

# X-MILL 500

X-MILL 500 Five-Axis Dental Milling machine



## User Manual

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# PREFACE

Dear customers,

Sincerely thank you to become users of Xiangtong products! Xiangtong X-mill 500 series of five-axis dental milling machines are quality equipment of the company for dental denture processing. To use the equipment better, you are wanted to read the operating manual provided with the equipment before starting to operate the equipment. The manual is intended for user's installation, commissioning, processing, troubleshooting and routine maintenance. Please pay attention to the relevant precautions, so as to avoid equipment damage and personal injury due to misuse.

X-mill 500 five-axis dental milling machine is made of high-quality components, materials, and specially developed motion control technology. The machine adopts high precision and high intelligence integrated design and assembly, uses dry milling processing, is compatible with zirconia block/wax/PMMA. The machine features double dust prevention, easy operation and digital, multi-sensor monitoring and design free of maintenance.

The milling machine is precise processing equipment. To ensure the safety of operators and the machine, it should be operated by professional operators. If you have any questions, please contact us in a timely manner, and our professionals will always be ready to help you.

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# CHAPTER 1: INTRODUCTION TO X-MILL 500 FIVE-AXIS DENTAL MILLING MACHINE

## 1-1 PRODUCT INTRODUCTION

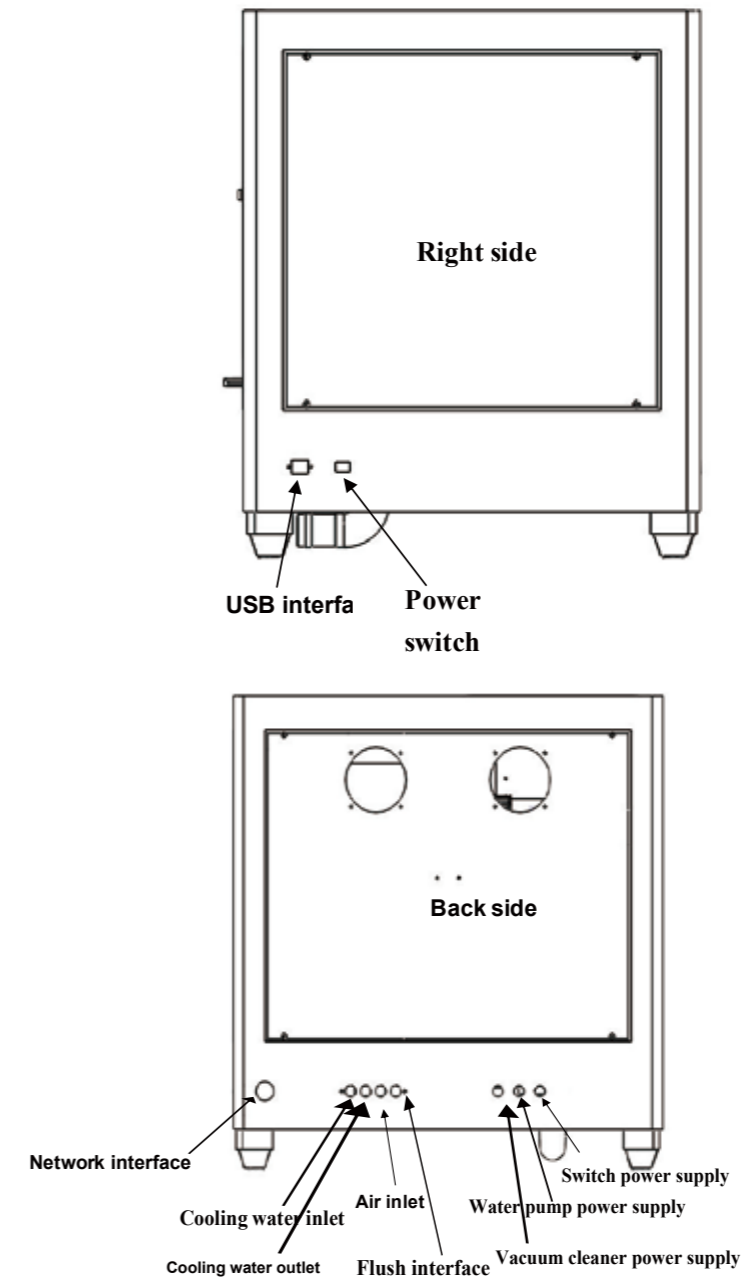
X-mill 500 is the five-axis dental milling machine developed by Shenzhen Xiang-tong Medical Technology Co., Ltd. It adopts the horizontal integrated design. Key machinery and control components are high-quality imported components. The specially developed control system features high speed, high precision and high intelligence. The system can automatically select best processing parameters based on materials and customer processing requirements, and uses multiple intelligence and protection procedures.

X-mill 500 can complete one-button operation, automatically replace the bur in the entire process, automatically detect the length of the bur, automatically correct the bur, and has eight burs. The maximum speed of spindle can be up to 60000 rpm, which is extremely strong, accurate, and reliable.

The machine has strong adaptability and selects different processing strategies according to the type of materials and tooth crowns, to meet diverse needs of different users and different products.

(Select processing strategies strictly in accordance with training requirements. Processing strategies vary with different materials. Please contact our technical staff before material replacement)

## 1-2 SHAPE STRUCTURE



### 1-3 TECHNICAL PARAMETERS

External dimension: 720x850x860 mm

Weight: 225 kg

Power supply voltage: Single phase AC 220V 50 Hz

Maximum power: 2.5 KW

Max spindle speed: 60000 rpm

Max feed speed: 6000 mm/min

Air supply pressure: > 0.5 Mpa

(Customers need to ensure that the air supply pressure is stable enough, and the air supply is clean after effective filtering.

Unstable air pressure will have serious impact on the stability of equipment processing.

Unclean air supply will greatly reduce the life of elements).

Spindle cooling: Water cooling

(Every day when the water pump is started, check whether it is running normally, to ensure the cooling effect).

X , Y, Z-AXIS trip: 220 mm\160 mm\120 mm

X, Y, Z-AXIS resolution: 0.001 mm

A-axis rotation range: 0°- 360°(±20° location processing)

B-axis rotation range: 360°

Maximum size of processed materials: 100 mm

Wax pattern 3 - 4 min/one tooth

Zirconia 8 - 10 min/one tooth

Tooth preparation model 1 h 20 min/one set

### 1-4 Use Environment and Requirements

1.Power supply should be grounding in accordance with the third method described in the Electrical Engineering Rules, to prevent damage to the human body caused by electricity leakage.

2.Milling machine should be horizontally placed on a stable workbench.

3.The wall should be greater than 40cm away from all around, to ensure good heat dissipation.

4.The exhaust port of vacuum cleaner must be connected outside, and the operator needs to wear dust masks.

5.Use ambient temperature: 10 °C ~ 30 °C .

Strictly ensure that the equipment can be used in this temperature range, to prevent poor electrical components caused by insufficient heat dissipation.

6.Use ambient humidity: 30% RH ~ 80% RH

7.Keep away from vibrating sources and high frequency launchers (eg ultrasonic).

8.Keep away from fire and inflammable and explosive articles.

## CHAPTER 2 INSTALLATION AND COMMISSIONING

### 2-1 Equipment Installation Considerations:

1. Open the packing box and check that the appearance of the equipment is damaged.

2. Count the accessories according to the packing list.
3. Install the equipment body on the horizontal and firm workbench, and remove the transportation fasteners.
4. Connect the power cable, air supply system, cooling water system and vacuum system according to the instructions.
5. Do not move the equipment by handling the enclosure and movable door. Instead, you shall handle the equipment bottom plate.
6. Do not move the equipment by pulling or pushing the equipment enclosure on the floor.

CAUTION! TAKE CARE NOT TO BE CRUSHED!

## 2-2 EQUIPMENT COMMISSIONING

1. Turn on the equipment power switch. The lighting lamp of the processing area and the screen will turn on.
2. Run the XMILL220, and click “MANUAL” button to enter the manual operation interface, as shown in the following figure.



Figure 2-1

3. Click X+, X-, Y+, Y-, Z+, Z- and A+, A- respectively to check if all axes operate normally.
4. Click “COLLET”, “SPINDLE”, “CLEANER”, “FIRST REFERENCE”, and “SECOND REFERENCE” respectively to check if their actions and positions are normal. After the inspection, stop the corresponding actions to avoid any danger to the subsequent operations.
5. After confirming that the above components function normally, click “AUTO” button to enter auto interface, as shown in the following figure.



Figure 2-2

6. Click “HOME” button to execute axis mechanical homing operation. When homing is completed successfully, “HOME” button is highlighted, indicating that the homing function is normal.

7. Switch back to the manual operation interface. The highlighted “T1”, “T2” or “T3” indicates the current bur number on the spindle. When first put the milling burs into the spindle, please check if there is a protection bar inside the collet. Use left hand to hold tight the protection bar and click “COLLET”. Then take out the protection bar and put T1 (the biggest bur) into it. Check if the NO. behind T on the screen is 1 or not. (like picture below)

```

NC File: ---
Material: ---
T: 1    F: 0    S: 0
Progress: 0/0/0.00%

```

If the NO is 1, then click “T2” on the manual interface and machine will put T1 bur into the tool station. After, you can put T2 bur into spindle. Then check tool NO. on the screen and click “T3”. Machine will put T2 bur into tool station and you can put T3 bur into the collet manually. At this time, you can click “T1”, “T2” and “T3” respectively to check if the tool change is normal.

8. When the bur changing operation is completed, click “TLC” button to execute the auto tool length checking operation. Watch this action and check if it is normal. Now, the installation and commissioning are finished.

## CHAPTER 3 PILOT RUN AND PROCESSING

### 3-1 PILOT RUN

1. Select auto mode. If the system has not performed mechanical homing, execute “Home” function.

2. Click “load” button and select the test processing file for pilot run. Load the file after confirmation. The relevant information of the processing file will be displayed after successful loading, such as the file name, material type, processing grade. For the specific meaning of the processing file information, please refer to Appendix II.



Figure 3-1

3. As shown in the above figure, you can adjust the feed rate and spindle rate under “AUTO” mode. Click the ‘+’ or ‘-’ button to adjust the feed rate to about 50%, and the spindle rate to about 30%. Pay attention that it is the rate adjustment under auto mode rather than the rate adjustment under manual mode.

4. Click “START” button to start the pilot run and auto processing, and the button will change to “pause”. Observe the equipment action and interface prompts, until the processing is finished without any abnormality.

5. Click “START” button again to start the auto processing. If you click “pause” button during the processing, the milling process will stop at the current point, the system will stop processing and return to the reference point automatically. When you click “START” button, the system will continue to run, starting from the paused point. If you click “stop” button during the processing, the system will not remember the current point, and the system will start from the beginning point when you resume milling again.

6. You can repeat the actions in step 5 to observe if the functions are normal. Now the pilot run and test are completed.

### 3-2 PROCESSING AND RUNNING

1. Start the software and click “home” to conduct the mechanical homing operation when the system initialization is completed without exception prompt.

2. Click “First reference” under manual mode, and each axis will return automatically to the position suitable for loading/unloading disc. Attach the work piece for processing to the clamp and tighten the locking screw.

3. Load the proper processing file, as done in the pilot run operation. The system will automatically select the processing strategy according to the file information. Adjust the federate and relevant auxiliary functions, and click “START” after confirmation to execute the auto processing.

4. If you need to suspend the operation during the processing, click “pause” button. If you need to stop the processing, click “stop” button. If any exception appears during the processing, the system will automatically interrupt the current processing and maintain the information of the current line. After troubleshooting, you can continue the interrupted processing by clicking “START”.

5. If power outage occurs during the processing, start the software after the system is powered on again. The system will automatically load the processing file loaded before the power outage and recover the saved information of the interrupted line. You can click “START” to resume the interrupted processing after the loading is completed. In the case of sudden power outage, as long as you don’t press the “stop” button, when you restart the software and click “START” again, the system will continue the interrupted processing.

### 3-3 SELECTION AND REPLACEMENT OF MILLING BUR

Bur replacement is very important in the daily processing. It will directly affect the equipment safety and processing quality. Therefore, careful operation is required. When the bur has been used for a period of time or affects the processing quality, you need to replace the bur according to the following steps:

1. Execute the “home” function to ensure that system has been homed.
2. If the current bur is not the bur for replacement, you can click the corresponding bur button under manual mode to remove the target bur. When the bur is removed, click “SECOND REFERENCE” to move the axes to the reference position.
3. Use left hand to hold tight the milling bur before loosen the spindle chuck to avoid any injury from the ejected bur( same as picture below ) . Please remember, the equipment shall not be operated simultaneously by several persons. Even when it is operated by a single person, special care shall be taken in each step, in order to avoid any personal injury due to the activation of spindle by mistake.



4. The new milling bur is equipped with collar. Insert the bur handle into the spindle chuck, ensuring that the collar is against the chuck. Tighten the chuck after it is in position. The collar is designed to ensure that the bur installation depth meets the equipment processing requirement. Do not put bur without collar into the chuck or magazine. Now the bur replacement is completed.

If too much part of the bur is exposed, the tool-cashing will be caused when it turns over, damaging the magazine. Therefore, the installation position of the bur with collar must be specified. When the bur is replaced, you shall manually turn it over to check if the position is correct, in order to avoid any exception.

5. Key points for installation: (Mark the position) to ensure that the exposed part is kept at the same position each time. Check if there is enough space in the magazine for the bur twice each day. If not, replace it with a new bur with collar.





6. When the number of teeth engraved by the bur reaches 150 units, you need to strictly monitor the bur edge and check if there is any breakage. If you have the 20X microscope, you can check if there is any breakage to the bur coating and edge and the sharpness of the bur. The quality of the machine needle must be ensured for the graving of high difficulty.

#### 7. Special notes for T3 bur

The T3 bur we offer is a very small bur (cutting diameter: 0.6mm), which is made of materials of high hardness and low toughness.

You need to take care of the T3 bur and avoid applying force on it. Take care not to touch the bur when cleaning up.

### 3-4 SPECIAL NOTES FOR LOADING MILLING MATERIAL

No matter what type of material is used, the following loading requirements must be observed, in order to avoid any failure.

1. No residual dust is allowed on the clamp, which shall be cleaned each time when loading the material.
2. Do not use the clamp with any defect, such as the bulging caused by bumping.
3. No residual dust is allowed on the edge of the material when it is installed. Be sure to clean it, in order to avoid the breakage caused by uneven force during the installation.

4. When tightening the clamp, be sure to evenly tightening each screw. Do not fully tighten a screw and then tighten other screws. It will cause uneven force to break the material or cause internal stress which results in breakage during the processing.

### 3-5 Trouble shooting

System information will be displayed on the screen during milling process. In case of any abnormality, the system will show error information on the screen. To ensure safety, most operations are accepted by the system only in normal situation. When you conduct the relevant operation in abnormal situation, the system will generate corresponding prompts.

Therefore, when there is any exception prompt, you can click “reset” button to reset the relevant exception. If the exception still exists after the reset operation, you need to take the corresponding troubleshooting measures according to the exception message and prompts, and then execute the reset or restart the software to remove the exception message.

## CHAPTER 4 MAINTENANCE AND PRECAUTIONS

### 4-1 INSTRUCTIONS FOR MAINTENANCE:

1. Clean the dust in the equipment processing chamber every day, and ensure that there is no dust buildup in the spindle sleeve groove and on the surface of tool length checking unit.

2. Clean the equipment processing chamber before replacing the materials for processing.

3. Remove the dust in the vacuum weekly to ensure functionality of it.  
(If the dust in the vacuum is not removed in time, the filter will be blocked. The suction power will be reduced. As a result, the dust will enter the equipment chamber, causing damage to the internal electronic components, triggering exception alarm and reducing its service life)

4. Inspect the water level of the cooling water tank each week, and check the output of the water pump each day. When the water level is low, make up or replace the water. The cooling water must be added with proper amount of antirust powder.

5. The self-contained computer is dedicated to the equipment. Please do not change the relevant setting of the system, install or uninstall any software. To ensure the normal operation of the system, please conduct virus checking and killing operation regularly.

6. To ensure the reliable operation of the system, please use a dedicated USB for this equipment. Do not mix it with the USB for life and learning use, in order to avoid virus and unnecessary trouble.

7. You are suggested to clean the equipment internal once each 2 months: Disconnect the equipment power and manually clean the equipment internal with dry and clean towel, gently wipe the sensors with clean tissue, in order to avoid any exception alarm caused by dust buildup.

### 4-2 SPECIAL NOTES:

1. If you use our equipment to process products other than the above-mentioned materials, please make evaluation according to the equipment parameters. You shall be fully liable for any accident caused by processing products of other materials.

2. Without the prior approval of our company, you shall not disassemble the external and internal components and electric components of the equipment. Our company shall not be liable for any equipment damage thus incurred.

3. The equipment adopts precise electronic components and has high requirement on the cleanness of the air source. The equipment is delivered with triple air filter. To increase the equipment operation reliability and service life, please ensure the cleanness of the air source and install the triple air filter as instructed.

### 4-3 PRECAUTIONS

1. The power socket must be connected with functioning ground wire. Otherwise, the equipment grounding protection will fail, the internal components will be burned, and electric shock will be caused in severe situation.

2. The vacuum discharge pipe must be extended to outdoors, in order to avoid polluting the indoor environment, impairing people's health and reducing the service life of the equipment.

3. Proper connect must be ensured when connecting the cooling water system, air supply system and vacuum system. Mismatch must be avoided; otherwise, important components will be severely damaged. If water leakage should occur, please stop using the equipment and contact us.

4. The cooling water must be added with antirust powder (two lids of antirust powder for a tank of water). Please check the water flow in time as instructed. If the water flow decreases obviously, please contact us.



4. The air source of the system shall adopt clean air which has been processed by air filter. Otherwise, the product surface quality will be affected, and the service life of the equipment components will be reduced. Enough air pressure shall be ensured to avoid the relevant exception alarm.

5. The status of the axes shall be observed during the manual operation. If they are not in the safe positions, do not return to the “auto interface”. Instead, you shall execute the manual “Home” operation. Please always observe the position and status of the axes to avoid any tool crashing or crash with the spindle. Otherwise, the important components will be severely damaged. In case of any emergency, please immediately press the Emergency Stop button.

6. Please strictly follow the equipment operation flow chart in the Appendix I when operating the equipment. Be sure to operate the computer according to the normal turn-on/off method, in order to avoid the loss of system files, which will prevent the starting of the system, reduce the system response or even cause system crash.

7. Do not move the equipment after it is installed. If it is necessary to move it, please contact us. You can only apply force to the bottom plate during the movement.

No force shall be applied to any part of the enclosure. Otherwise, enclosure deformation or even equipment dropping will be caused, resulting in severe accident.

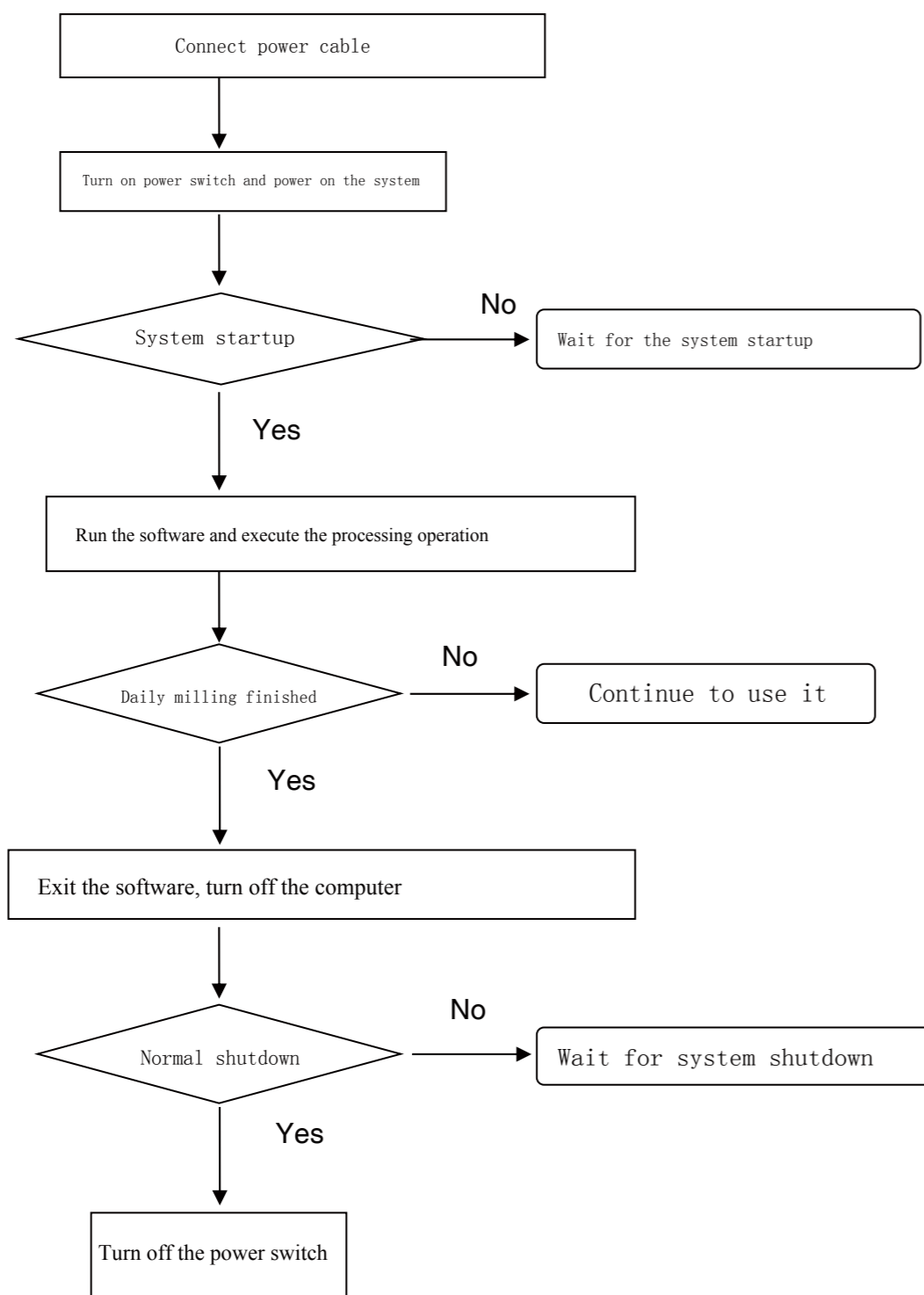
8. If there is any abnormal noise or abnormal action during the use, please record the relevant exception message and contact us.

9. To avoid unnecessary injury, this equipment shall not be operated simultaneously by several persons.

## CHAPTER 5 COMMON ERRORS AND SOLUTIONS

Failure symptom	Cause analysis	Solution
Axis limit alarm(positive or negative)	Powder on axis sensor.	Use clean tissue to gently wipe the powder on the axis sensor.
communication error( alarm 1) Check signal line	Communication line is loose.	Open the back cover and check signal line.
Low air pressure alarm	The air supply pressure did not reach the required level or the pipe had leakage.	Check the air supply source and air supply pipe. Then click “reset” and system is back to normal
Inverter alarm: 34 Overheat of spindle	The cooling system is abnormal, the water level of the water tank is low, or the cooling loop was blocked.	Check the water pump, water level in the water tank and the cooling loop.

## APPENDIX I: OVERALL OPERATION FLOW CHART OF THE EQUIPMENT



## APPENDIX II REFERENCE TABLE FOR PROCESSING FILE INFORMATION

SN	Module name	Information	Module meaning
1	CA	Custom	Customized processing mode, where the rate can be adjusted and vacuum can be manually started and shut down
2	WA	Wax Class A	Wax, high-efficiency processing mode, where the rate cannot be adjusted, and the vacuum is started
3	WB	Wax Class B	Wax, conventional processing mode, where the rate cannot be adjusted, and the vacuum is started
4	WC	Wax Class C	Wax, high-quality processing mode, where the rate cannot be adjusted, and the vacuum is started
5	ZA	Porcelain Class A	Porcelain, high-efficiency processing mode, where the rate cannot be adjusted, and the vacuum is started
6	ZB	Porcelain Class B	Porcelain, conventional processing mode, where the rate cannot be adjusted, and the vacuum is started
7	ZB	Porcelain Class C	Porcelain, high-quality processing mode, where the rate cannot be adjusted, and the vacuum is started