# liquid nitrogen cooled planetary ball mill for ultra-low temperature grinding

Liquid Nitrogen Cooled Planetary Ball Mill is a special kind of grinding ball mill, which is designed to load the ball milling jars under the environment with heat preservation cover, and continuously input liquid nitrogen gas into the grinding space to absorb the heat generated by the high-speed rotation of the ball milling jars, so as to make the ball milling jars loaded with materials and balls always remain in a certain low-temperature environment.


## Liquid Nitrogen Cooled Planetary Ball Mill

The liquid nitrogen cooled planetary ball mill is an essential equipment for fine powder grinding, mixing, small sample preparation, new product development, and small batch production of high-tech materials. Its compact size, comprehensive functionality, high efficiency, and low noise make it ideal for research centers, universities, and enterprise laboratories. Four samples can be obtained simultaneously per grinding cycle, and powder samples can also be prepared in a vacuum environment when equipped with a vacuum milling tank.

## Features

1. Ultra-low temperature liquid nitrogen supply to the inner chamber, temperature adjustable from -60°C to -1°C.
2. Automatic temperature control using a liquid level controller to optimize liquid nitrogen consumption.
3. Compatible with traditional vertical and 360-degree rotary planetary ball mills.
4. Stores 3 modes and 15 solutions.
5. Power failure protection with memory self-start function.
6. Insulated cavity for continuous low-temperature maintenance and efficient cold air recovery, reducing operating costs.
7. Oil seal mute technology: gears and bearings sealed in an airtight box with lubricant, reducing gear noise by over 50% and doubling service life.
8. PLC frequency conversion control for time, speed, and direction (forward/reverse) settings.
9. V-type card holder for secure jar fixation and operator safety.
10. Precision gear transmission.
11. Supports 2 or 4 grinding jars simultaneously.
12. Capable of dry, wet, vacuum, and vacuum atmosphere protection grinding.
13. Universal support feet and wheels for stability and easy movement.

14. Intelligent safety switch: door can be opened only when the ball mill is stopped, preventing jar ejection and protecting safety.
15. Grinding effect can reach 0.1 micron.
16. Certified with CE certificate.
17. Total timing range: 1 to 9999 minutes.
18. Intermittent timing range: 1 to 9999 minutes.
19. Continuous operation up to 72 hours.

## Application Needs Solved

- Ultra-fine grinding or mixing experiments requiring ultra-low temperatures.
- Processing temperature-sensitive samples at -60°C to -1°C.
- Grinding materials in medicine, biology, aviation, and other fields requiring ultra-low temperature environments.

## Working Principle

The grinding jar is mounted eccentrically on the sun wheel of the planetary ball mill. The sun wheel and the grinding jar rotate in opposite directions at a ratio of 1:2, causing the grinding balls inside to undergo superimposed rotational motion (Coriolis force). This interaction between friction and impact forces generates high kinetic energy, resulting in efficient material size reduction. Ultra-low temperature liquid nitrogen is continuously supplied to the inner chamber, maintaining the samples at ultra-low temperatures throughout the grinding process.

## Application Areas

1. Agriculture: plant material, seeds, soil, tobacco, wood fiber
2. Biological: bones, hair, tissue, paper ceramics, glass ceramic oxides, clay minerals, glass, hydroxyapatite, china clay, quartz sand, electronic ceramics, structural ceramics, piezoelectric ceramics, nano-materials, capacitors, MLCC, thermistors (PTC, NTC), ZnO varistors, dielectric ceramics, alumina ceramics, zirconium oxide ceramics, phosphor, zinc oxide powders, cobalt oxide powders, Ni-Zn ferrite, Mn-Zn ferrite, chemicals, plastics, carbon fiber, catalysts, cellulose, pigments, paints, polymers
3. Building materials: soap clay, cement slag, polymers, gypsum, sand, stone
4. Environmental research: mixtures, electronic debris, sludge, waste
5. Minerals, metallurgy, and metals: alloys, coal, coke, iron ore, metal oxides, quartz, sub-precious stones, slag, magnetic materials, lithium cobaltate, lithium manganese, catalysts, phosphor, long afterglow luminescent powders, rare-earth polishing powders, electronic glass powders, fuel cells, zinc oxide piezoelectric resistors

## Grinding Jars and Balls

- Grinding jars: refined mold or high-precision polishing, smooth inner/outer walls, large R angle bottom to prevent material sinking, ergonomic grip for safety and convenience.
- Jar materials: zirconia, silicon oxide, agate, carbide, stainless steel, high chrome steel, nylon, polyurethane, polypropylene (pp), PTFE, aluminum oxide, etc.
- Jar volumes: 0.1L, 0.25L, 0.5L, 1L, 1.5L, 2L, 2.5L, 3L, 4L, 5L, 10L, 15L, 20L, 25L, etc.

- Grinding balls: zirconia, high chrome steel, stainless steel, corundum, polyurethane, alumina, onyx, tungsten carbide.
- Grinding balls typically match jar material; sizes range from 2mm to 50mm. Recommended to use 3-4 different sizes in mixed proportions.

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| Model | PM1LN | PM2LN | PM4LN | PM8LN | PM12LN | PM20LN |
|---|---|---|---|---|---|---|
| Grinding jar capacity | 50 to 250ml | 50 to 500ml | 50 to 1000ml | 500 to 2000ml | 1000 to 3000ml | 1000 to 5000ml |
| Vacuum jar capacity | 50 to 100ml | 50 to 250ml | 50 to 500ml | 500 to 2000ml | 1000 to 3000ml | 1000 to 5000ml |
| Revolution speed | 5 to 450rpm | 5 to 400rpm | 5 to 400rpm | 5 to 320rpm | 5 to 320rpm | 5 to 230rpm |
| Rotation speed | 10 to 900rpm | 10 to 800rpm | 10 to 800rpm | 10 to 640rpm | 10 to 640rpm | 10 to 460rpm |
| Power | 0.55kw | 0.75kw | 0.75kw | 0.75kw | 1.5kw | 3kw |
| Power supply | 220Vac, 50Hz | 220Vac, 50Hz | 220Vac, 50Hz | 220,380Vac, 50Hz | 380Vac, 50Hz | 380Vac, 50Hz |

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|---|---|---|---|---|---|---|
| Control temperature | -60°C to -1°C | | | | | |
| Liquid nitrogen tank | Automatic boost 30L | | | Automatic boost 50L | | |