

**SFM-1 (QM - 3SP2)**  
**High Speed Shimmy Ball Mill**  
**Operational Manual**

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***Please read the manual carefully before using this machine!***

## 1. Purpose

QM series planetary ball mills could grind or mix solid particles of different granularities and materials, suspension and paste with dry and wet methods. If a vacuum ball milling tank is used, it will be possible to grind and mix samples in vacuum or inert gases. In addition, this series of ball mills is widely applied to the fields such as geology, metallurgy, soil, building materials, chemical industry, light industry, medicine, electronics, porcelain, battery and environmental protection and so on.

Along with the high-speed development of science and technologies, and the wide application of nano materials, the mechanical alloying (MA) discovered in 1980s endows QM series planetary ball mills with new missions. The basic process of mechanical alloying is that the powder and particles of several kinds of metallic and non-metallic elements are repeatedly mixed, crashed and cold welded in ball mill, gradually refined to nano level in the process of ball milling, and form a nucleus of alloy phase in solid state, which has made some substances difficult to realize alloying with traditional melting process actually materialize alloying in the process of milling, and made many units using the ball mills manufactured by our plant realize many kinds of alloy powder, such as nano crystalline hard alloy, Nd<sub>60</sub>Fe<sub>20</sub>Al<sub>10</sub>CO<sub>10</sub> non-crystalline alloy powder, and Al<sub>2</sub>O<sub>3</sub>/Al compound powder and so on.

## 2. Operational Principle

QM series planetary ball mill has four ball milling tanks on a big tray, and when this big tray circumsolve (revolution), it will drive ball milling tanks to circumsolve (rotation) surrounding its rotor axis to form epicyclic motion. The drive ratio of revolution and rotation is 1:2 (one circle of revolution will make two circles of rotation). As for the functions of epicyclic motion, the milling ball and milling materials inside the tanks impact with each other under the functions of eccentricity, and break up, grind and mix testing samples.

## 3. Characteristics

- A. QM-3SP2 gear drive planetary is manufactured with self-lubricating reinforced engineering plastics by our plant, which ensures mechanical strength and reduces noises at the same time. This product is a patented product of our plant with a patent number of ZL022202595.
- B. Interval operation function: To prevent the property and quality of milling materials from being affected by overheating generated by ball milling, this machine could automatically control the time of each state as per the circulating mode of “operation – shutdown – re-operation”.

## 4. Technical Parameters

Model: QM – 3SP2

Matchable ball milling tank:

Capacity (capacity of single tank, unit: ml): 50, 100, 250, 400, 500

Material: Stainless steel, agate, nylon, polyurethane, polytetrafluoroethylene, hard alloy (YG8)

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and porcelain and so on.

Type: Ordinary tank, stainless steel vacuum tank, stainless steel vacuum cover (used together with ball milling tanks of agate, nylon and porcelain etc. for pumping vacuum). The capacity of vacuum ball milling tanks is not over 250ml.

Maximum charge of ball milling tank: three fourths of the cubage of the tank (including milling ball).

Granularity of materials fed: Soft materials  $\leq 10$  mm; other materials  $\leq 3$  mm.

Granularity of materials reclaimed: The minimum could be up to 0.1  $\mu$ m.

Rated rotating speed: Revolution (big tray) 290 turns / min  $\pm 10\%$ ; rotation (ball milling tank): 580 rotations /min  $\pm 10\%$ .

Operational mode: Ball mill is controlled with frequency converter, and has five operational modes in total:

1. Unilateral operation with shutdown at non-fixed time;
2. Unilateral operation with shutdown at fixed time;
3. Positive and negative alternate operation with shutdown at fixed time;
4. Unilateral interval operation with shutdown at fixed time;
5. Positive and negative alternate interval operation with shutdown at fixed time;

Mode of speed control: Frequency converter: 0~50Hz; resolution: 1 Hz; and limited speed of this machine: 0~45Hz.

Control method: 0~42Hz (0~530 turns / min): make manual adjustments at any time, 0.1~100h operation at fixed time, 0.1~50h positive and negative revolution at fixed time, 0.1~100h interval operation at fixed time, and 0~100 times of restarting operation.

Model of electrical machinery: Y802—4  
revolutions / min.

External size of ball mill: 750 X 460 X 590 mm.

Net weight of ball mill: 130KG.

## 5. Structure Sketch

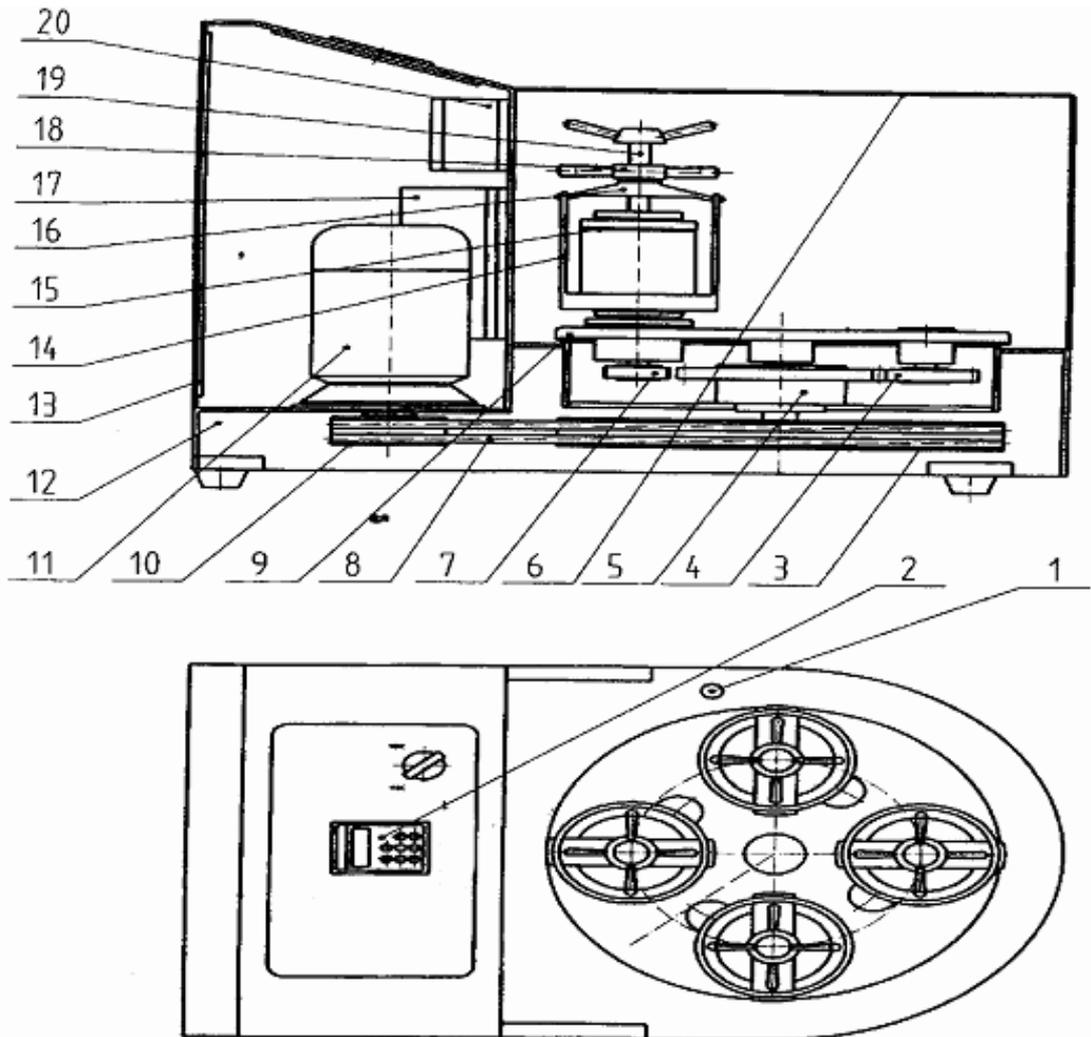


Figure 1

1. Safety switch	13. Back cover
2. Control box	14. Puller cover
3. Big pulley	15. Ball milling tank
4. Transient gear	16. Beam
5. Fixed gear	17. Frequency converter
6. Protection cover	18. Locking screw
7. Planetary gear	19. Pressure screw
8. V-belt	20. Exhaust fan
9. Big tray	QM-3SP2 Planetary Ball Mill
10. Small pulley	Turn on/ off
11. Motor	
12. Machine foundation	

Please see figure 2 for structure theory.

**Gear Drive Planetary Gear Train**

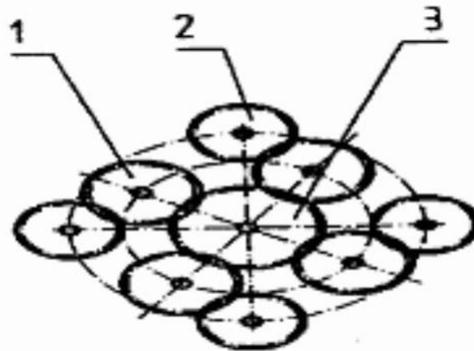


Figure 2

1. Transient gear	3. Fixed gear
2. Planetary gear	

## 6. Operational Procedures

### 7.1. Examination

After tearing open the container, check if the machine is lacked of some accessories according to packing list, and if the ball mill, power pack and ball milling tank are damaged in transportation.

### 7.2. Reading

Read the User's Manual carefully, carry out non-load test running of the ball mill as per the steps described in the Manual, and check if the operation of frequency converter and ball mill is normal.

### 7.3 Loading Tank

It's possible to load tank if the above items are checked and proved qualified.

- a. Loading milling tank: To enhance the efficiency of ball milling, milling balls of different sizes are loaded into the tank, with big balls for breaking up coarse milling materials, and small ones for milling and grinding such materials to make them reach required fineness.

In the following table are number of balls equipped for ball milling tanks of various specifications (only for reference).

Cubage of Tank (ml)		50	100	150	250	300	400	500
Ball (Piece)	Φ 6	50	100	150	250	280	320	400
	Φ 10	8	16	24	40	48	80	100
	Φ 20				2	3	6	8

Note: The optimal numbers of balls equipped are the experience data obtained by users from practice according to the nature of milling materials and the required fineness.

b. Loading milling materials:

Requirements on granularity of milling materials before ball milling: The granularity of short materials shall be no bigger than 10mm, and that of the other materials shall be less than 3mm generally. The loading of materials shall be no higher than three fourths of the cubage of the tank (including milling balls).

**7.4. Loading Ball Milling Tank**

Immediately after loading of tank, we could install ball milling tanks inside the puller cover of ball mill. It is possible to install 4 ball milling tanks at the same time, or install 2 ball milling tanks symmetrically, and it's forbidden to install only 1 or 3 ball milling tanks. After installation, make use of two force-applying bushing (accessory of this machine) to tighten V-type bolt and lock nut in succession to prevent milling tanks from loosening in the process of ball milling.

**Note:** It's forbidden to knock at bolts and nuts with hammer when tightening them.

After loading of ball milling tanks, put on the protection cover and turn on the safety switch to make the ball mill operate normally. If any unexpected accident occurs in the process of ball milling, the protection cover will loosen or fall off, the safety switch will be off, and the ball mill will stop running immediately. In such conditions, it's necessary to eliminate accidents first, put on the protection cover again, and then restart up the machine.

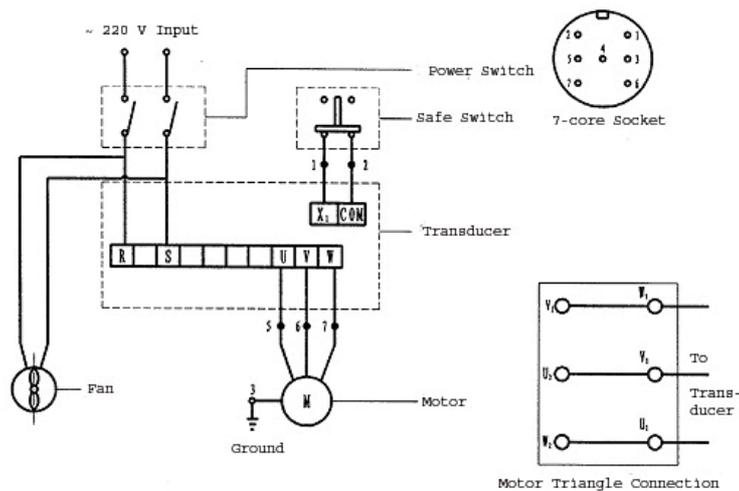
After completion of ball milling, loosen the lock nut and V-type bolt with force-applying bushing successively, and pour the testing samples and milling balls into the sieve (accessory of this machine) at the same time to make balls separate from milling materials.

Before ball milling over again, please check if the puller cover is loosened first, if it is, it's a must to tighten the screws to avoid any accident.

Attention shall be paid to the unloading of ball milling tank. Due to the mutual impact between milling balls and between milling balls and ball milling tank in the process of ball milling, the temperature and pressure inside the tank after long-time ball milling will be very high. So, it's necessary to cool down the ball milling tank before unloading it after completion of ball milling, so as to prevent milling powder from being blown out by high pressure. Some metal powder has ultrafine granularity after ball milling, and inside the tank is nearly vacuum state. In such conditions, if the tank cover is opened abruptly and the milling materials are poured out, such materials will be oxidized drastically and combusted. Therefore, after ball milling of active metal powder, it's a must to open the tank slowly after sufficient cooling, pause for a moment, and then pour out the milling materials. And reclaiming materials inside vacuum glove box will exert better effects.

## 7. Power Setting

1. Motor selected: Y802 220V. Please see the wiring diagram of electrical appliance as shown in figure 3 for details. The wiring of this machine has already been conducted before it leaves the factory, so it shall not be changed at random.



**Figure 3: Wiring Diagram of Electrical Appliance**

2. Transmission system: speed regulation by frequency variation is adopted with the scope of frequency variation between 0~45Hz.
3. Rated rotating speed: Revolution 0~290 turns / min; rotation: 0~580 turns / min; corresponding frequency: 0~45Hz. The frequency converter displays the speed of rotation.

## 8. Description of Frequency Converter

### 9.1. Technical Indexes of Frequency Converter

9.1.1. Model: LB60G-2S0007BER;

9.1.3. Output: Voltage 0~240V, frequency 0~50Hz, rated current 4.5A, power 0.75KW, allowed overload 150% per minute;

9.1.4. Indication: Frequency, rotating direction, rotating speed, voltage, current (digital display), abnormal indication (character indication), state display (light emitting diode red display);

9.1.5. Requirements on ambient environment: The indoor altitude of the use place shall be below 1000 meters and free of corrosive gases, dust and direct sun shining; ambient temperature: -10 – 40°C; humidity: 20 – 90% (without phenomenon of water bead coagulation); vibration: below 0.6G.

9.1.6. Function code table of frequency converter:

Function Code	Function Description	Set Scope	Ex-factory Value
Cd01	Number of poles of electromotor	02 ~ 14	04
Cd02	Operating method Note: “0” indicates unilateral operation, and “1” indicates alternative operation.	0 ~ 1	0
Cd03	Operating timing control Note: “0” indicates non-fixed time (continuous), and “1”	0 ~ 1	0

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	indicates fixed time.		
Cd04	Time setting for alternative operation Note: Take hour as the unit.	0.1 ~ 50.0	0.5
Cd05	Upper limit frequency Note: Take Hz as the unit.	0.01 ~ 50	45
Cd06	Lower limit frequency Note: Take Hz as the unit.	0 ~ 50	1
Cd07	Accelerating time Note: The time from starting 0.5Hz to 50Hz with second as the unit.	0.1 ~ 3600	10
Cd08	Decelerating time Note: The time from 50Hz to stopping 0.5Hz with second as the unit.	0.1 ~ 3600	15
Cd09	Setting of the drive ratio of coefficient dragged	0.10 ~ 200.00	0.43
Cd10	Display method Note: "0" display frequency with power switched on, and "1" display rotating speed with power switched on.	0 ~ 1	0
Cd11	Operational method Note: "0" indicates positive rotation, and "1" indicates reverse rotation.	0 ~ 1	0
Cd12	Fixed operating time Note: Take hour as the unit.	0.1 ~ 100.0	0.1
Cd13	Current display correction Note: Take A as the unit.	0.1 ~ 10	9
Cd14	Interval shutdown time of alternative operation Note: The interval time of negative and reverse alternative rotations with hour as the unit.	0.0 ~ 100.0	0.1
Cd15	Operational interval shutdown time Note: Circulating startup time in unilateral operation with hour as the unit.	0.1 ~ 100.0	0.1
Cd16	Number of restarting for operation	0 ~ 100.	0

**Other description:** Frequency converter will operate normally when X1-COM on the row of frequency converters of free stop and operation is short connected. When X1-COM is broken off, the frequency converter will stop freely.

9.1.7. Explanation on the operation and functions of contact panel:

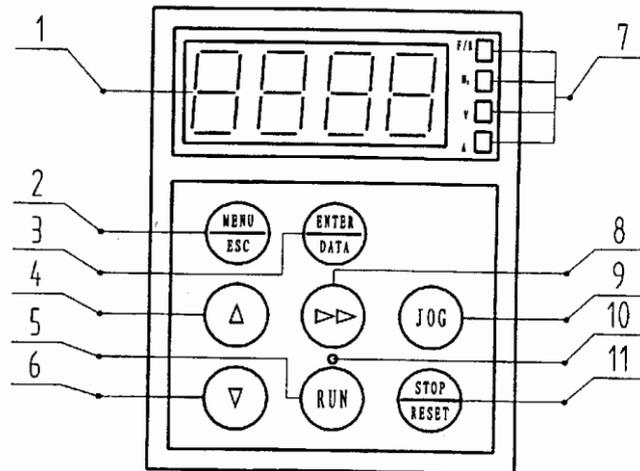


Figure 4

Explanation on each serial number of contact panel:

1. LED digital tube display zone: Display frequency, positive and reverse rotating direction, rotating speed, voltage, current and failure code, and function code etc..
2. MENU/ESC menu selection and switching button: A switching button in the state of programming and monitoring, for switching between parameter display and programming menus. If this button is operated in the state of programming menu, it will return to the previous menu.
3. ENTER/DATA function selection and saving button: Enter into the next menu in the state of programming, and finish the saving operation of parameters in the state of third-level menu.
4. ▲ Up button: Increase by degrees of function code, menu group, or set parameter values.
5. RUN Operation order button: To be used for starting frequency converter in the mode of panel control.
6. ▼ Down button: Decrease by degrees of function code, menu group, or set parameter values.
7. Unit indicator light: Green light indicates the state of rotating direction (F/R), frequency (Hz), rotating speed (Hz, v), voltage (v), and current (A) etc. respectively.
8. ▀ Shift button: ① Shift the display of rotating direction, frequency, rotating speed, voltage and current and so on.  
② Change the modification digit of the set data, including from kilodigit to the two digits behind decimal point.
9. JOG Inching button: This frequency converter has no such function.
10. Operation indicator light: This light appears green when the frequency converter operates.
11. STOP/RESET Stop order/ failure reset button: Press this button to stop the operation of frequency converter, and reset operation starts in the state of failure alarm.

## 9.2. Operating method

(A) Test running of frequency converter --- non-load operation of ball mill (with no ball milling tank installed)

1. Turn on the power supply switch, and LED will display “P. OFF”, and will display in a flicker way “50.00”, Hz indicator light turns on.

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3. Press menu selection and switching button **MENU/ESC**, LED will display the function code “Cd01”.
4. Press function selection and saving button **ENTER/DATA**, LED will display the current value of the function code “Cd01”, such as “04” (digit in ones place flickers). If modification is necessary, it’s possible to press **▲** or **▼** to set the value required. After setting, press the button **ENTER/DATA** once again, the value set will be confirmed and saved, and the next function code “Cd02” will be displayed at the same time. If this button is not pressed, the value already set will not be recognized by the frequency converter, and the previous value will remain effective.
5. According to the demands of ball milling techniques, set each function code one by one as per the abovementioned method.

As for data setting, it’s possible to press shift button **▲▼** to make LED flicker display corresponding to the digit of data already set, so as to finish the data setting quickly.

6. After setting Cd16, press the button **ENTER/DATA** to confirm and display “-b-”; after pressing the down button **▼**, LED displays “Cd16”. If you continue pressing the button **▼**, function code will decrease from Cd16 to Cd01 one by one.

Note: In the process of setting, if LED displays the symbols such as “-b-”, “-R-”, “-P-”, “-H-”, “-d-”, and “-c-” etc., these are all the other functions of frequency converter and have nothing to do with the functions of ball mill, and you only need to press the button **▼** continuously to return to “Cd16”.

7. Explanation on function code: ① Cd01, Cd05, Cd06, Cd07, Cd08, Cd09 and Cd13 are fixed ex-factory values and shall not be changed, or the correctness of such parameters as rotating speed and current etc. will be affected.
  - ② Setting Cd07 and Cd08 is to keep a delaying interval between the positive and reverse alternative operation of electric machinery. Over small setting value will possibly affect the life of electric machinery.
  - ③ When Cd10 setting is “0”, LED display shows the frequency after the frequency converter is started up; and when the setting is “1”, LED display shows the rotating speed after the machine is started up.
  - ④ When Cd11 setting is “0”, LED display shows positive rotation (ball mill turns clockwise) after the frequency converter is started up; when the setting is “1”, LED display shows reverse rotation (ball mill turns anticlockwise).
8. The start-up temperature of cooling axial fan of the frequency converter is 43°C. When the working temperature of the frequency converter is over 43°C, the axial fan will turn on automatically; on the contrary, when the working temperature is lower than 43°C, it will turn off automatically.
9. If the frequency converter is confirmed to work normally after the abovementioned operations, it’s possible to continue the non-load test running of ball mill.
10. Put on the protection cover of ball mill, switch on the safety switch, and press the operation order button **RUN**, the operation indicator light will turn on and the ball mill will begin test running.
11. Press the up button **▲** and down button **▼** for accelerating and decelerating testing of the ball mill.
12. Adjust the rotating speed of the ball mill to the maximum rated rotating speed, and make it

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operate for some time before judging if the operation sound of the ball mill is normal.

13. After everything is proved normal, press the stop order button **STOP/RESET** to make ball mill stop freely, and LED will restore its flicker display.
14. About 5 seconds after the power switch is switched off, "P. OFF" will appear and then disappear.

### (B) Test running of installing ball milling tank to ball mill

1. If the frequency converter and ball mill are proved fully normal after all of the above operations, it's possible to install the ball milling tank with milling materials and milling balls inside it to the ball mill according to section II "Operational Procedures" of this manual.
2. Put on the protection cover, switch on the electric power source, and carry out the test running of ball mill.

### (C) Practical examples of operation

#### **Example 1:** Unilateral operation with shutdown at non-fixed time.

Ball mill some testing sample with non-fixed long-time unilateral operation at the rotating speed of 400 turns / minute.

- Setting:
1. cd02, set the operational method as unilateral operation "0".
  2. cd03, set the control in operation as non-fixed time "0".
  3. Press **MENU/ESC** button to make the display conduct flicker display.
  4. Press **RUN** button to make ball mill begin to work.
  5. Press  button till two red lights turn on and display the rotation speed of ball mill.
  6. Press  or  button to adjust the speed to 400 turns / minute.
  7. After long time operation, press **STOP/RESET** button to shut down the machine manually.
  8. Switch off the power supply and the ball milling is completed.

#### **Example 2:** Unilateral operation with shutdown at fixed time.

Ball mill some testing sample with shutdown after 10h unilateral operation at the frequency of 40Hz.

- Setting:
1. cd02, set the operational method as unilateral operation "0".
  2. cd03, set the control in operation as fixed time "1".
  3. cd12, set the operating time as "10.0".
  4. cd16, set the number to operation and restarting times as "0".
  5. Press **MENU/ESC** button to make the display conduct flicker display.
  6. Press **RUN** button to make ball mill begin to work.
  7. Press  button till red light Hz turns on, and the display shows the frequency.
  8. Press  or  button to adjust the frequency to 40Hz.
  9. The machine will stop automatically after 10h ball milling.
  10. The ball milling is completed, switch off and disconnect the power supply.

#### **Example 3:** Positive and reverse alternative operation with shutdown at fixed time.

Carry out positive and reverse alternative operation of some testing sample every 1.5h, and the

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machine will shut down automatically 15h later.

- Setting:
1. cd02, set the operational method as alternative operation “1”.
  2. cd03, set the control in operation as fixed time “1”.
  3. cd04, set the alternative operating time as 1.5h.
  4. cd12, set the operating time as 15h.
  5. cd14, set the interval time of alternative operation as “0.0”.
  6. cd16, set the number to operation and restarting times as “9”.
  7. Press **MENU/ESC** button to make the display conduct flicker display.
  8. Press **RUN** button to make ball mill begin to work.
  9. Same as the previous example, set the rotating speed or frequency as per related requirements.
  10. The machine will stop automatically 15h later, switch off and disconnect the power supply.

Note: In operation, the function code cd16 displays countdown, such as the countdown 9~0 displayed in this example.

### **Example 4:** Unilateral interval operation with shutdown at fixed time.

Some testing sample requires 0.5h operation before 1h shutdown, and then continues 0.5h operation in the same direction before further 1h shutdown. Repeat such operation for 10 times before shutdown of the machine.

- Setting:
1. cd02, set the operational method as unilateral operation “0”.
  2. cd03, set the control in operation as fixed time “1”.
  3. cd12, set the operating time as 0.5h.
  4. cd15, set the interval shutdown time as “1.0”.
  5. cd16, set the number to operation and restarting times as “9”.
  6. Press **MENU/ESC** button to make the display conduct flicker display.
  7. Press **RUN** button to make ball mill begin to work.
  8. Same as the previous example, set the rotating speed or frequency as per related requirements.
  9. The machine will stop automatically after 10 times of repeated operation, and then switch off and disconnect the power supply.

Note: In operation, the function code cd16 displays countdown, such as the countdown 9~0 displayed in this example.

### **Example 5:** Positive and reverse alternative interval operation with shutdown at fixed time.

Some testing sample requires 0.8h operation in positive direction before 0.5h shutdown, and then 0.8h operation in reverse direction, and finally shutdown of the machine after 20 times of repeated operation.

- Setting:
1. cd02, set the operational method as alternative operation “1”.
  2. cd03, set the control in operation as fixed time “1”.
  3. cd04, set the alternative operating time as 0.8h.
  4. cd14, set the interval shutdown time of alternative operation as 0.5h.
  5. cd16, set the number to operation and restarting times as “19”.
  6. Press **MENU/ESC** button to make the display conduct flicker display.

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7. Press **RUN** button to make ball mill begin to work.
8. Same as the previous example, set the rotating speed or frequency as per related requirements.
9. The machine will stop automatically after 20 times of alternative circulation, and then switch off and disconnect the power supply.

### 9.3. Failure elimination of frequency converter

If any abnormal situation occurs to the frequency converter, its protection functions will work, LED will display the function code in a flicker way, failure output relay will work, frequency converter will stop output, and ball mill will stop automatically. After such failures are eliminated, press **MENU/ESC** button and then restart up the ball mill for operation.

### Contents and Countermeasures of Failure Alarm

Failure Code	Failure Type	Possible Cause of Failure	Countermeasure
0C-1	Over current for accelerating operation of frequency converter	<ol style="list-style-type: none"> <li>1) Time for acceleration is set too short;</li> <li>2) V/F curve or torque elevation is set up improperly;</li> <li>3) Reset the working electric machinery when instant stop happens;</li> <li>4) Capacity of frequency converter is on the low side;</li> <li>5) There is failure or disconnection of code wheel in the process of accelerating operation of PG.</li> </ol>	<ol style="list-style-type: none"> <li>1) Adjust accelerating time;</li> <li>2) Adjust V/F curve or torque elevation;</li> <li>3) Set the starting mode A-00 as rotating speed tracking restart mode;</li> <li>4) Choose the frequency converter with matching capacity grade;</li> <li>5) Check the code wheel and its wiring.</li> </ol>
0C-2	Over current for decelerating operation of frequency converter	<ol style="list-style-type: none"> <li>1) Time for deceleration is set too short;</li> <li>2) Potential energy load or load inertia is relatively big;</li> <li>3) Capacity of frequency converter is on the low side;</li> <li>4) There is failure or disconnection of code wheel in the process of decelerating operation of PG.</li> </ol>	<ol style="list-style-type: none"> <li>1) Adjust decelerating time;</li> <li>2) Connect braking resistance externally;</li> <li>3) Choose the frequency converter with matching capacity grade;</li> <li>4) Check the code wheel and its wiring.</li> </ol>
0C	Over current for constant speeding operation of frequency converter	<ol style="list-style-type: none"> <li>1) Voltage of the grid is on the low side;</li> <li>2) Capacity of frequency converter is on the low side;</li> <li>3) Reset the working electric machinery when instant stop happens (during starting period);</li> <li>4) Load is too much.</li> </ol>	<ol style="list-style-type: none"> <li>1) Check the input electrical source;</li> <li>2) Check whether the input is of phase lack;</li> <li>3) Choose the frequency converter with matching capacity grade</li> <li>4) Set the starting mode A-00 as rotating speed tracking restart mode</li> <li>5) Check the code wheel and its wiring;</li> <li>6) Check the load or replace the</li> </ol>

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Failure Code	Failure Type	Possible Cause of Failure	Countermeasure
			frequency converter with another one with bigger capacity.
0E-1	Over voltage for accelerating operation of frequency converter	<ol style="list-style-type: none"> <li>1) The input voltage is abnormal;</li> <li>2) Start up the working electric machinery (non-speed tracking startup).</li> </ol>	<ol style="list-style-type: none"> <li>1) Check the input electrical source;</li> <li>2) Set the starting mode A-00 as rotating speed tracking restart mode.</li> </ol>
0E-2	Over-voltage for decelerating operation of frequency converter	<ol style="list-style-type: none"> <li>1) Time for deceleration is set too short;</li> <li>2) Potential energy load or load inertia is relatively big;</li> <li>3) The input voltage is abnormal.</li> </ol>	<ol style="list-style-type: none"> <li>1) Adjust the decelerating time;</li> <li>2) Connect braking resistance externally;</li> <li>3) Check the input electrical source.</li> </ol>
0E	Over voltage for constant speed operation of frequency converter	<ol style="list-style-type: none"> <li>1) Abnormal change happens to input voltage.</li> </ol>	<ol style="list-style-type: none"> <li>1) Install input reactor;</li> <li>2) Check the input electrical source.</li> </ol>
FTL	Failure of power module	<ol style="list-style-type: none"> <li>1) Instant over current of frequency converter;</li> <li>2) Inter-phase or ground short circuit of three-phase output of frequency converter;</li> <li>3) The frequency converter is not well ventilated or the fan is broken;</li> <li>4) Short through of bridge arm of power module.</li> </ol>	<ol style="list-style-type: none"> <li>1) Please refer to the countermeasure against over current;</li> <li>2) Check the output connecting line and conduct wiring again;</li> <li>3) Dredge air duct or change fan;</li> <li>4) Seek for technical support.</li> </ol>
0H	Overheating of radiator of power module	<ol style="list-style-type: none"> <li>1) Ambient temperature fails to meet specification requirements;</li> <li>2) Ventilation of frequency converter is poor;</li> <li>3) Failure of fan;</li> <li>4) Temperature testing circuit is damaged.</li> </ol>	<ol style="list-style-type: none"> <li>1) The working environment of frequency converter shall meet specification requirements;</li> <li>2) Rectify and improve the ambient ventilation and heat dissipation environment of frequency converter;</li> <li>3) Change fan;</li> <li>4) Seek for technical support.</li> </ol>
0L	Over loading of electric machinery	<ol style="list-style-type: none"> <li>1) V/F curve setting is improper;</li> <li>2) The voltage of grid is too low;</li> <li>3) Long-time operation of general electric machinery with big load at low speed;</li> <li>4) The over-load protection coefficient of electric machinery is not set properly;</li> <li>5) Locked operation or over big load of electric machinery.</li> </ol>	<ol style="list-style-type: none"> <li>1) Adjust V/F curve;</li> <li>2) Check the input voltage of grid;</li> <li>3) Select electric machinery specially for frequency converter if long-term low-speed operation is required;</li> <li>4) Set the over-load protection coefficient B-18 of electric machinery</li> </ol>

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Failure Code	Failure Type	Possible Cause of Failure	Countermeasure
			correctly; 5) Adjust on-load working conditions or select frequency converter with matching capacity grade; 6) Adjust the wiring of code wheel or change the direction function setting of code wheel.
EMS	Failure of exterior equipment	1) Failure terminal of external equipment works;	1) Check the reasons for the operation of failure terminal of exterior equipment.
CPU	Electromagnetic interference	1) Single-chip machine is severely interfered.	1) Press STOP/RESET button for reset. 2) Seek for technical support.
CPUE	E <sup>2</sup> PROM failure	1) E <sup>2</sup> PROM is severely interfered in reading and writing; 2) E <sup>2</sup> PROM is damaged.	1) Press STOP/RESET button for resetting.
STOP	Locking for emergency stop	Double click the button STOP/RESET on the panel, stop the machine urgently, and lock the operation control.	1) Double click the button STOP/RESET on the panel to relieve locking for emergency stop.

NOTE: ① In the process of ball milling, the mutual impacting between milling balls as well as milling ball and tank wall will make the temperature of the tank wall rise, which is a normal phenomenon and doesn't belong to over-heating protection of frequency converter. If the temperature has influence on the nature of milling materials, users could adopt internal operation method for ball milling or other cooling methods.

② If users could not eliminate failures of frequency converter by themselves, they could contact our plant or the manufacturer of frequency converter directly.

## 9. Common Failures and Simple Repair & Maintenance of Ball Mill

### 1. Ball mill refusing to work

Situation 1: No display is seen after the mains switch of the frequency converter is opened. Check if the power supply is normal firstly, and then check if the mains switch is damaged.

Situation 2: The frequency converter displays something, but the electric machinery doesn't start up after the operation button is pressed down. Check if the two ends of connecting wire of the 7-core socket are plugged firmly and if the cover of the ball mill is placed on correctly firstly, and then check if the safety switch (travel switch) is damaged.

2. If the rotating speed of big tray decreases obviously or is not even, or the rotation is weak in the ball milling process, it shows that the driving V-belt of the electric machinery is worn and shall be replaced with the following method.

3. Abnormal noises occur abruptly in normal operation of ball mill. In such conditions, it's necessary to shut down the machine immediately, check if the ball milling tanks are loosened. And then, tighten the bolts before restarting the ball mill.

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4. The noises of ball milling are lightened or disappeared abruptly in the normal operation of ball mill. In such conditions, it's necessary to shut down the machine immediately, pull out the power line, and rotate the ball milling tanks with hands. If it's found that one or several ball milling tanks not able to rotate freely, it shows that gears are damaged and shall be replaced.
5. If metal friction noise or abnormal smell appears in the normal operation of ball mill, it's necessary to shut down the machine immediately, and pull out the power line. Pull the puller cover with hands. If the axis is loosened, it shows that the bearing is worn and shall be replaced.
6. Methods for private repair:

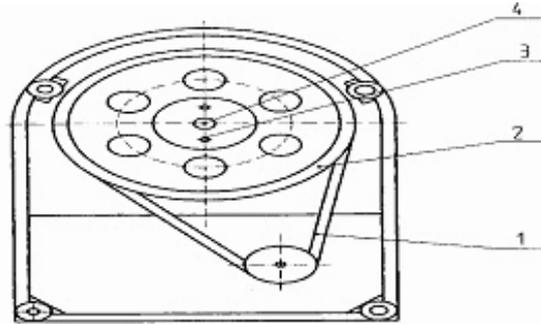


Figure 5

1. V-belt	3. Screw hole
2. Big pulley	4. Hexagonal bolt

A. Method for replacing V-belt of the electric machinery

- a. Lift the ball mill (as shown in figure 4);
- b. Unload the V-belt (1) of the electric machinery and replace it with V-belt A1422 (accessory of this machine), which is of the same type.

B. Method for replacing gears and bearing:

- a. Loosen the four inner hexagonal-head bolts inside the puller, and unload four pullers one by one (please see figure 1).
  - b. Lift the ball mill.
  - c. Unload the V-belt of the electrical machinery (1).
  - d. Loosen hexagonal-head bolt 4, and screw in the two screw rods of M12 x 85 (accessories of this machine) into the screw holes (3) of big pulleys at the same time to protrude the big pulley (2) slowly.
  - e. Immediately after unloading the big pulley, six hexagonal-head bolts could be found. After screwing out the bolts, unload the big tray and drive from the front side of the ball mill at the same time before changing damaged parts.
  - f. After replacement, restore the ball mill according to the steps opposite to the above ones.
7. If it's difficult for you to repair this machine by yourselves, please contact us freely.

## 10. MTI Support

- 9.1. MTI Corporation provides one year limited warranty from date that we shipped the goods. If you find any defective part caused by manufacturer please feel free to contact us. We will replace defective part and instruct you how to change the part by yourselves during warranty period. However, MTI Corp is not responsible for any damage or consequence damage caused by misuse. After warranty, MTI will continue to provide technical support and spare parts at a reasonable cost.
- 9.2. If you have any question, please contact us at [info@mtixtl.com](mailto:info@mtixtl.com) or call us at 1-888-5253070. MTI Engineers will instruct you how to use and maintain the machine.

## 11. Packing list

Code	Name	Qty	Remark
1	User's manual	1	
2	V-belt of electric machinery	1	A type 1422
3	Screw rod for maintenance	2	M12 X 85
4	Force-applying bushing	2	
5	Inner hexagonal wrench	1	
6	Stainless steel sieve	1	