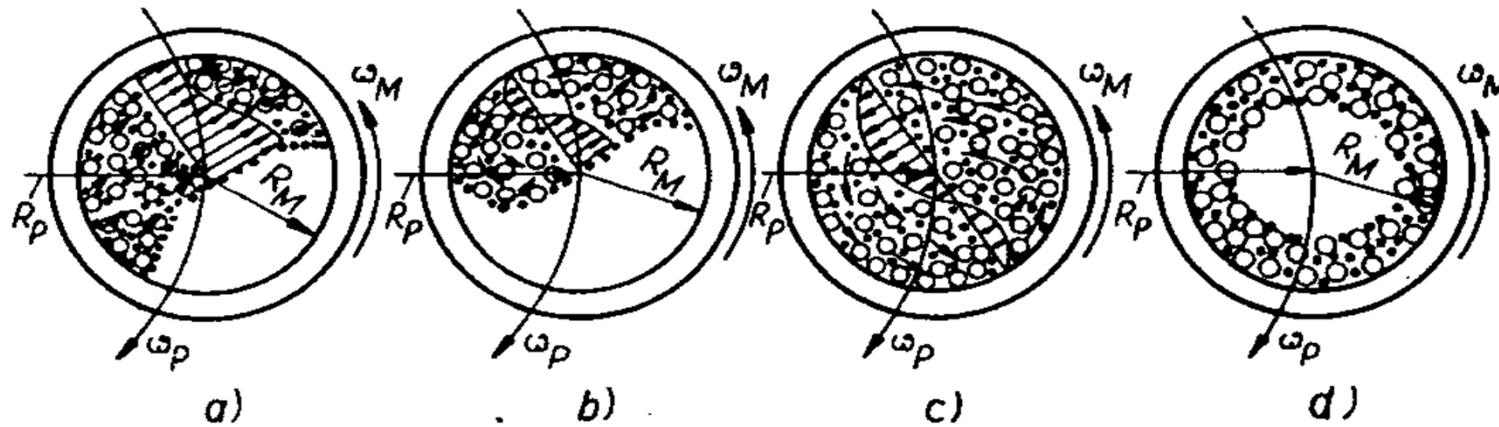
- **250W – motor**
- **Rimmed, protected mortar bowl**
- **Very robust construction**
- **Large range of grinding pressures**
- **Easy setting of scraper**
- **TÜV - Safety**

# Principle of a Planetary Ball Mill

- ① Bowl with balls and sample fixed on the sun disk
- ① Sun-disk rotates
- ① Bowls rotates likes planets around the center of the sun-disk
- ① Milling by battering and friction



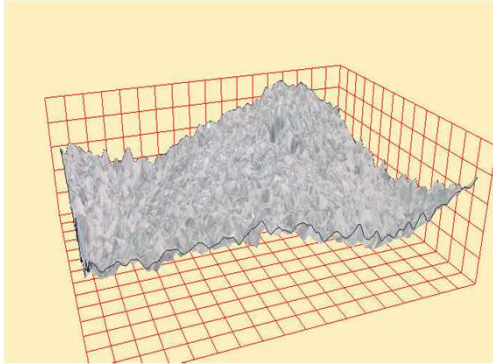
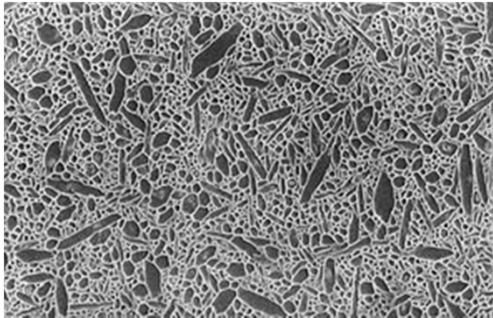
# Sample Movement in Grinding Bowl



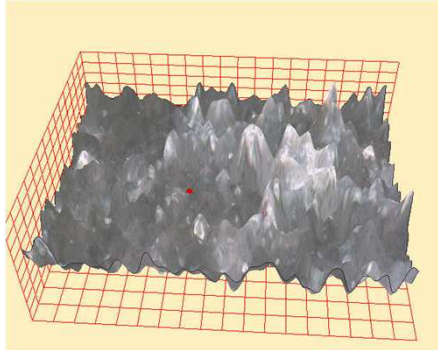
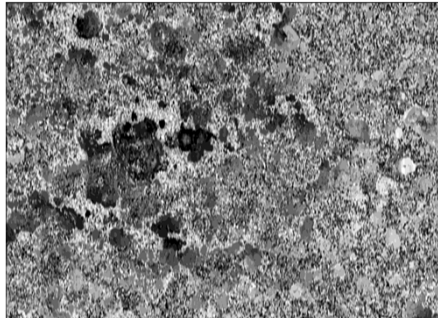
- Sliding Regime
- Throwing Regime
- Turbulence Regime
- Circle Regime

# Surface characteristics / roughness influencing the comminution

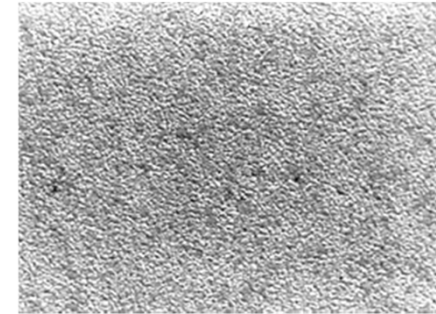
## Silicon nitride



## Aluminium oxide



## Zirconium oxide



# Planetary Mono Mill PULVERISETTE 6 *classic line*



Operating principle	Percussion
Max. feed size	10 mm
Max. capacity	1 x 225 ml
Final fineness	<1 $\mu$ m
Hard (abrasive)	++
Medium-hard	++
Soft	++
Brittle	++
Tough	+
Fibrous	+
Temperature-sensitive	+
Moist	++

Laser spectral analysis, chemistry, pharmacy, glass, ceramics, construction materials, coal, coke, mineralogy, geology, foodstuffs

- **patented planetary ball**
- **easier adjustable counter weight**
- **bench top model**
- **RS232 interface**
- **programmable interval, break time and reversing**
- **TÜV - Safety**
- **GTM-System**
- **Safe-lock**

# Planetary Ball Mill PULVERISETTE 5 *classic line*



Operating principle	Percussion
Max. feed size	10 mm
Max. capacity	4 x 225 ml
Final fineness	<1 $\mu$ m
Hard (abrasive)	++
Medium-hard	++
Soft	++
Brittle	++
Tough	+
Fibrous	+
Temperature-sensitive	+
Moist	++

Laser spectral analysis, chemistry, pharmacy, glass, ceramics, construction materials, coal, coke, mineralogy, geology, foodstuffs

- **bench top model**
- **modern design and technology**
- **digital rotation control**
- **8x80 ml volume bowls**
- **2 or 4 working stations.**
- **forced cooling**
- **high milling energy**
- **TÜV - Safety**
- **GTM-System**
- **Safe-lock**

# Planetary Micro Mill PULVERISETTE 7 *classic line*



Operating principle	Percussion
Max. feed size	5 mm
Max. capacity	2 x 20 ml
Final fineness	<1 $\mu$ m
Hard (abrasive)	++
Medium-hard	++
Soft	+
Brittle	++
Tough	-
Fibrous	+
Temperature-sensitive	+
Moist	++

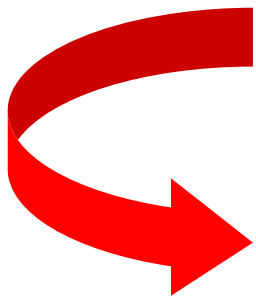
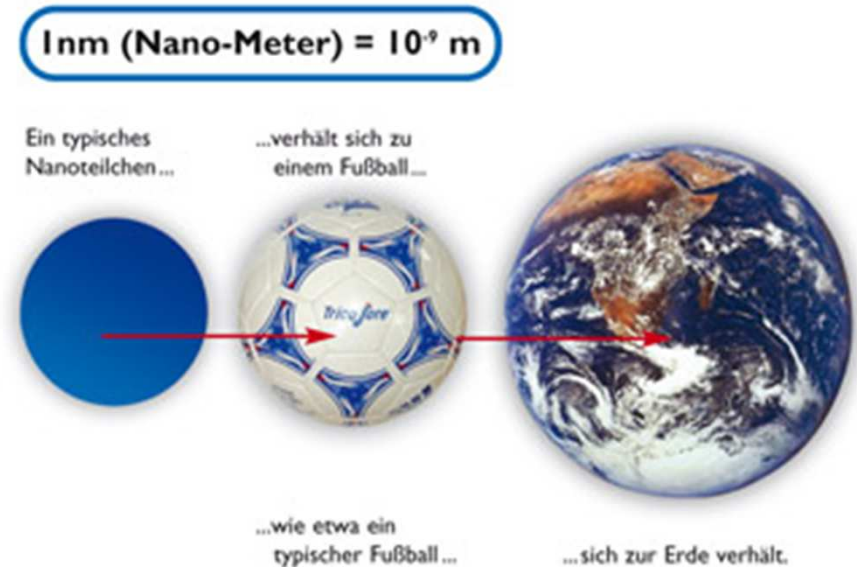
Chromatography, X-ray spectral analysis, biology,  
pharmacology, galenics, nuclear research, technical science

# Nano particles

"What do we actually mean by this?"



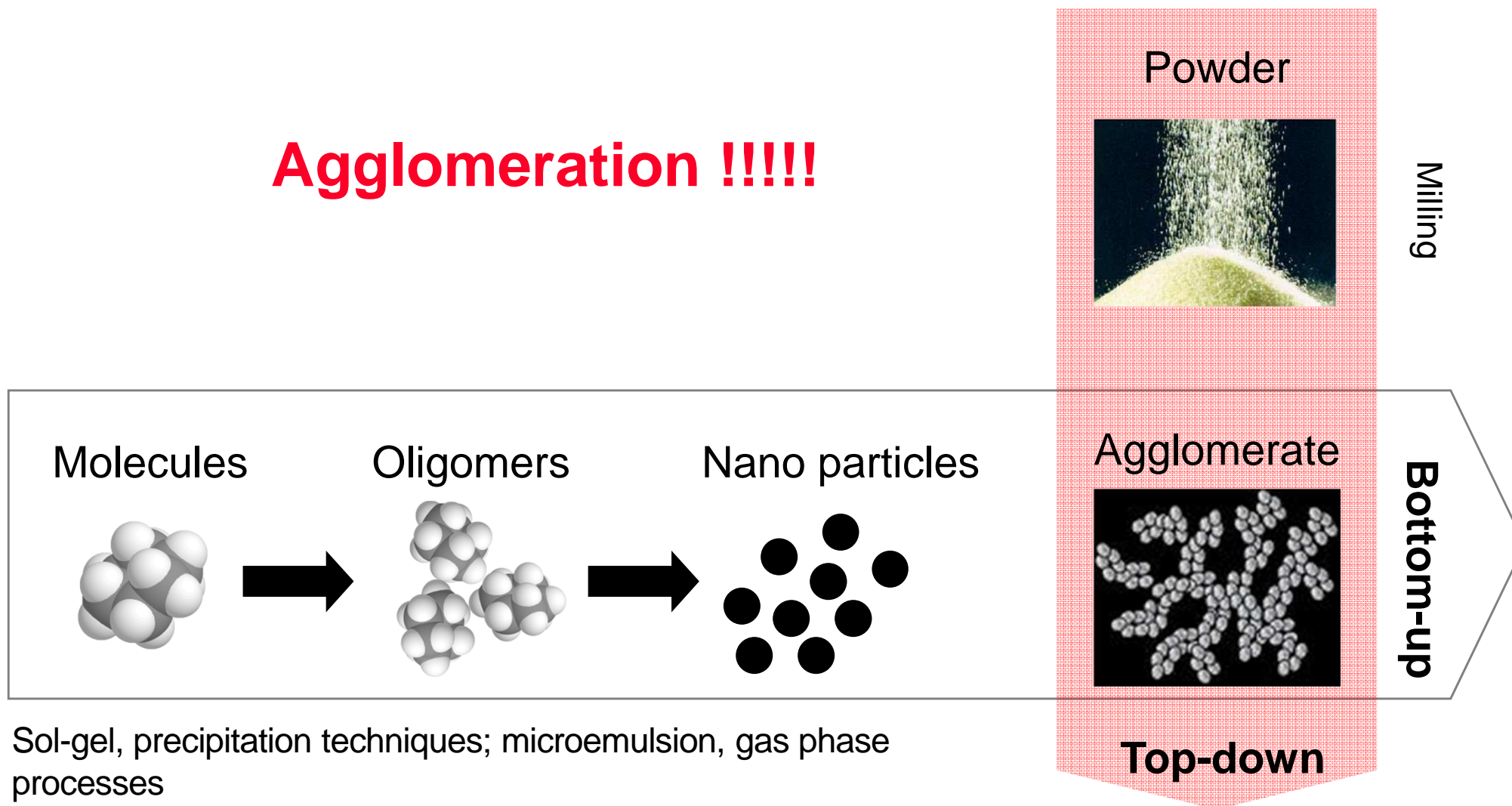
## And what are the benefits?



- ⊙ Improved catalytic properties with hot surfaces
- ⊙ Immense boundary surfaces in plastics and paints
- ⊙ Photocatalytic properties

"Frequently a problem"

# Agglomeration !!!!!



## New conception



- **FRITSCH**
- **PREMIUM LINE**
- **Bowls embedded IN**
- **the sun-disk**



# Bowls embedded

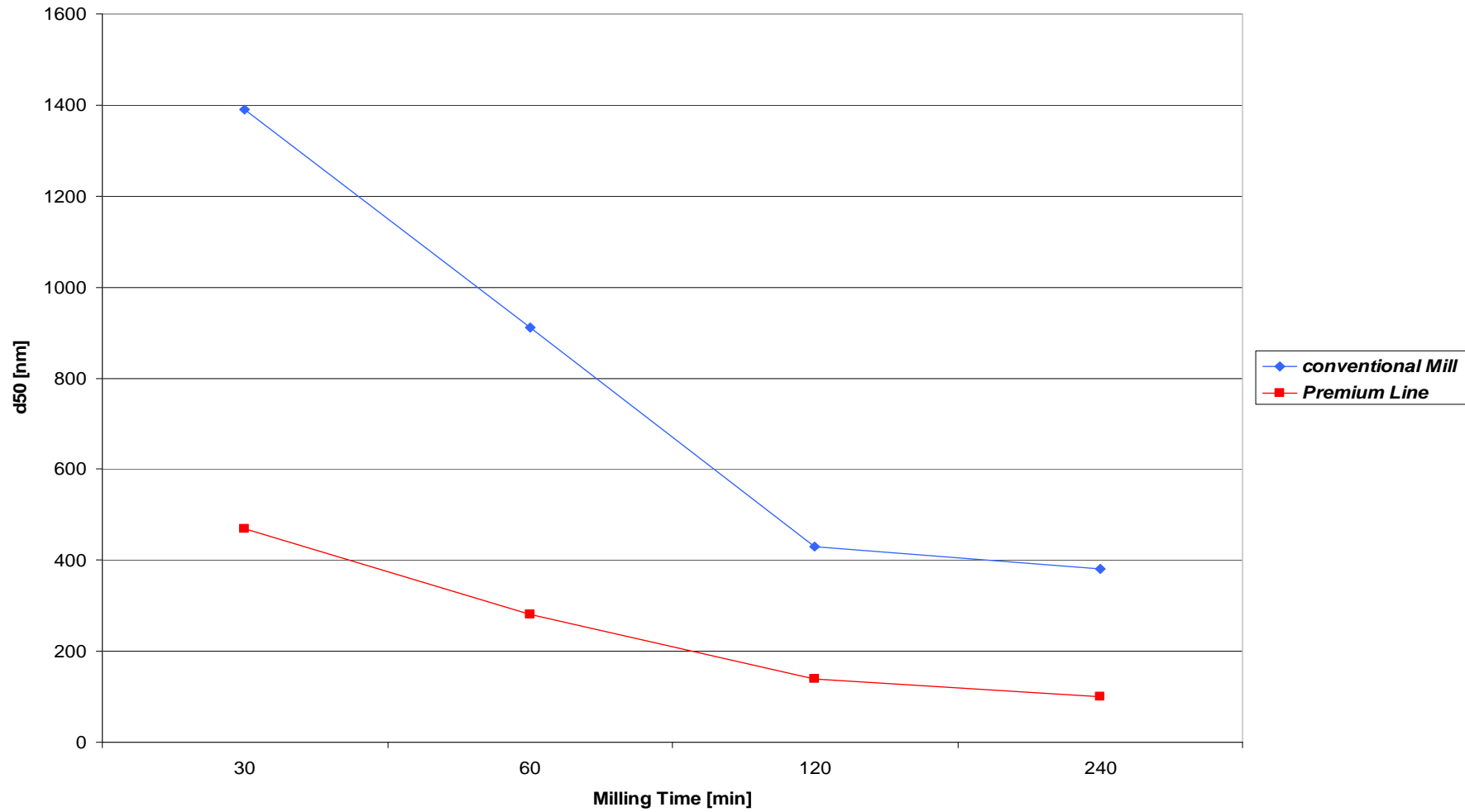


# Faster



- Maximum speed up to 1100 rpm
- 150% more energy than conventional mill
- Much faster result down to nano size range

# Faster





- Exchange of bowls with just two steps: SelfLOCK
- Automatic positioning of bowls
- Cover can be removed for cleaning
- Automatic closing

- ① RFID-Chip detects grinding bowl material – sets proper rotation-speed
- ① Storage of SOP – secured by passwords
- ① Validation of the process by computer interfaces: USB, Bluetooth, Ethernet
- ① Ergonomic Touchscreen with different languages
- ① Parameter check prevents mistakes