CNC milling machine
Operation manual

BSM-420W

V1.0.5

2024.09.13 Updated

Content

Foreword

Thanks for choosing dental milling machine from Chengdu Besmile Medical Technology Co., Ltd.(Hereafter "BSM"). In order to maintain reliability, accuracy and service life of BSM-420W, regular professional maintenance is very important in addition to correct operation/use. Please refer to this manual and consult BSM/BSM local dealer for more information.

Before connecting and starting the BSM-420W, please read this manual carefully to ensure correct operation/use by BSM approved Personnel.

- The installation environments must clean, dry, orderly and be free of corrosive gas and flammable gas.
- When wiring, it is **forbidden** to connect the equipment to 3PH220V power supply or 380V power supply, because once connected incorrectly, the internal components of the equipment will be damaged or personnel will be injured.
- The grounding project must be implemented correctly, and the grounding must be implemented in accordance with your local electrical regulations.
- Keep children and animals away from the working place.

When receiving, inspecting, installing, wiring, operating, and maintaining the equipment, the following symbols must be noticed with special attention and the instructions following them must be taken.

The meaning of the symbols "Danger" and "Warning":

It reminds the operator that if it is not observed, the operation may fail or an action cannot be performed.

It means to remind the operator to pay special attention. Failure to comply may cause machine failure or moderate injury to personnel, or cause serious damage to the product, or even malfunction.

Chapter 1. Product Introduction, Inspection and Technical Parameters

1-1 Product introduction

BSM-420W is a high-precision, high-efficiency, high-reliability and high-intelligence integrated dental milling equipment. This equipment is suitable for processing materials like titanium disc, pre-mill, and glass ceramic. Using traditional machinery with high-precision screw guide rail structure to build on the basis of ensuring the rigid structure of the equipment to make installation and maintenance easier, and the high-resolution servo drive system ensures operational stability and accuracy.

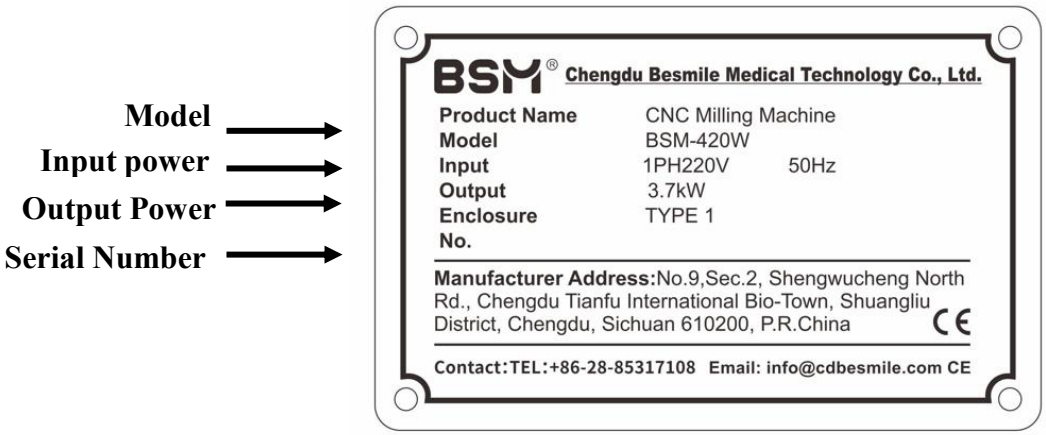
1-2 Product inspection

Please check the package after arriving, and contact BSM or BSM local dealer if the package is not in good condition. Then check the following items after unpacking:

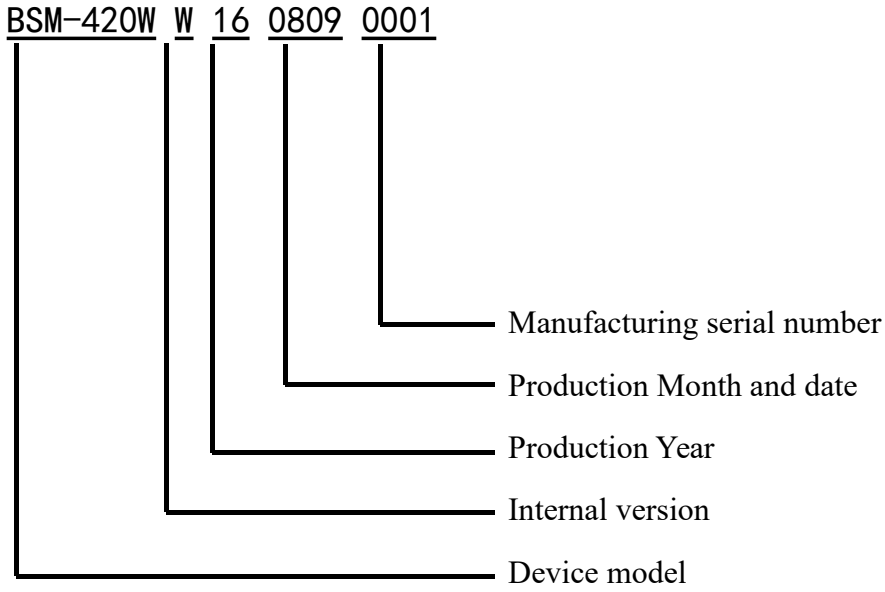
Item	Content
Whether the product model is the one you ordered	The product model is listed on the device nameplate
Whether the LCD screen is damaged	The LCD panel is free of scratches or cracks.
Whether the shell is damaged or loose	The shell is in good condition and no screws are loose

Please contact BSM or BSM local dealer your local dealer immediately if any of the above situation occurs.

1-3 Nameplate description

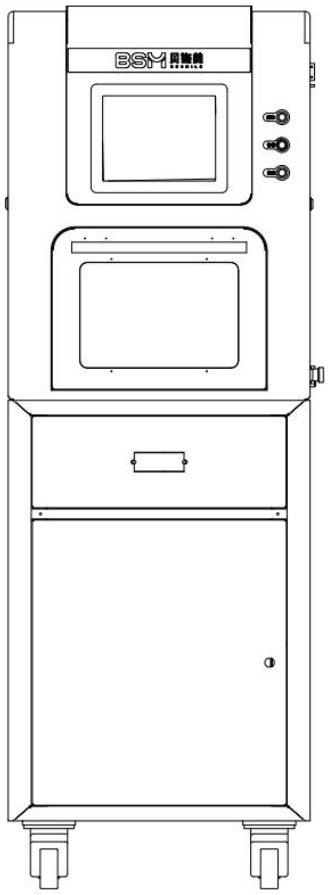


Serial number description

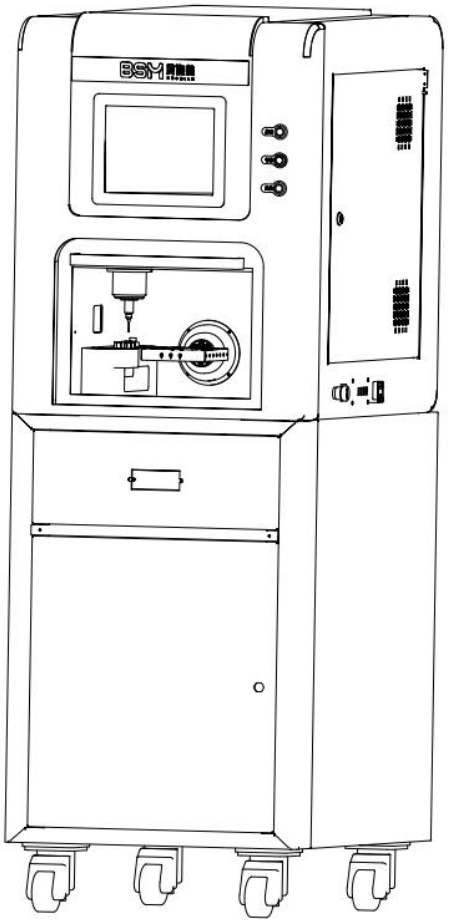


1-4 Product appearance

1-4-1 Device view



Front view



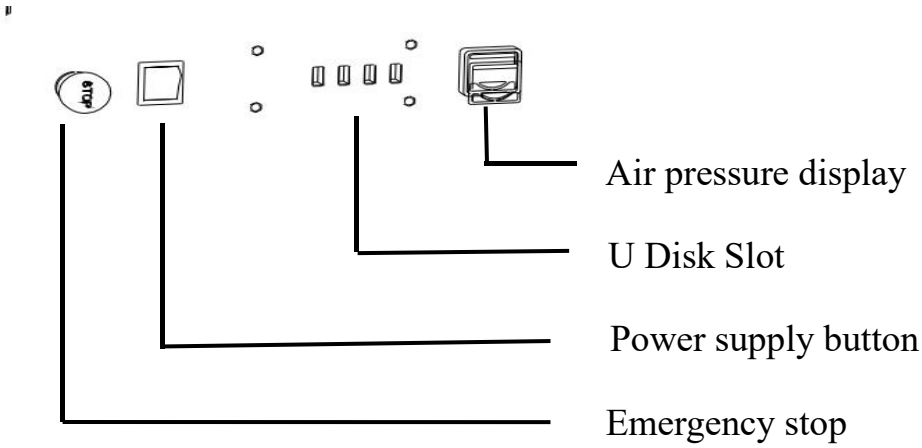
Side view

1-4-2 Button definition

Start: Press this button to start processing after the processing file has been loaded into the system.

Pause: Press this button to pause the processing program. Then press the “Start” button and the program will continue to run at the pause position.

Reset: When an alarm occurs, press this button to reset some alarm states. If we press this button in a pause state, the program will return to the initial state.



Emergency stop: Press this button to interrupt equipment operation in emergencies.

Power supply button: Press this button to turn on/off the system and screen of the equipment.

U disk slot: Insert U disk for program copy and data backup.

Air pressure display: display the current air pressure used by the equipment.

1-5 Technical parameters

BSM-420W Technical parameters	
Model	BSM-420W
Machinable materials	Round holder: φ98mm pure titanium and titanium alloy disc, pre-mill, etc. Square holder：pre-mill, glass ceramic
Number of linkage axes	4
Spindle speed	≦60000RPM
Built-in tool	Round holder: 6　　Square holder: 6
Cooling method	Water-cooled
Power supply	220V
Air pressure	0.65~0.8MPa
Working environment	5~40℃/ 41-104°F
Dimensions (mm)	Length*width*height：800*570*1650

Weight	About 300Kg
Total power	3.7KW

X,Y, Z axis stroke range：120mm\170mm\110mm

X,Y,Z axis resolution：0.001mm

A-axis rotation range：0°- 360°

1-6 Precautions

Before working with this machine, make sure all safety precautions are taken. This machine must be operated when the front door is closed. Please press the "Stop" button in case of emergency.

The ground wire must be organized properly to prevent personal injuries.

Make sure the cooling water pump and the cutting fluid pump are in good working condition every time before starting up the equipment, otherwise it will cause damage to the spindle and the cooling water pump.

Make sure the compressed air pressure is within the range of 0.65-0.8 MPa.

It is forbidden to rotate the holder or X/Y/Z axis manually.

When the machining process is interrupted unexpectedly, if you do not choose to continue from the pause position, the “Reset” button should be pressed to reset the program to the initial state. Otherwise, processing errors are prone to occur, and in serious cases, machine collisions will happen to damage the equipment.

After starting up, please check whether the spindle is in a safe position (it

should stay at the mechanical origin under normal conditions). If it is not at the mechanical origin, enter the “Manual” page and move the spindle to the mechanical origin. (Attention: If steps are not followed, the spindle will easily collide with the hard limit, resulting in loss of accuracy, and cause mechanical damage additionally).

After powering on, please ensure the tool number is correct, and all the tools are accurately placed in the magazine.

1-7 Use environment and requirements

1. Power requirements：1PH220V，50HZ;
2. Platform requirements: The platform of the equipment must be sufficiently rigid and even, otherwise it will affect the performance of the equipment;
3. Surrounding environment requirements: In order to make the product comply with the company's warranty and future maintenance, please pay attention to the following items:

- There is 25cm (9.84 inch) space between the equipment and wall to ensure good heat dissipation.
- Room temperature where the device is placed： 5℃～40℃ (41-104°F).
- Relative humidity where the equipment is placed： within 10%～80%, and no condensation.
- Keep away from vibration sources, high-frequency transmitters (such as ultrasonic).
- Keep away from fire sources, flammable and explosive materials, and in environments containing corrosive gases and liquids.

1-8 Transport and storage

1-8-1 Transport

When transporting, please use a lift truck or forklift. Lifting the equipment packaging box manually is not allowed. It is strictly forbidden to drag the shell/movable door or

slide the shell on the ground when relocation it.

1-8-2 Storage

Please keep the equipment in the packing box before installation, please pay attention to the following factors:

- The environments must be clean, dry, orderly and be free of corrosive gas and flammable gas.
- The environment temperature shall be in the range of 5℃~40℃(41-104°F)
- The package should be placed in a strict upright position, never place the equipment upside-down or sideways.

Chapter 2. Installation and Wiring

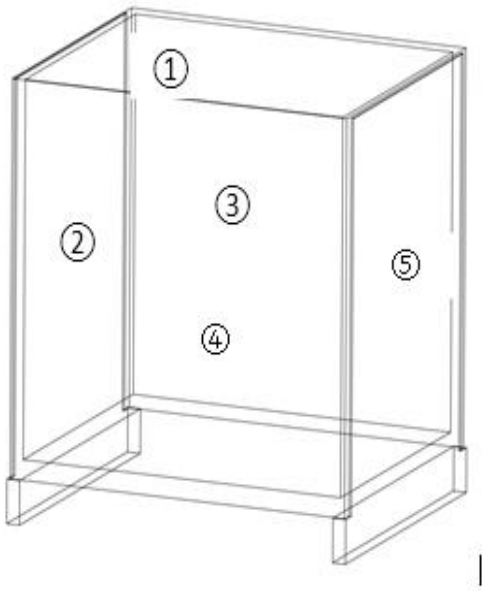
2-1Installation environmental conditions

Pls. strictly following the requirements in Chapter 1-7: Use environment and requirements/

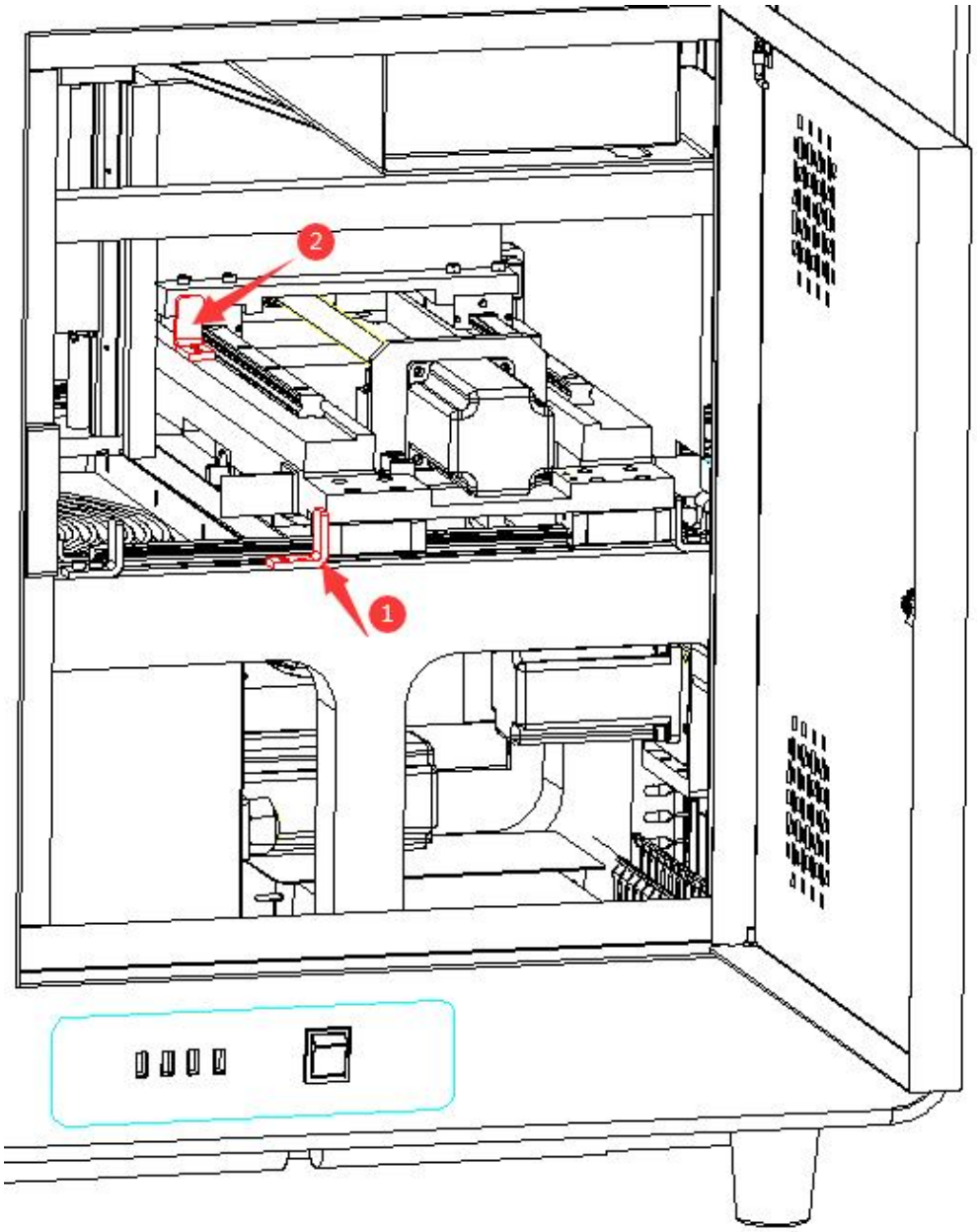
2-2 Installation steps

2-2-1 Unpacking

1) Before opening, pls. check the packaging of the device and make sure it is complete and undamaged. If there is damage, please contact BSM or BSM local dealer.
2) If there is no damage, unpacking the platform box and equipment box, starting from top face to side faces in the following order.（①→②→③→④→⑤）.

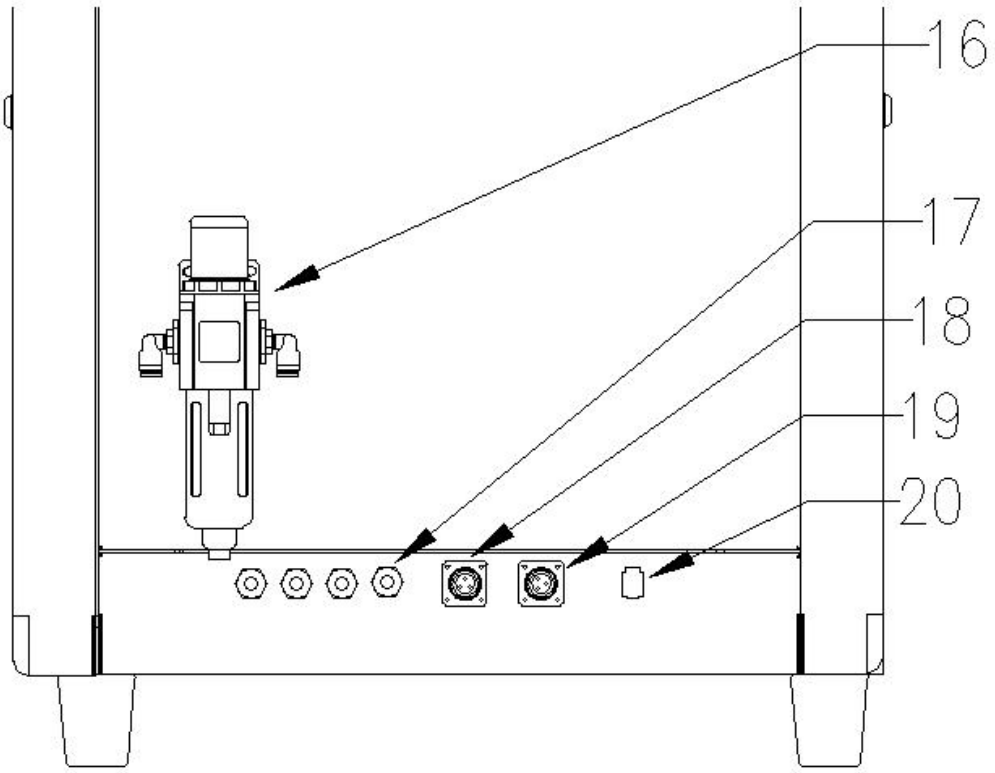


3) Count the accessories according to the packing list;
4) After removing all fixing screws on the outer package, install the platform on an even, rigid and stable space, remove the anti-collision film wrapped, place the equipment on the platform. Pls. report BSM or BSM local dealer with clear picture if equipment shell is scratched or cracked.
5) Remove 4 handle bars and install 4 screws to lock the equipment on platform.
6) Open the right side door on the equipment and remove the limiting blocks in the chamber, because the X and Y axes were fixed before delivery.



2-2-2 Line connection

Connect the power cord, gas supply system and water supply system as required:



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1) Power supply wiring: Connect the 1PH 220V, 50HZ power supply to the serial number 18 aviation socket, and connect the external plug board to the 19 aviation socket;
2) Air pipe wiring: connect the air pipe from interface marked “air” in No. 17 to the right side of air filter (No. 16), then connect the dry air with a pressure of 0.8MPA to the inlet on the left side of filter (No. 16).
3) Spindle cooling wiring: Connect the inlet and outlet pipes of the spindle chiller to the “inlet” and “outlet” interfaces respectively in No. 17;
4) Cutting fluid cooling wiring: Connect the cutting fluid water inlet pipe to the interface marked “standby” in No. 17;
5) Network wiring: connect the network cable to the interface in No. 20.

2-3 Equipment debugging

Before turning on the product, please prepare according to the following factors, otherwise it will cause irresistible damage to the equipment:

- Be sure the limiting block is cleared and all wires and lines are connected correctly.
- Make sure the air blowing pipe is in good working condition, and the air pressure is within the fixed pressure range (0.6-0.8 Mpa).
- Before the equipment is powered on, make sure there is enough water flow at the water outlet of the water pipe, and observe make sure there is no water leakage at the rear of the equipment.

Chapter 3. Operation Processing

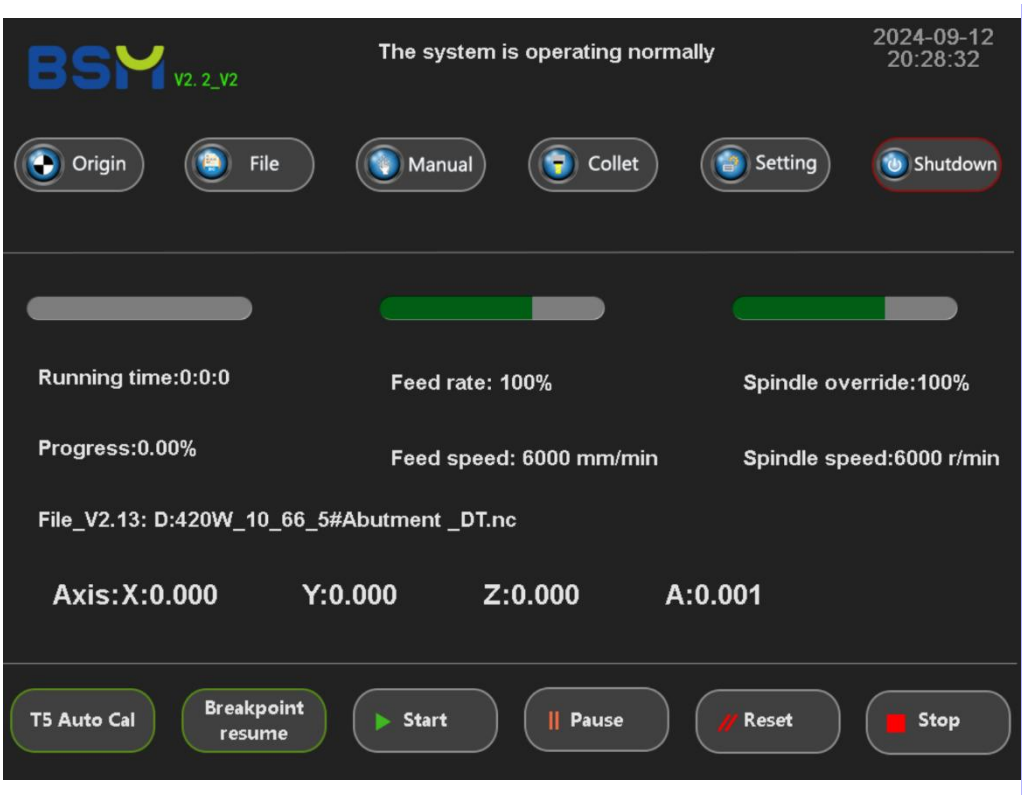
3-1 Equipment operation steps

1. Install processing materials, install tool magazine tools, install and detect the condition of water pipes and air pipes;
2. Power on the system, import the machining program into the system and execute the machining program;
3. Execute the origin return operation for each axis;
4. Carry out the tool magazine refresh action;
5. Press the start button to process.

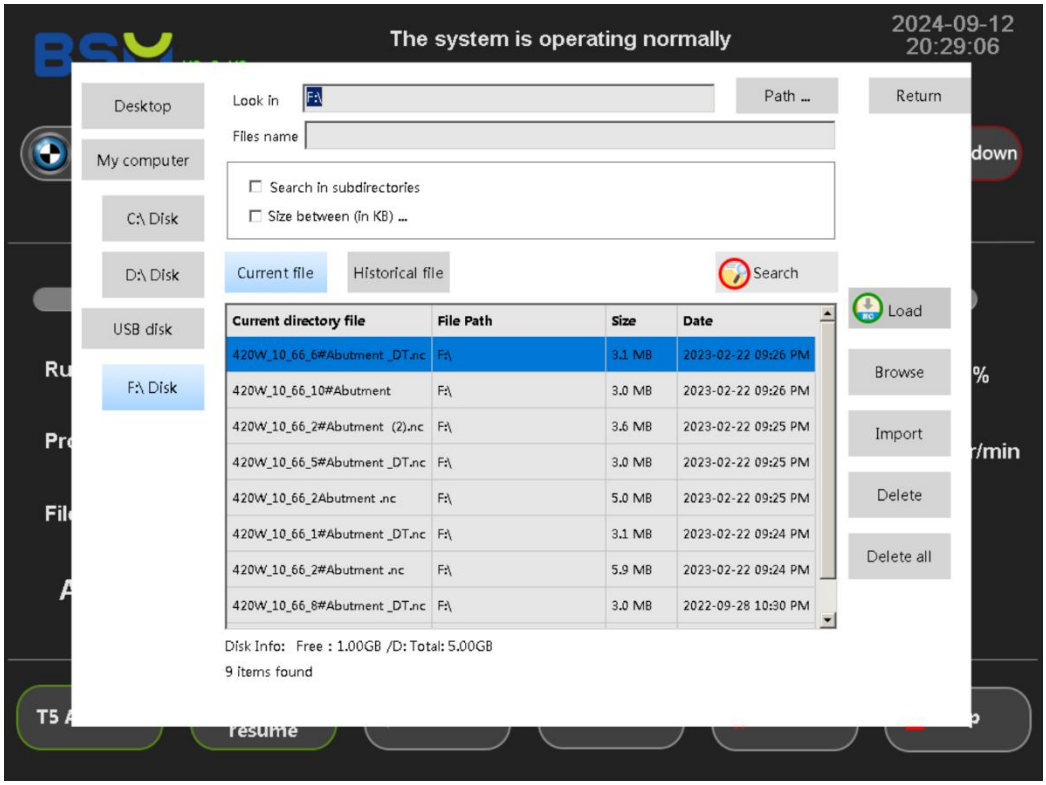
3-2 NC Processing document import

The specific operation steps of this system program import method are as follows:

1. Copy the NC file into the U disk, insert it into the host, and enter the system main interface;



2. Select the U disk program, select the file to be processed, and click to load;

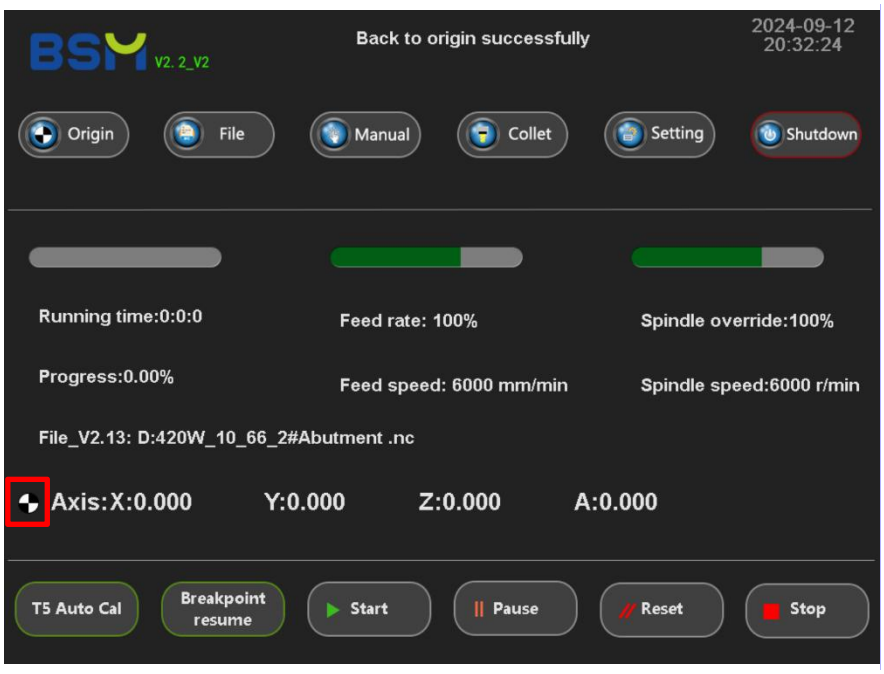


3. When the status bar shows that the processing file is loaded completed, it means that the file is loaded;

4. Execute the loaded program.

3-3 Zero points mark

If the screen has the following origin mark after power on and back to origin, you can operate according to the normal steps.

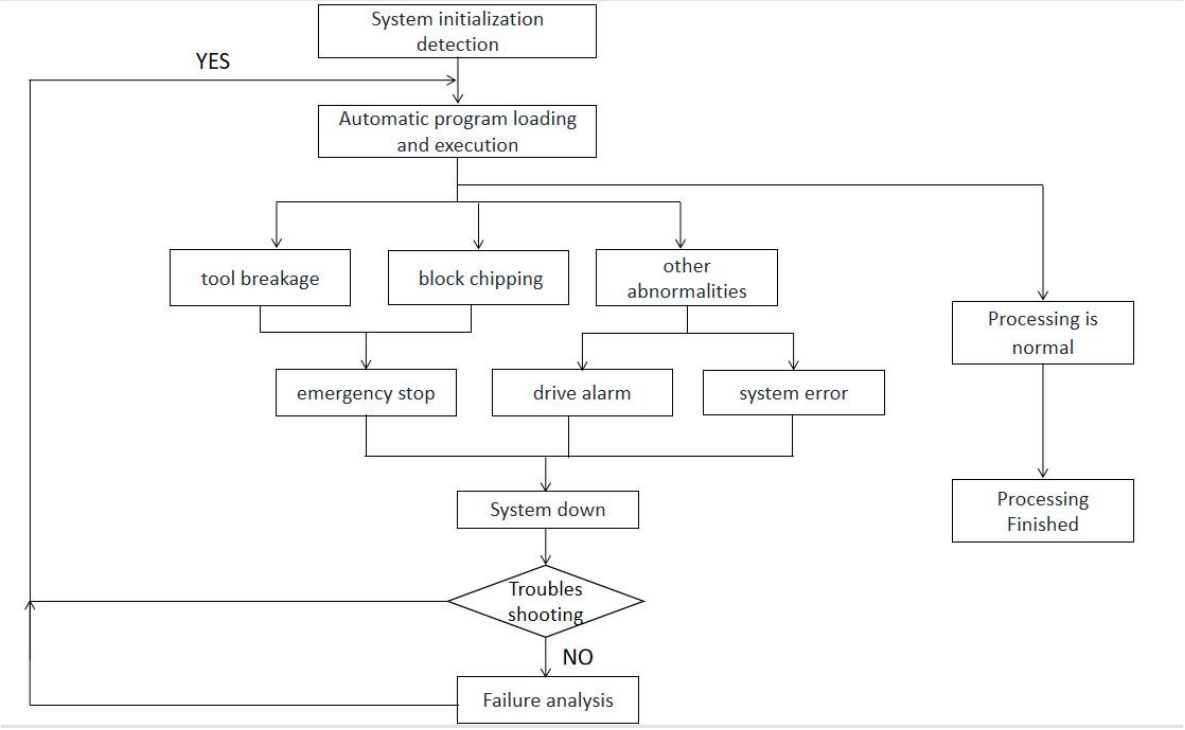


If there is no such mark after starting up, please contact the BSM and BSM local

dealer immediately.

3-4 Processing emergency treatment

If the tool is broken or abnormal during the processing, please refer to the following methods to deal with it:



3-5 Tool maintenance

The tool is another determinant of the processing quality. The quality of the tool directly determines the processing efficiency and the quality of the processing. Therefore, when the tool is used for a period of time or affects the processing quality(the processed product has edge cracking, falling off, or chips appears during processing）, the following tool replacement operations should be performed:

1. First perform the "Ref" operation to ensure that the system has returned to the system reference point;
2. Replace the tools in the tool magazine with new ones and place them in the order of 1#2#3;
3. Set the system mode to "Manual" to perform T1 tool replacement;

4. After the tool replacement is completed, refresh the magazine status;
5. After a period of time milling or the milled restorations has reached a specified number, the edges and chipping conditions need to be strictly checked. You can use a 20x microscope to check if the tool's coating falls off and the cutting edge is chipped. To mill some complex restorations with more details, must ensure the tools are qualified;
6. Note for T3 tool: As the T3 tool is φ0.6mm and the bur is made from high hardness and low toughness material. Therefore, when performing a tool change operation on T3, you must take care to prevent the tool tip from breaking and affecting the normal running of the equipment.

3-6 Material clamping/ loading

The following operations must be paid attention to when loading the blanks:

1. No milling dust left inside of the holder. The cavity of the holder must be clean before loading a blank.
2. If the holder is deformed due to artificial damage, please do not use it and contact the BSM or BSM local dealer for replacement.
3. When tighten the circle holder, tighten each screw in diagonal order gradually and evenly in 3-4 successive times to make sure the blank will bear even stress after loading.

3-7 Abnormal detection

There are system information prompts on the bottom of the LCD screen. If the system fails during work, the corresponding alarm information will be prompted on the screen to provide equipment failure information.

When the system has an abnormal prompt, the user can click the "Reset" button to reset the related abnormality. If the abnormality still exists after reset, please contact the BSM/BSM local dealer to solve it.

Chapter 4. Maintenance and Precautions

4-1 Maintenance instructions

1. It is recommended to clean the cutting residues in the processing area every day to ensure that there is no accumulation of residues around the spindle sleeve and the tool setting surface of the tool setting instrument.
2. Before changing the material, the processing area changing should be cleaned up.
3. Check the water level of the water chiller and the water output of the water pump every week. When the water level is lower than normal, replenish or replaced it in time. The cooling water should be pure water with an appropriate amount of anti-rust fluid, it's recommended to replace the circulating water once a month. Check the water level of the cutting fluid tank every day, and replenish the cutting fluid in time when the water level is lower than normal. It is strictly forbidden to switch on the cutting fluid pump when the water level is low.
4. In order to avoid computer virus invasion, please make sure the specific U-disk only transferring safe files for this machine.
5. Ensure that the internal temperature of the equipment is in the range of 5℃～40℃.
6. Good ventilation should be ensured inside the equipment to prevent the service life of the equipment from being affected by high internal temperature.
7. After each processing, the dust in the spindle chuck should be cleaned carefully and completely to prevent the clamping of the tool from being affected by the accumulation of dust.
8. Check the guide rails bearing seat every month. Tighten it when it is loose and report to BSM/BSM local dealer when there is abnormal sound..
9. Refuel the guide rails every 90 days to ensure the lubrication of the bearing.
10. Ensure the cleanliness of the guide rails each time to prevent dust accumulation and affect the accuracy of the screw.

4-2 Statement

1. If any material other than above mentioned will be processed on this equipment, please do the evaluation work according to the above equipment parameters, and the user shall be fully responsible for all the results including any unexpected situation caused by it.
2. Without the consent and permission of BSM, it is strictly forbidden to disassemble the external and internal spare parts and electrical accessories of the equipment. BSM will not be responsible for the equipment damage caused by this.
3. This equipment is assembled with precision electronic components, which requires a high degree of cleanliness of the air source. A triple air filter is already installed in the machine. Make sure the air tubes are properly connected to external air compressor through this triple air filter.
4. Non-Warranted parts list

   Silicone dust cover, Spindle chuck, Tool holder, Tool setter, Milling Burs

Chapter 5. Common Issues and Solutions

5-1 Common issues and solutions table

Fault phenomenon	Possible reason	Solutions
Power on, no display on the panel	The internal power supply of the device is disconnected	Disconnect internal power cord and check if the power cord is normal
X/Y/Z/A limit	The system runs to the limit position	Check whether the system limit switches are loose
Spindle failure	Water chiller failure	Check the water chiller
OCC	Overcurrent	Immediately stop the machine and contact the technical support

OV	Over voltage	Immediately stop the machine and contact the technical support
OL	Over load	Check whether the load is stuck
CF	Abnormal driver detection circuit	Immediately stop the machine and contact the technical support
OH	Over heat	Stop the machine and unplug power supply till the internal tempreture is below 30℃
A.910	Over load	Stop the machine and check whether the load of each axis screw is overloaded

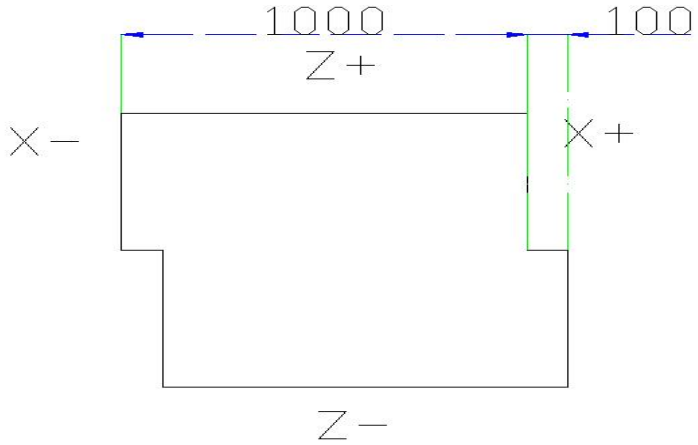
Note:

* For other faults other than the above faults, please contact BSM/BSM local dealer at the first time.

Chapter 6. Equipment Calibration

6-1 X-axis offset

If the offset is in the negative direction, as shown in the figure:



The X axis is offset by 1mm in the negative direction. In this condition, necessary to offset the origin position of the workpiece to the X positive direction by 0.5mm. For example, the origin position of the X-axis workpiece is 68.780, then set it to 69.280.

6-2 Z-axis offset

When the Z axis is offset, the thickness of the cut object changes.

For example: the set thickness of the object is 10.100mm, and the thickness of the cut object is 10.400. In this condition, increase the Z-axis offset by 0.15mm. For example, if the original Z-axis offset is 18.160mm, then set it to 18.310mm.

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**Besmile reserves the right to product upgrade and wiring changes. If the machine received is different from the above described, please contact BSM/BSM local dealer immediately.