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Vertical Planetary Ball Mill Introduction

1.Vertical Planetary Ball Mill Introduction

The Vertical Planetary Ball Mill is an essential piece of equipment for mixing, fine grinding, sample preparation, new product development, and small-batch production of high-tech materials.
The SISCO Vertical Planetary Ball Mill features a compact design, versatile functions, high efficiency, and low noise. It is well suited for research institutes, universities, and corporate laboratories for preparing research samples. Up to four samples can be processed simultaneously in a single experiment.
When equipped with vacuum ball milling jars, the mill can also be used to grind samples under vacuum conditions, providing greater flexibility for specialized material preparation and research applications.

2.Vertical Planetary Ball Mill Structure Schematic Diagram

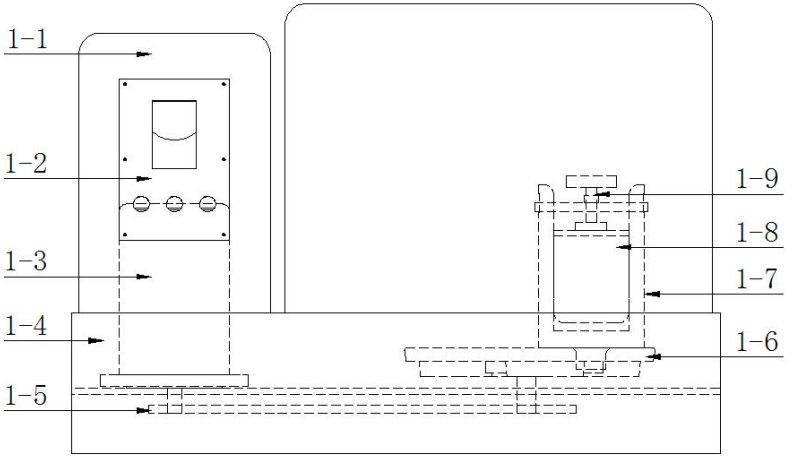

Figure 1. Schematic Diagram of the Vertical Square Planetary Ball Mill Structure

1-1.Control Box；1-2.Control Panel；1-3.Motor；1-4.Machine Frame； 1-5.Drive Belt；1-6.Planetary Mechanism；1-7.Grinding Jar Holder；1-8.Grinding Jar；1-9.Grinding Jar Clamping Device

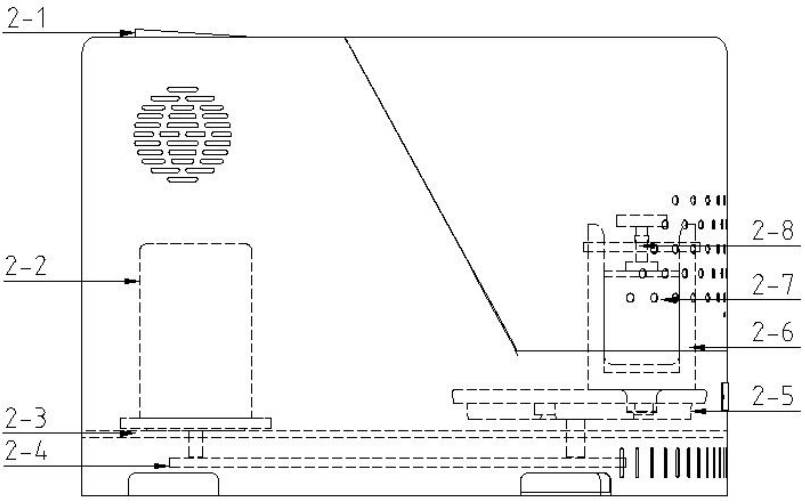

Figure 2. Schematic Diagram of the Vertical Semicircular Planetary Ball Mill Structure

2-1.Control Panel； 2-2.Motor； 2-3.Machine Frame； 2-4.Drive Belt；
2-5.Planetary Mechanism；2-6.Grinding Jar Holder；
2-7. Grinding Jar； 2-8. Grinding Jar Clamping Device；

Note: The above structural diagrams are for reference only. The structure and component locations may vary depending on the specific model.

2.3 Main technical Parameters of Vertical Planetary Ball Mill

Table 1 Main Technical Parameters of Vertical Square Planetary Ball Mill

Model	Power Supply	Rated Power （KW）	Jar Rotation Speed (rpm)	Total Running Time (min)
XQM-2	220V/50Hz	0.75	70-670	1-9999
XQM-4	220V/50Hz	0.75	70-670	
XQM-6	220V/50Hz	0.75	70-670	

XQM-8	220V/50Hz	1.5	70-580	1-9999
XQM-10	220V/50Hz	1.5	70-580	
XQM-12	220V/50Hz	1.5	70-580	
XQM-20	380V/50Hz	4.0	50-430	
XQM-40	380V/50Hz	5.5	40-390	
XQM-60	380V/50Hz	7.5	40-260	
XQM-80	380V/50Hz	11	40-240	
XQM-100	380V/50Hz	11	40-240	
XQM-200	380V/50Hz	18.5	30-190	

Table 2. Vertical Semicircular Planetary Ball Mill Specifications

Model	Power Supply	Rated Power（KW）	Jar Rotation Speed(rpm)	Total Running Time (min)
XQM-0.2A	220V/50Hz	0.09	120-1160	1-9999
XQM-0.2S	220V/50Hz	0.09	120-1160	
XQM-0.4A	220V/50Hz	0.25	90-870	
XQM-2A	220V/50Hz	0.75	70-670	
XQM-4A	220V/50Hz	0.75	70-670	
XQM-8A	220V/50Hz	1.5	70-580	
XQM-10A	220V/50Hz	1.5	70-580	
XQM-12A	220V/50Hz	1.5	70-580	
XQM-16A	380V/50Hz	3.0	60-510	

4.Operating Procedures

Check → (Accessory Check, Power-on Trial Check) → Ball & Material Loading → Filling Jars → Power-on Standby → Set Inverter Parameters → Grinding → Shutdown → Unloading Jars → Discharging → Cleaning Equipment

4.1 Inspection

4.1.1 Accessories & Housing Inspection

After unpacking, first check the packing list to verify that all accessories are complete, and inspect the equipment housing for any damage sustained during transportation. If any accessories are missing or the housing is damaged, contact the person listed on the packing list immediately. Once everything is confirmed to be in normal condition, sign the receipt to confirm acceptance, then connect the power supply as required and perform a no-load trial run of the ball mill.

4.1.2No-Load Trial Run

Depending on the equipment model and the user's application requirements, our company equips the system with three types of control systems: inverter type, microcomputer touchscreen type, and microcomputer push-button type.

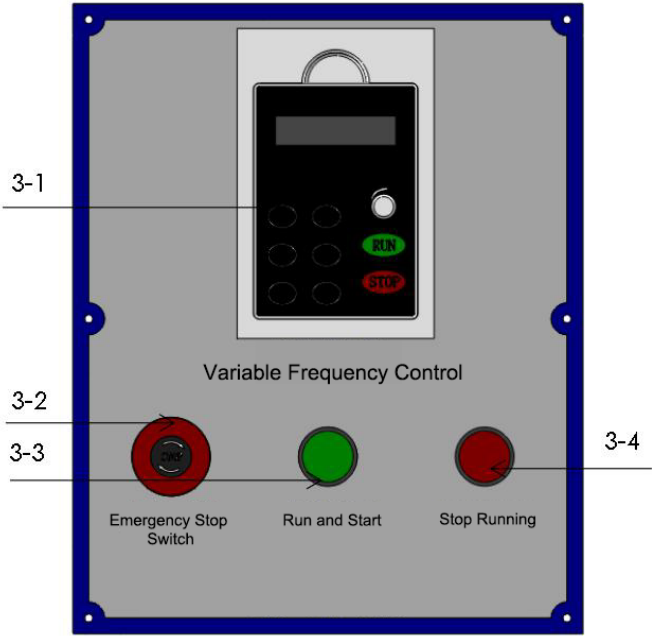

Figure 3: Schematic Diagram of the Inverter Control Panel for the Vertical Planetary Ball Mill

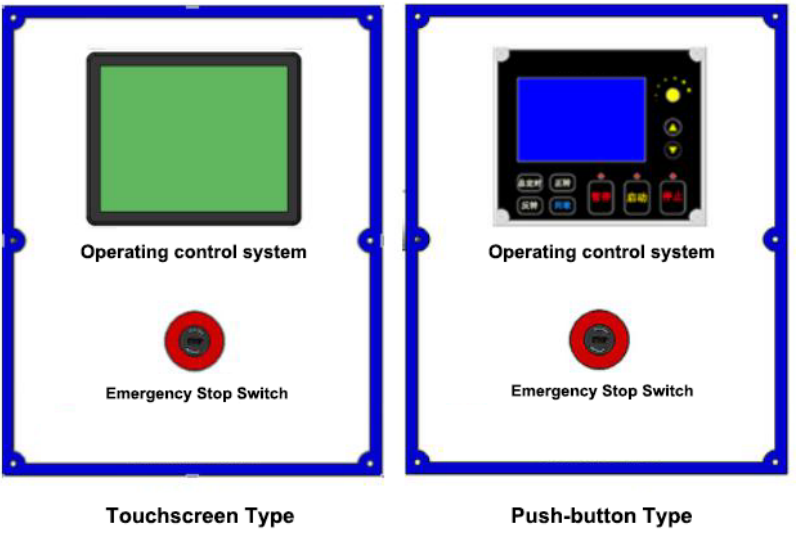

Figure 4. Schematic Diagram of the Microcomputer Control Panel

of the Vertical Planetary Ball Mill

3-1.Variable Frequency Drive (default speed display)

3-2.Emergency Stop Switch

3-3.Start Button

3-4.Stop Button

No-Load Test Operation:

① Add lubricating oil according to Table 10 in the Maintenance section. Connect the power supply, turn on the air switch, and check whether the fan operates normally.

② Turn the speed control knob on the variable frequency drive (3-1) fully counterclockwise.

③ Release the Emergency Stop Switch (3-2). The switch is used to disconnect the power supply in an emergency. Pressing the switch disconnects the power; rotating it clockwise releases the switch and enables operation. Check whether the variable frequency drive (3-1) displays numbers. If there is no display, check the power connection. If numbers are displayed, proceed to the next step.

④ Press the Start Button (3-3) to start the equipment. Check that the speed display on the variable frequency drive (3-1) is zero. Slowly turn the speed control knob clockwise to increase the speed to 1/2 of the rated maximum speed, and run the equipment for 5 minutes.

⑤ If no abnormal conditions are found, turn the speed control knob on the variable frequency drive (3-1) back to zero and press the Stop Button (3-4). After the equipment has come to a complete stop, disconnect the power supply.

Note: Some models in the Vertical Planetary Ball Mill series are not equipped with an air switch. The air switch, if provided, is located near the equipment power connection.

4.2 Ball Loading and Material Charging

Figure 5. Actual View of the Grinding Jar Holder and Clamping Device of the Vertical Planetary Ball Mill

5-1.Clamping Rod；5-2.Locknut；5-3.Crossbeam；5-4.Grinding Jar；5-5.Grinding Jar Holder；

For optimal ball milling performance, large, medium, and small grinding balls are generally used in combination. Large balls provide weight, crush the material, and disperse the smaller balls, while small balls are mainly used for mixing and grinding. Under normal conditions, the ball-to-material ratio should be approximately 1:1. The total volume of the grinding balls and material should be at least 1/3 and no more than 2/3 of the total volume of the grinding jar (5-4).
Feed particle size: ≤10 mm for brittle materials; ≤3 mm for other materials.

Note: To prevent grinding balls and material from falling into the interior of the equipment and causing wear to the gears and bearings, first load the grinding balls and material into the grinding jar (5-4), and then install the loaded grinding jar into the grinding jar holder (5-5). Do not install an empty jar first and then add the grinding balls and material.

4.3 Grinding Jar Installation

Installation Steps:

① Place a rubber pad at the bottom of the grinding jar holder (5-5).

② Place the grinding jar (5-4), loaded with grinding balls and material, into the grinding jar holder (5-5).

③ Insert the crossbeam of the grinding jar clamping device (5-3) into the corresponding position of the grinding jar holder (5-5).

④ Tighten the clamping rod (5-1) to secure the grinding jar (5-4) in the grinding jar holder (5-5).

⑤ Finally, tighten the locknut (5-2) to ensure that the entire clamping assembly is securely tightened.

Notes:

① The grinding jars (5-4) must be installed symmetrically. Do not operate the equipment with only one or three grinding jars installed. The total weights of the two symmetrically positioned grinding jars, including the jar, grinding balls, and material, should be kept as consistent as possible.

② The center of the bottom of each grinding jar (5-4) should be aligned as closely as possible with the center of the grinding jar holder (5-5).

③ Ensure sufficient tightening force when tightening the clamping rod (5-1) and locknut (5-2).

④ The vacuum grinding jar and lid use a flat seal with an O-ring vacuum seal and are secured by pressing with the clamping rod (5-1). The lid is equipped with a gas extraction tube. Turn the valve counterclockwise to open it and clockwise to close it. A vacuum pump can be used to evacuate the air from the grinding jar or to fill it with inert gas for protection.

4.4 Power-On Standby

Connect the equipment to the power supply and turn on the air switch (for models equipped with an air switch). Check that the Emergency Stop Switch (3-2) is released (rotated clockwise and in the raised position) and that the Variable Frequency Drive (3-1) displays numbers. The equipment is then in power-on standby mode.

4.5 Variable Frequency Drive Parameter Settings

For details, refer to the Variable Frequency Drive Operating Instructions. For operation of the microcomputer button-type control panel, refer to the TCA-I Intelligent Controller Manual. For operation of the microcomputer touchscreen control panel, refer to the Microcomputer Touchscreen Operation Manual.

4.6 Grinding

After setting the functional parameters of the variable frequency drive, close the machine cover securely. Press the Start Button (3-3) to start the equipment, then slowly turn the speed control knob on the Variable Frequency Drive (3-1) to adjust the speed to the preset value and begin grinding.

Notes:

① After the equipment has been running at high speed for 3 minutes, open the machine cover and check whether the grinding jar clamping device is loose. If it is loose, retighten it. If there is no looseness, adjust the speed back to the required operating speed.

② The speed displayed on the Variable Frequency Drive indicates the rotation speed of the grinding jars and their actual operating speed.

③ A higher speed does not necessarily result in better grinding performance. Excessively high speeds will accelerate the wear of mechanical components and shorten the service life of the equipment. Users are advised to select the lowest grinding speed that meets the actual material requirements.

④ During operation, users must regularly inspect the equipment. If any abnormal operating condition is detected, stop the equipment immediately for inspection.

4.7 Shutdown

After the equipment has operated for the preset time, turn the speed control knob on the Variable Frequency Drive (3-1) back to zero. Press the Stop Button (3-4). After the equipment has come to a complete stop, disconnect the power supply.

Note: After the speed control knob on the Variable Frequency Drive has been turned to zero, the equipment remains in power-on standby mode. The power supply should be disconnected only after the equipment has completely stopped.

4.8 Grinding Jar Removal

① Open the machine cover.

② Loosen the locknut (5-2).

③ Loosen the clamping rod (5-1).

④ Remove the clamping device.

⑤ Remove the grinding jar (5-4).

Note: For medium- and large-sized planetary ball mills, the grinding jars are relatively heavy, making manual installation and removal inconvenient. A corresponding loading and unloading lifting device for planetary ball mills can be purchased as an optional accessory according to requirements.

4.9 Material Removal

Pour the material and grinding balls from the grinding jar into a ball-and-material separator (optional) for separation.

4.10 Equipment Cleaning

Clean the grinding jars and grinding balls thoroughly and keep them dry for future use. Then wipe the equipment clean from the inside out with a clean cloth.