Milling Machine Operation manual

Type：BSM-520W

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Chapter 1 Introduction

1-1 Preface

Dear customers,
thank you for choosing BSM-520W, it is a 5-axis wet dental CNC Milling Machine.
In order to get a better product experience, before using this machine, please read this manual carefully to make sure it is used correctly.
You may find updates of this document at https://www.bsmdental.com/service
More questions please contact your local dealer or info@cdbesmile.com

1-2 Safety instruction

The following matters should be followed before you finish reading this manual:

- The installation environment must be free of moisture, corrosive gas and combustible gas.
- When wiring, it is forbidden to connect the three-phase 220V power supply or 380V power supply to the equipment. If the connection is wrong, the internal components of the equipment will be damaged or personal injury will be caused.
- The earth wire must be connected correctly in accordance with the provisions of the electrician regulations of your region.
- Do not touch the machine and especially the cables with wet or damp hands.

During the process of delivery inspection, equipment installation, wiring, operation and maintenance, the following signal words shall be noted at all times:

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.

Note: To ensure the correct operation, please read this Operation Manual carefully.

Accessory List

Please refer to the accessory list to check the parts:

Device Name	Number	Specifications and Model	remark
Five-axis linkage machining center	1	BSM-520W	
Cooling tank	1		
M4 hexagon	1		
M5 hexagon	1		
Power cord	1		
Instruction	1		
Air hose	2	1.5meter φ8	
Water hose	2	1.5meter φ8	
Water hose	1	1.5meter φ16	
The 6-hole socket board	1		
CAM software	1		
Tool	15	Ball 3.0 RC16 Ball 2.0 RC12 Ball 1.5 RC8 Ball 1.0 RC10 Ball 1.5 RC12 Flat 2.0 RC7 Flat 1.0 RC5 Nose 1.5r0.1 RC8 Nose 1.5r0.1 RC14 Nose 2r0.2 RC8	D6 metal needle

		Drill 2.2 RC18 Drill 1.5 RC13 D2.5 D1.0 D0.6	
Spindle collet disassembly tool	1		
φ8 connector	4		
Key	1		
Cutting water tank	1		Contains a water pump
Cutting fluid	1		
φ8 connector tee	3		
Bellows	1		
M4X25 screw	12		
M4X8 screw	6		
M5X12 screw	6		
Clamp	1		on the bellows
Air source processor	1		installed on the device
Titanium disc	1	98 X 14mm	
Titanium column	5		
Glass ceramics	3		
Substitute wood	3		
U-disk	1		

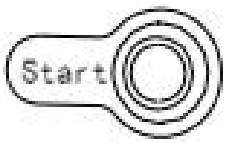
If you find that the parts list does not match, or there are problems in the product appearance inspection description, please contact our business center personnel for proper solution.

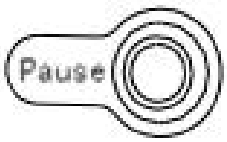
Chapter 2. Product Overview

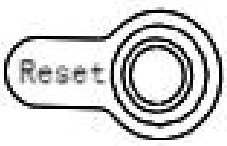
2-1 Product introduction

BSM-520W is a high-precision, high-efficiency, high-reliability and high-intelligence integrated dental milling equipment. The equipment adopts the most advanced technology in the field of CNC machining, five-axis linkage technology, equipped with a high-precision electric spindle, which is stable and reliable in performance, with a longer service life. It is equipped with an efficient CNC system and high-resolution servo control system, capable of precise data processing and analysis. It features rated torque output and automatic tool change functions, real-time monitoring, and is built with international cutting-edge dental processing software. This ensures the leading position of the equipment and the diversity of processing materials. The BSM-520W can process a variety of oral materials including pure titanium, titanium alloy, PEEK, PMMA, wax, substitute wood, and cobalt-chromium alloy.

2-2 Product Appearance and Function Definition



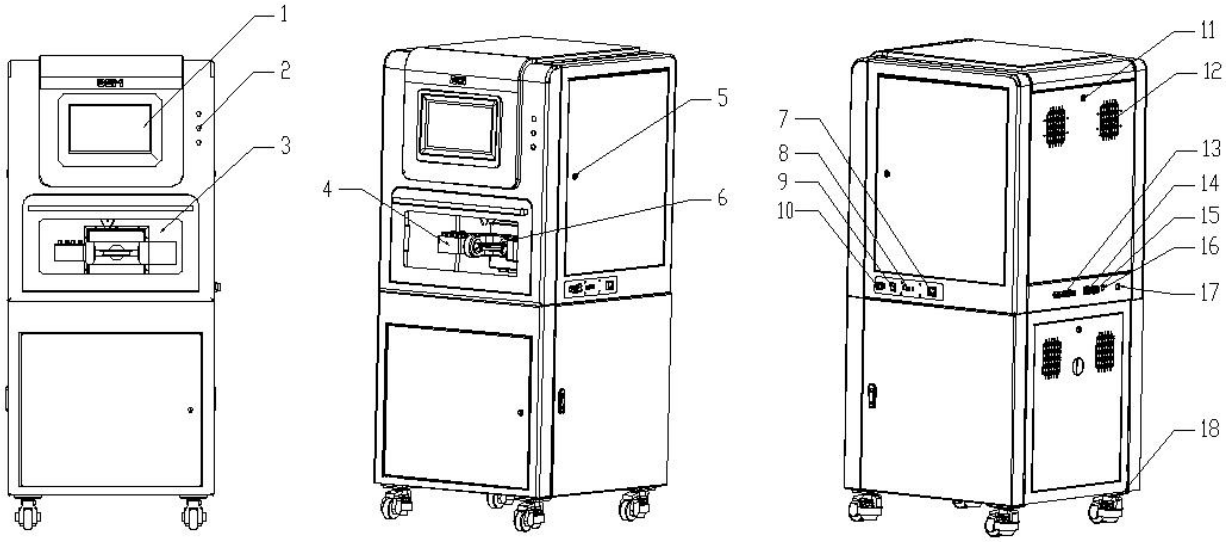




2-2-1 Definition of Operating Buttons

Start: Press this button to begin processing after the system is ready and the processing document has been loaded into the system.
Pause: Pauses the program's execution. To continue, press the Start button, and the program will resume from the paused position.
Reset: Press this button to reset certain alarm states when an alarm occurs, or press this button during pause to return the program to its initial state.

2-2-2 Function Definition



1. LCD Touch Screen: For equipment operation

2. Operation Buttons: Start， Pause， Reset

3. Viewing Window: To observe the device's operational status.
4. Tool Magazine: Placement location for tools and tool setters.
5. Side Door Keyhole
6. Fixture: Used for work-piece clamping.
7. Digital air pressure display: it shows the pressure of compressed air
8. USB Port: For program import and export.
9. Power Button: Switch on/off
10. Emergency Stop: Used to interrupt the device operation in emergency situations.
11. Rear Door Keyhole
12. Cooling Vents: for heat dissipation
13. Spare, Air Tube, Cooling Water Inlet, Cooling Water Outlet
14. Power Input
15. External Power Supply

16. Ethernet Connection Port
17.Cutting fluid Inlet
18. Casters

2-3 Technical Parameters

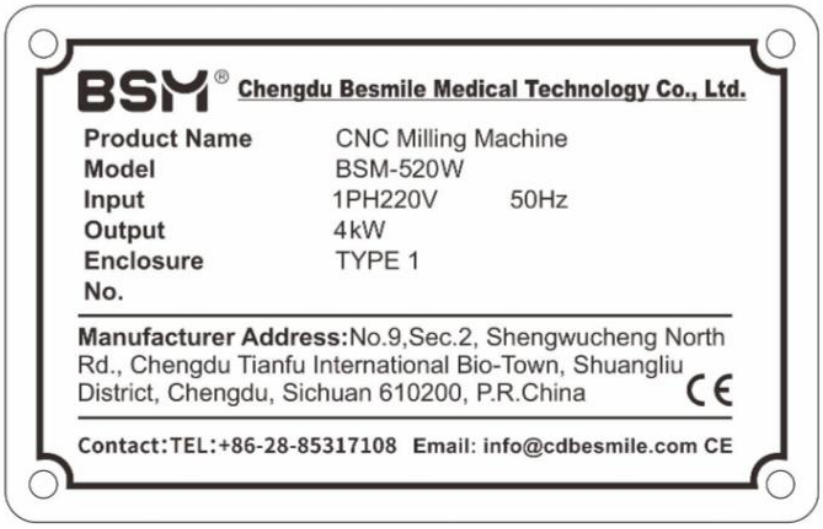
Technical Parameters			
W*D*H	770mm*800mm*1700mm	Weight	500kg
Built-in Tools	16	Number of linkage axes	5
Tool Types	Ball-mill D3.0RC16	Ball-mill D2.0RC12	Ball-mill D1.5RC8
	Ball-mill D1.0RC10	Ball-mill D1.5RC12	End-mill D2.0RC7
	End-mill D1.0RC5	Bull Mill 1.5RC8	Bull Mill 1.5RC14
	Bull Mill 2RC8	Drill D2.2RC18	Drill D1.5RC13
	Glass ceramic needle 2.5	Glass ceramic needle 1.0	Glass ceramic needle 0.6
Voltage/Power	220V/4Kw	Air Pressure	＞0.65Mpa
Working Environment	5℃~40℃	Motor Type	AC Servo
Scope of Processing			
Millable Materials	Titanium, Titanium Alloy , PMMA, PEEK, Wax, Co-cr Alloy, Substitute Wood，Glass ceramic，Titanium premill	Millable Restorations	Full Crown, coping, Inlay & Onlay, Veneer, Splint, Customized Abutment, Implant Bridges & Bars
Functional Features			
Repetition Accuracy	±0.005mm	Automatic Tool Length Detection	Positive
Cooling System	Automatic Water-cooling Spindle	Automatic Tool Life Detection	Positive
Vacuum System	Negative	Remote Assistance	Positive

Dry Milling	Negative	Touchscreen Control	13.3-inch True Color Touch Screen

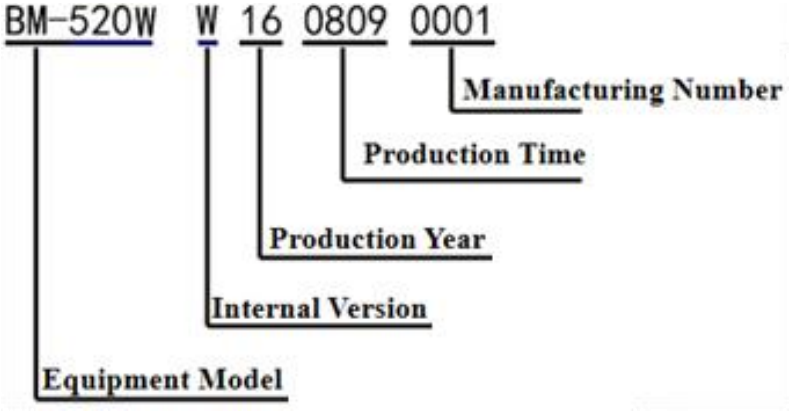
2-4 Mechanic Parameters

- X, Y, Z Axis Stroke Range: 280mm, 105mm, 190mm
- X, Y, Z Repeat Positioning Accuracy: ±0.005mm
- X, Y, Z Positioning Accuracy: ±0.005mm
- axis Rotation Range: ±360°
- axis Rotation Range: ±30°
- Maximum Size of Milling Materials: 98mm

2-5 Nameplate Explanation



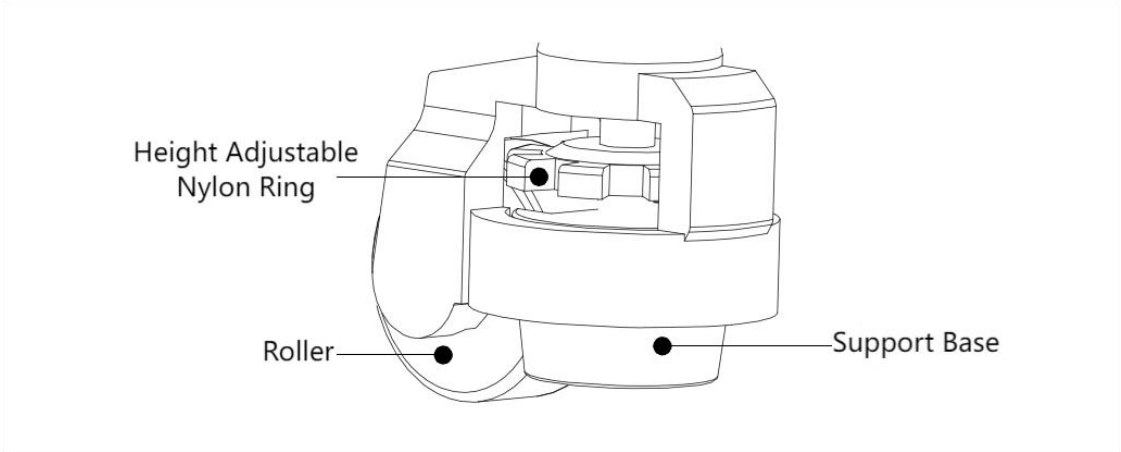
Production Control Serial Number Explanation



Chapter 3. Transportation and Storage

3-1 Transportation

When transporting, the platform and device are separated， please use a lift truck or forklift for safety. After installation, for short distances moving, the device can be moved with its built-in casters. Since the device's built-in casters can only pass steps of limited height, please ensure to move the device on a flat surface to prevent the device from tipping over when moving over higher steps. To use the device's built-in casters, first adjust the height by raising the supporting base with the nylon rings, then the device can be pushed on its casters.



3-2 Storage

Before installation and debugging, please keep the device inside its packaging box. If the device is not in use temporarily, to ensure it meets our company's warranty criteria and for ease of future maintenance, please pay close attention to the following storage conditions:

Must be placed in a dust-free, dry location.
The storage environment temperature must be within the range of 0°C to 40°C.
The storage location must be free from corrosive gases and liquids.
When stacking devices, please strictly follow the stacking signs indicated on the packaging box.

Chapter 4 Installation and Wiring

4-1 Installation Environment Conditions

1) **Power Requirements**: Single-phase 220V, 50HZ
2) **Placement requirements**: the equipment must be placed on a stable platform that could support the weight, otherwise the performance of the equipment will be affected.

3) Ambient environment requirements：

- Ensure there is more than 40cm of space around the device for good heat dissipation.
- The ambient temperature where the device is placed: 5°C ~ 40°C.
- The relative humidity where the device is placed: within 10% ~ 80%, with no condensation or water vapor.
- Keep away from sources of vibration and high-frequency emitting devices (such as ultrasound).
- Keep away from fire sources and flammable, explosive materials, and environments containing corrosive gases or liquids.

An ambient temperature below 40℃ is recommended for long-time operation to ensure reliable performance of equipment components. If the ambient temperature exceeds 40℃, please place the equipment in a well-ventilated place or a place with air-conditioner.
In addition, please comply with the following requirements when choosing an appropriate placement. Failure to comply with the following precautions may prevent the equipment from being covered by the company’s warranty coverage and future maintenance:

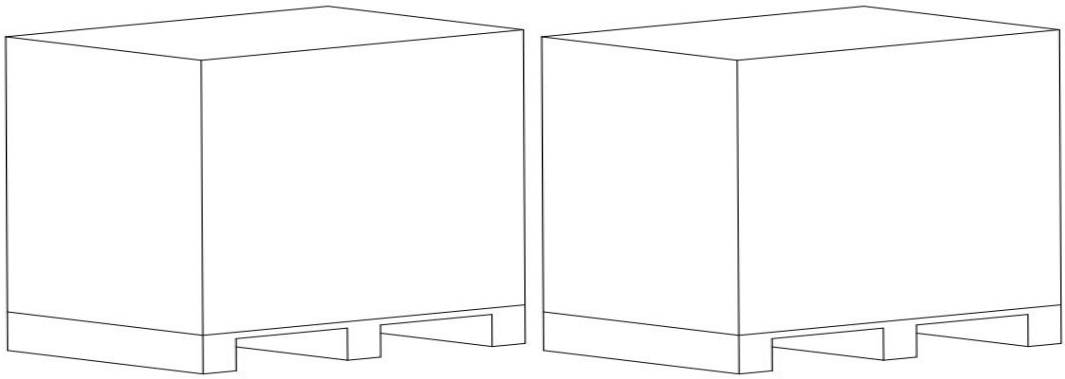
- The suitable installation environment for the equipment includes: place without a lot of heating equipment; place without water, droplets, steam, dust and oil dust, corrosive, flammable gas and liquid; place without floating dust and metal particles; place sturdy without vibration and electromagnetic noise.
- The temperature and humidity of the equipment installation site shall not exceed the specific range.

4-2 Installation Steps

For detailed information, please connect BSM or BSM authorized dealer for installation video.

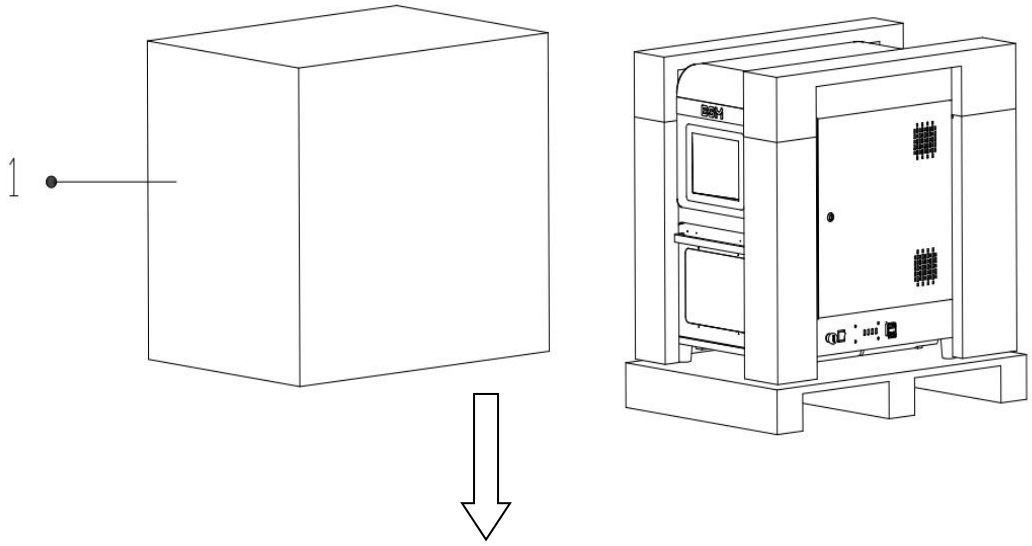
1) Check package:

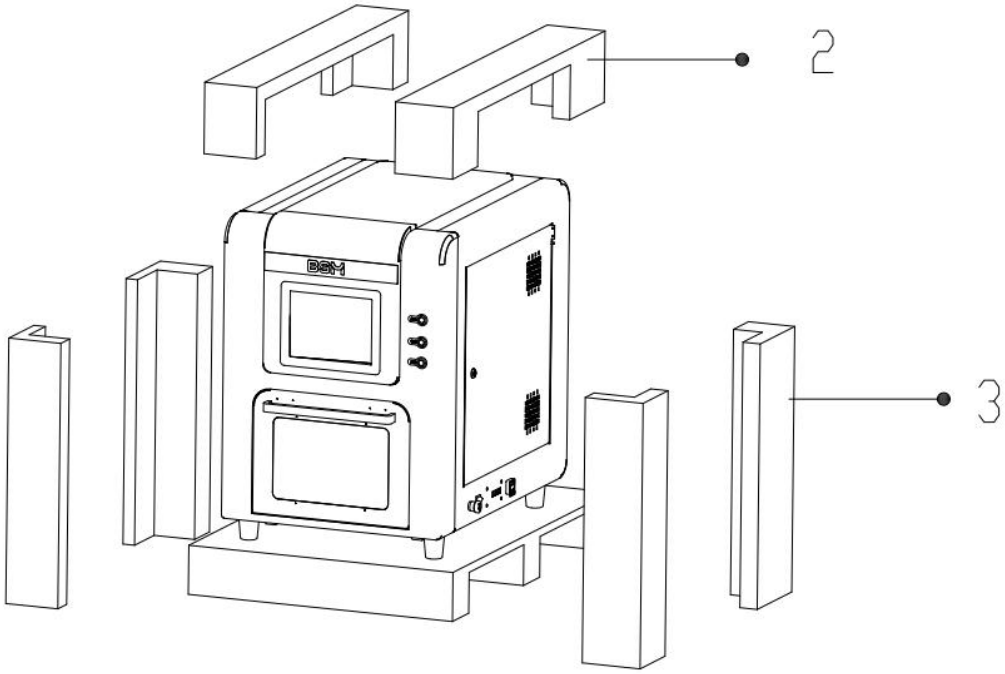
Before opening the packaging box, inspect the external packaging of the device for any damage. If there is no damage, proceed with the unboxing steps as follows (1→2→3). If there is damage, please contact BSM or BSM authorized dealer.



2) Unpack the device:

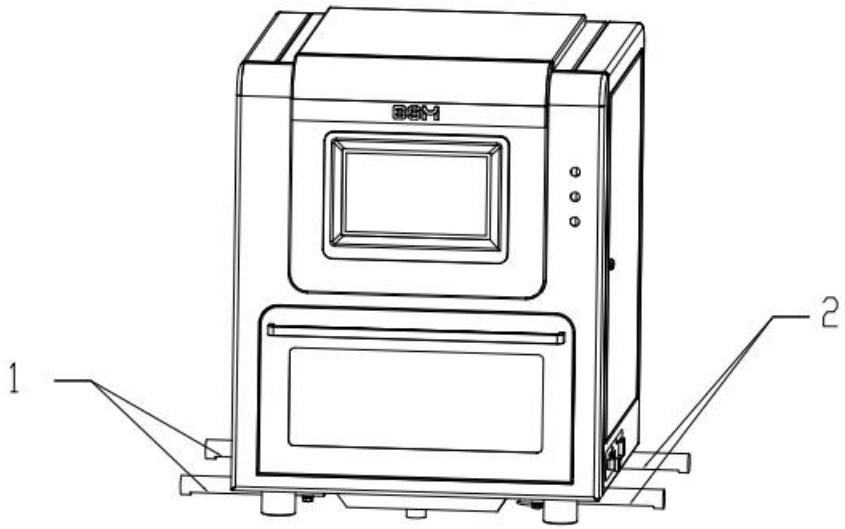
If there is no damage, unpack the platform box and device box，remove the protective foam around the device.



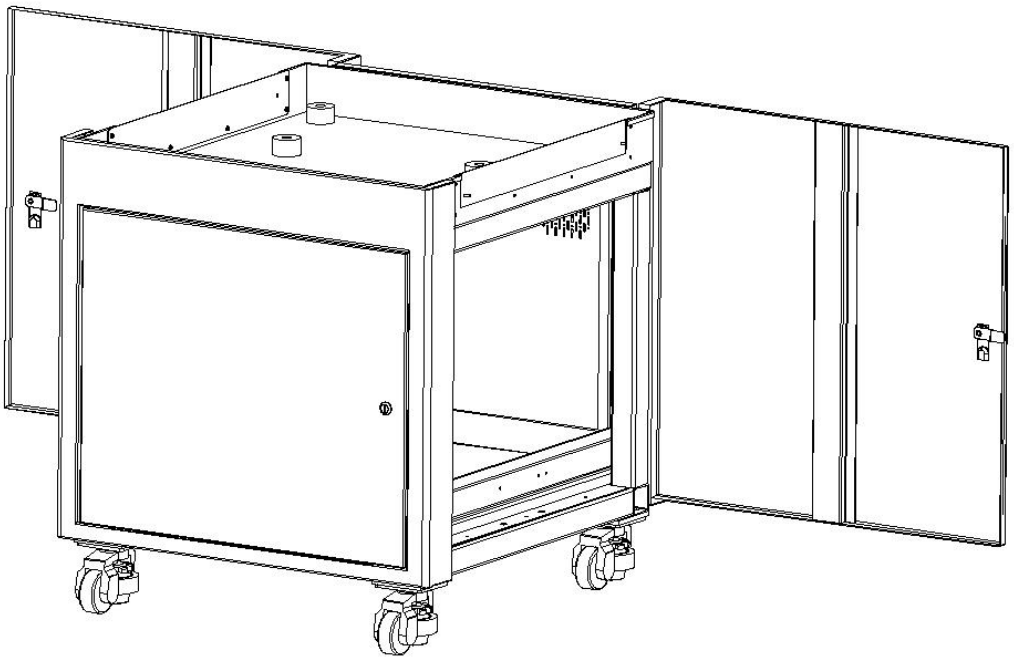


3) Accessory List Check:

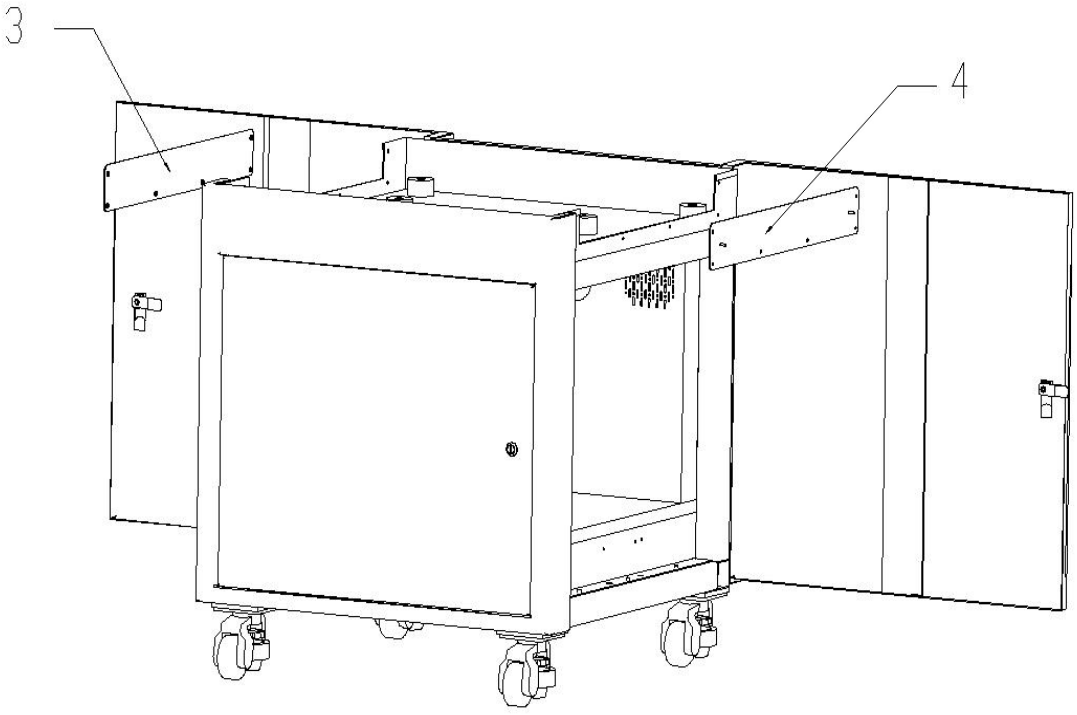
Please check the accessories according to the Accessories List(refer to page 2). If discrepancies with the accessory list are found or if any issues described in the product appearance inspection arise, please contact BSM or BSM authorized dealer to obtain a proper resolution.



Equipment Body

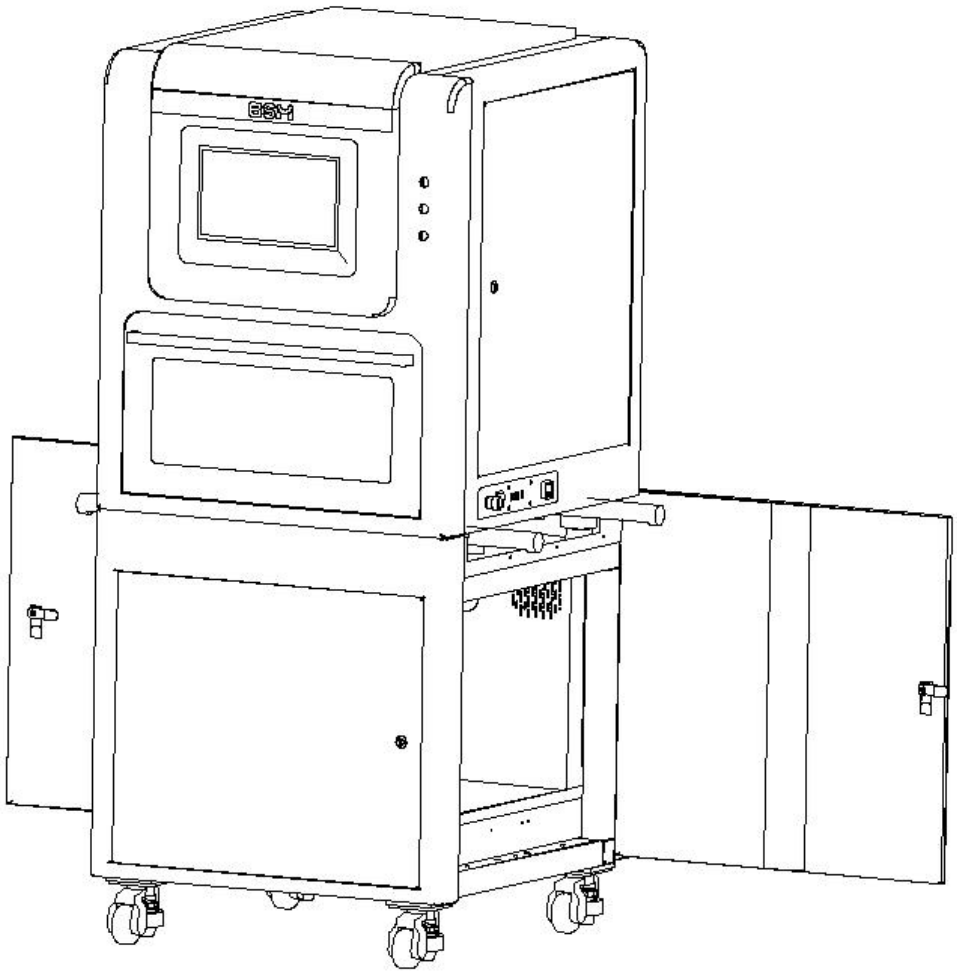


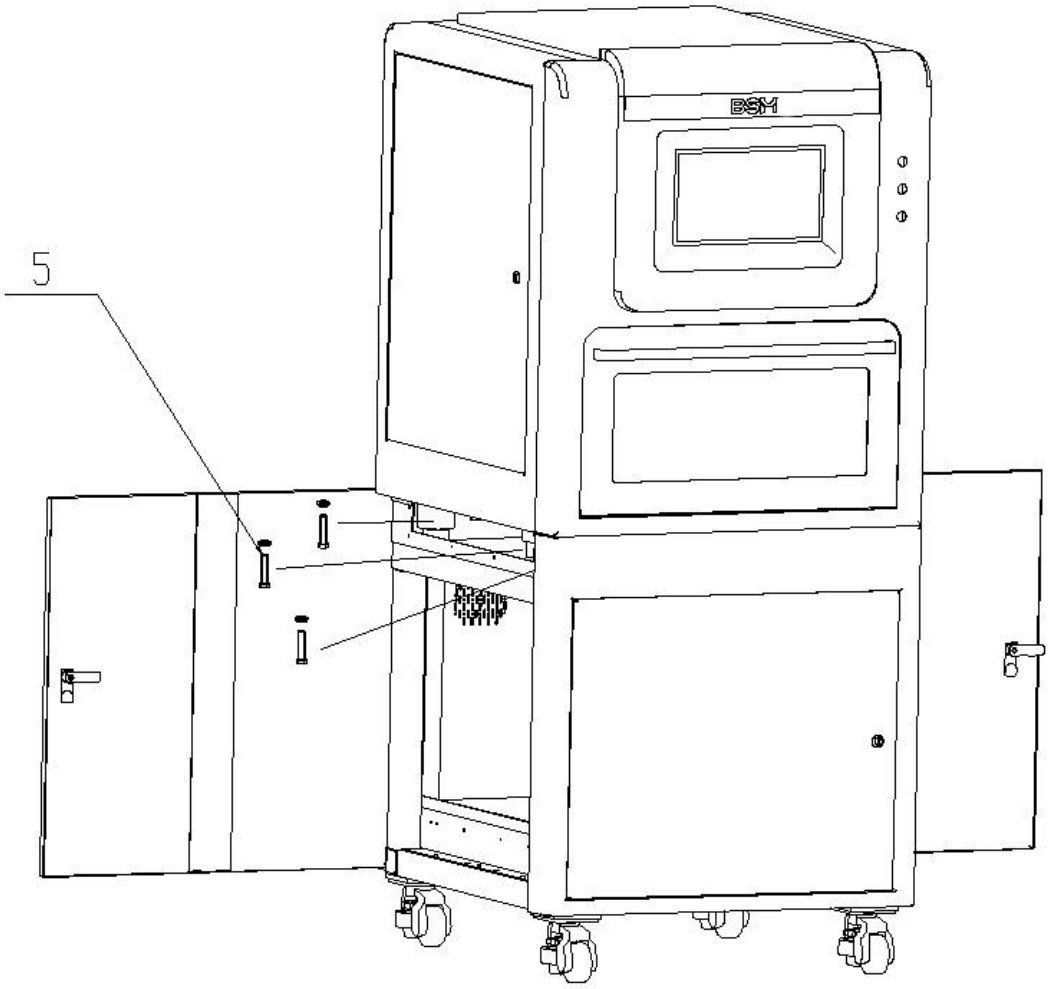
Equipment Base



4）Since the body and base are packaged and transported separately. After the equipment is unpacked, it is necessary to carry out simple assembly on site. During assembly, rotate the lifting rod of the body as shown in the figure above and open the left and right doors of the base as shown in the figure. After removing the 3 and 4

baffles, use the forklift fork to insert the body into the position 1 and 2, and align the body with the shell of the base.

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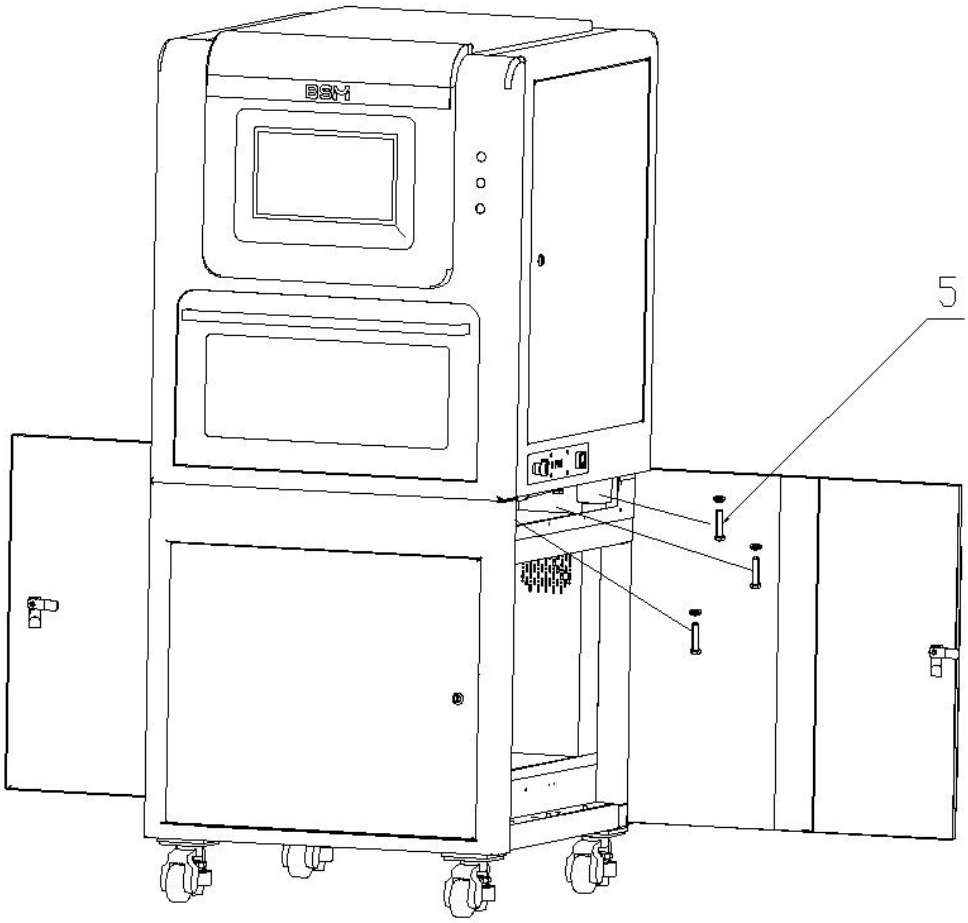
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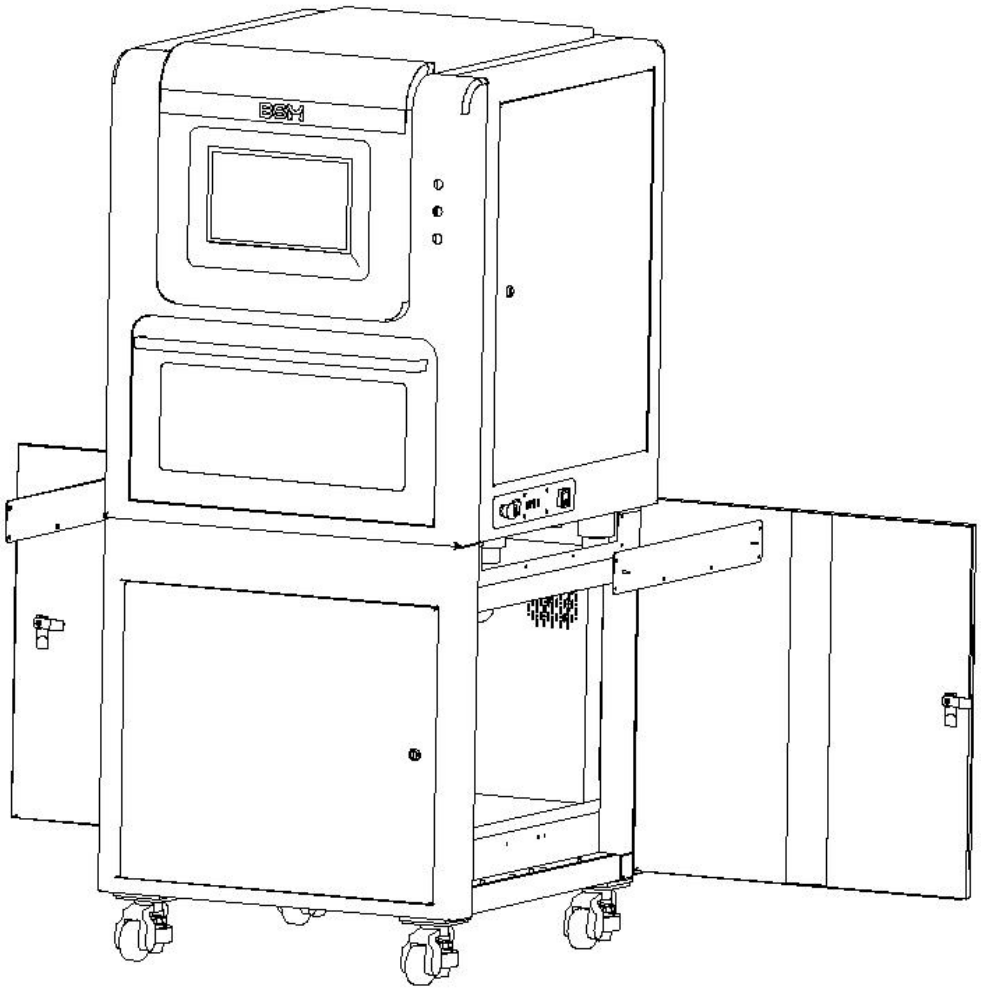


5）Rotate the body lifting rod to the original state, and connect the base to the body using M12×110mm screws in the accessory. After connecting the body to the base, install the removed 3 and 4 baffles. Close the left and right side doors of the base to complete assembly.

Assembly completed
After assembling, remove the transportation fixing attachments located inside the processing area.

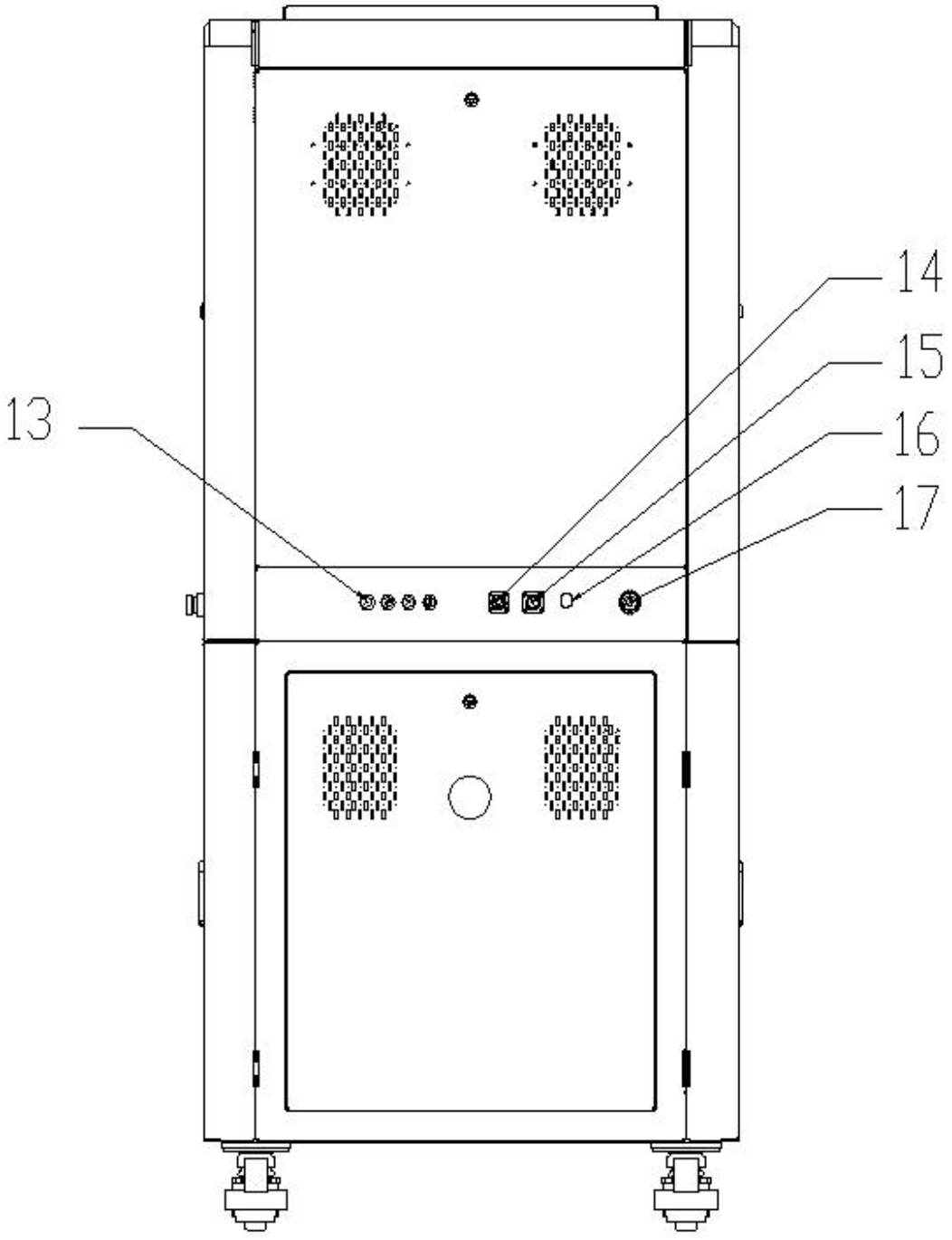
6）Device check:

Remove the protective film wrapped around the device and check the following items:

- Check the equipment nameplate to make sure it matches the purchased model
- Check if the device's LCD touch panel has any scratches or cracks.
- Check the device surface for any scratches, loosen screws and signs of damage

7）Wiring Connection:

Connect the power cable, external power cable, compressed air and Internet as required.



- Power connection: No. 14 named power cable.
- External power cable connection: No.15 named external power cable
- Compressed air connection: Connect the pressure of 0.8Mpa and dry air to the

equipment through the air source pipe in No.13

- Network connection: Connect the Ethernet cable to the network port labeled No. 16.
- Cutting liquid cooling connection:In order to facilitate the cutting fluid tank to be placed under the body, connect the water outlet of the pump in the cutting fluid tank to the water inlet No.17.

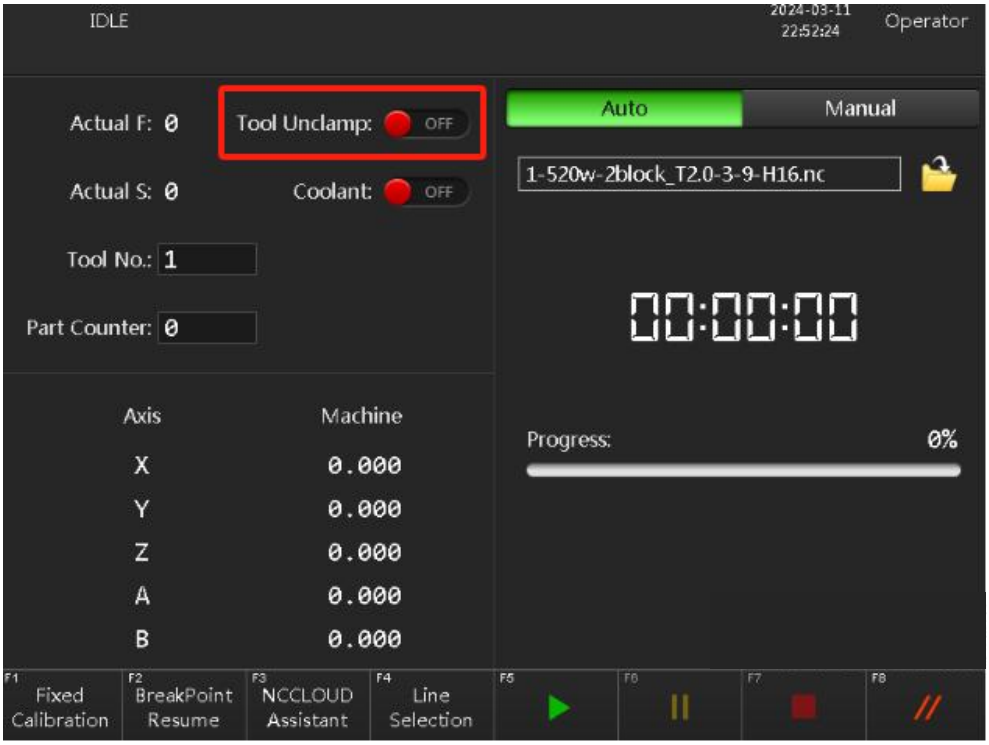
8) Water chiller connection:

Add pure water to water chiller until the water level is in the range of “Full”. It is used to cooling the spindle.
Put the water chiller beside the device, connect the power of water chiller to external power cable (No. 13), connect the ware inlet of water chiller to outlet of device, outlet of water chiller to inlet of device (No. 13).

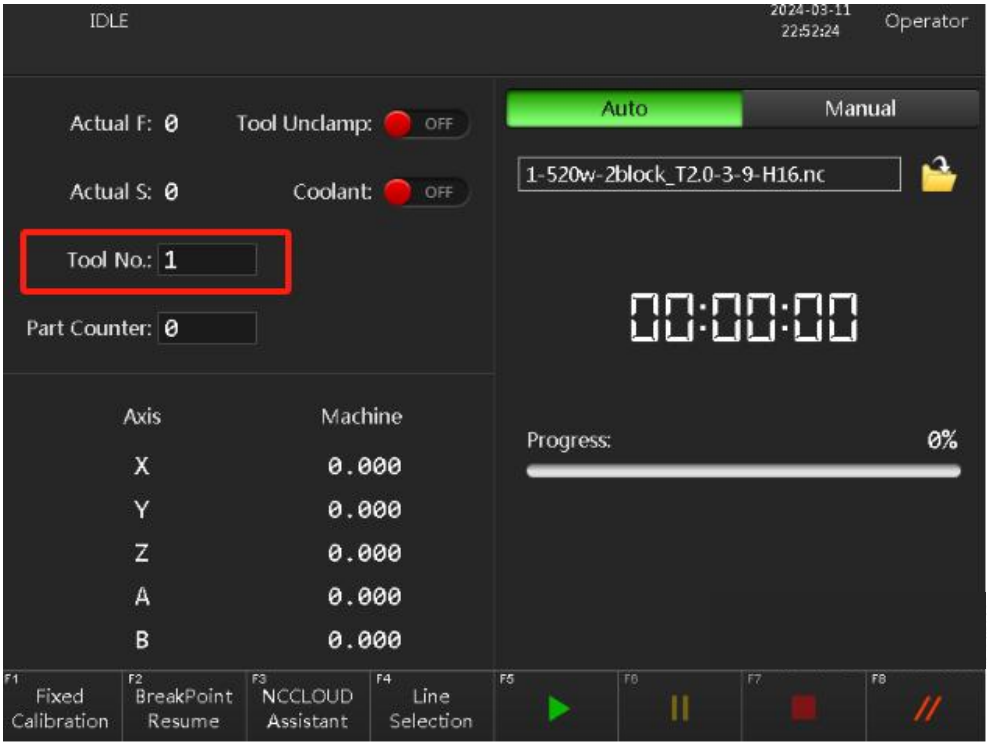
After connected all the connections, power on the device by the power button (No.9).

4-3 Install milling burs

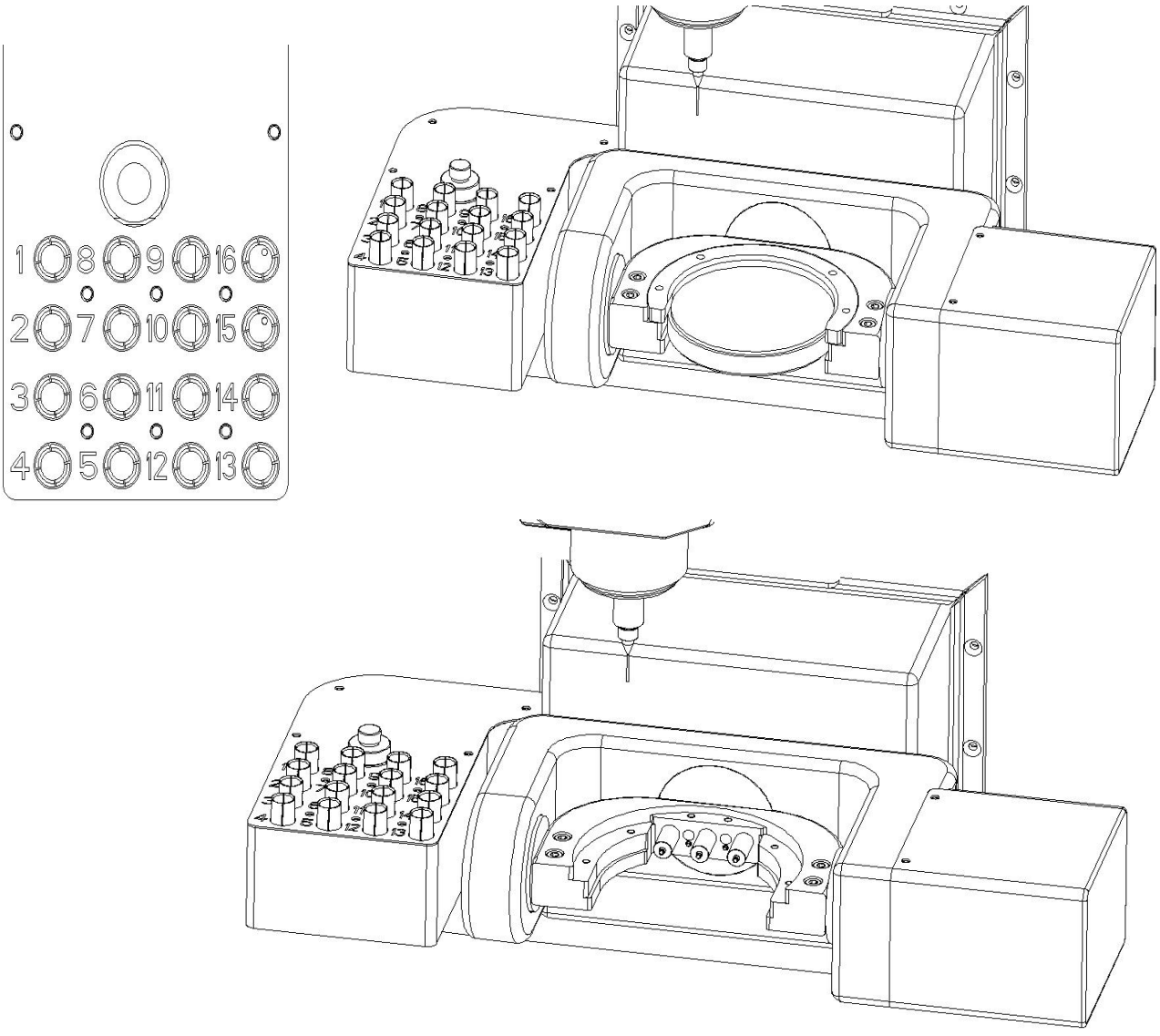
1) Hold the protective rod in spindle collet with your hand.
Click ‘Tool Unclamp’ on screen, take down the protective rod.

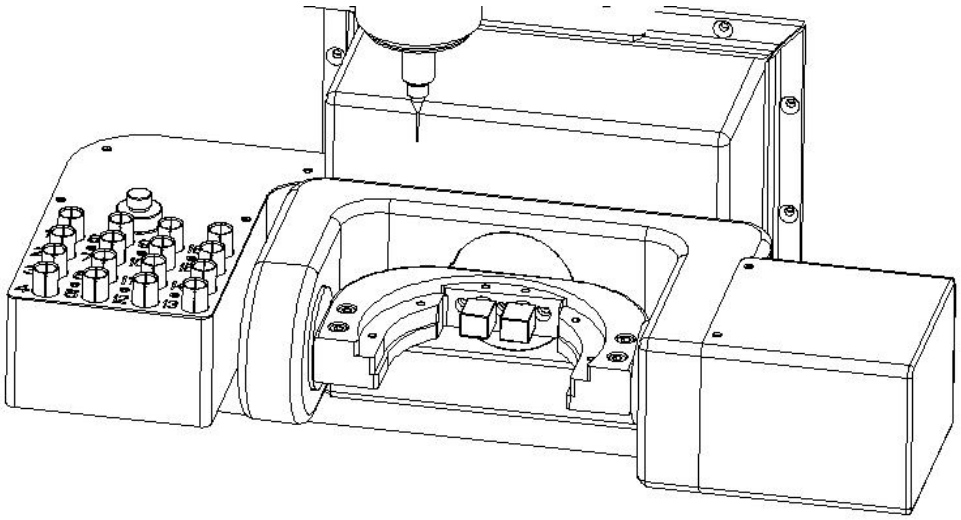


2) Check the tool number on screen and install the corresponding tool to spindle. (For example, it is T1 on screen now, please insert 3mm ball-mill to spindle.)



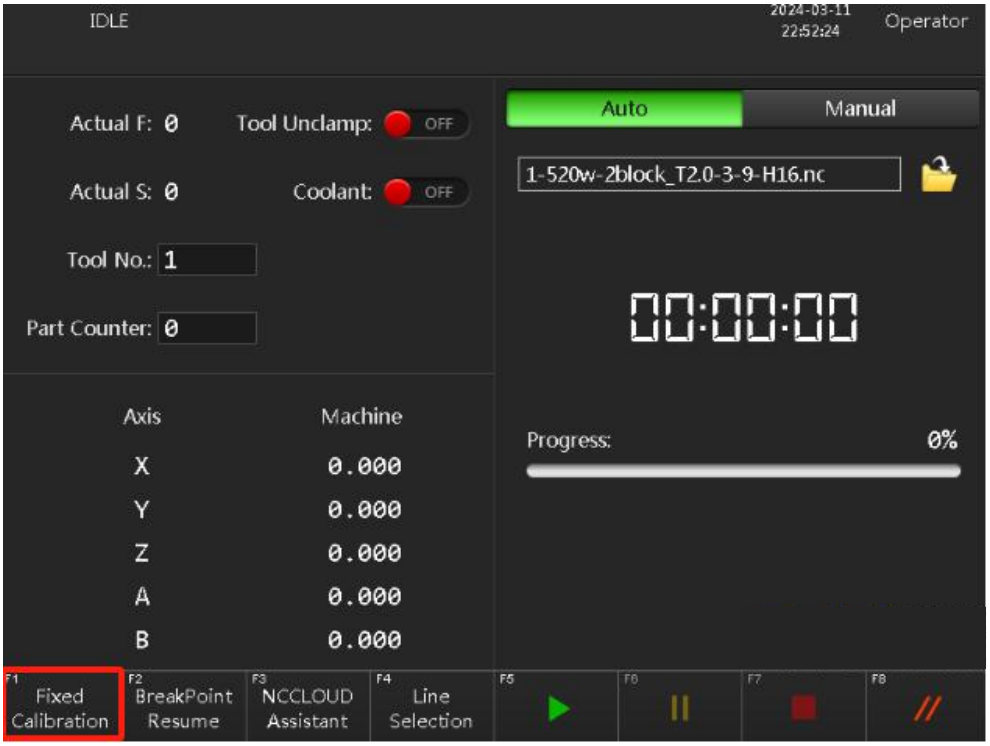
3) Install all the other tools to the correct position manually as follow picture shows:





1: The 1# tool holder holds a D3.0RC16 ball end mill.
2: The 2# tool holder holds a D2.0RC12 ball end mill.
3: The 3# tool holder holds a D1.0RC10 ball end mill.
4: The 4# tool holder holds a D2.0RC8 bull mill.
5: The 5# tool holder holds a D1.5RC14 bull mill.
6: The 6# tool holder holds a D1.5RC8 bull mill.
7: The 7# tool holder holds a D1.0RC5 flat end mill.
8: The 8# tool holder holds a D1.5RC8 ball end mill.
9: The 9# tool holder holds a D2.0RC7 flat end mill.
10: The 10# tool holder holds a D2.2RC18 drill.
11: The 11# tool holder holds a D1.5RC13 drill.
12: The 12# tool holder holds a D1.5RC12 ball end mill.
13: reserve.
14: The 14# tool holder holds a D2.5 glass ceramic needle.
15: The 15# tool holder holds a D1.0 glass ceramic needle.
16: The 16# tool holder holds a D0.6 glass ceramic needle.

4) Click "Fixed calibration"--"Start calibration"--"Yes" to measure and record the length of new tool on spindle.



5) Click ‘Manual’- ‘Tool change’- ‘T_X’- ‘Yes’ to change the tool on spindle
6) During tool changing, please check if the spindle puts down the milling bur right to the center of tool magazine. If not, please contact BSM authorized dealer or BSM.

4-4 Calibration

In order to avoid the loss of equipment accuracy due to vibration and shaking during

transportation, it is necessary to verify the accuracy for Z and Y axis of the equipment before the initial cutting, please do it as Section 7-1.

After calibration, the installation for BSM-520W is finished, please enjoy your work with BSM-520W!

Chapter 5 Operation and Cautions

5-1 Daily workflow for users

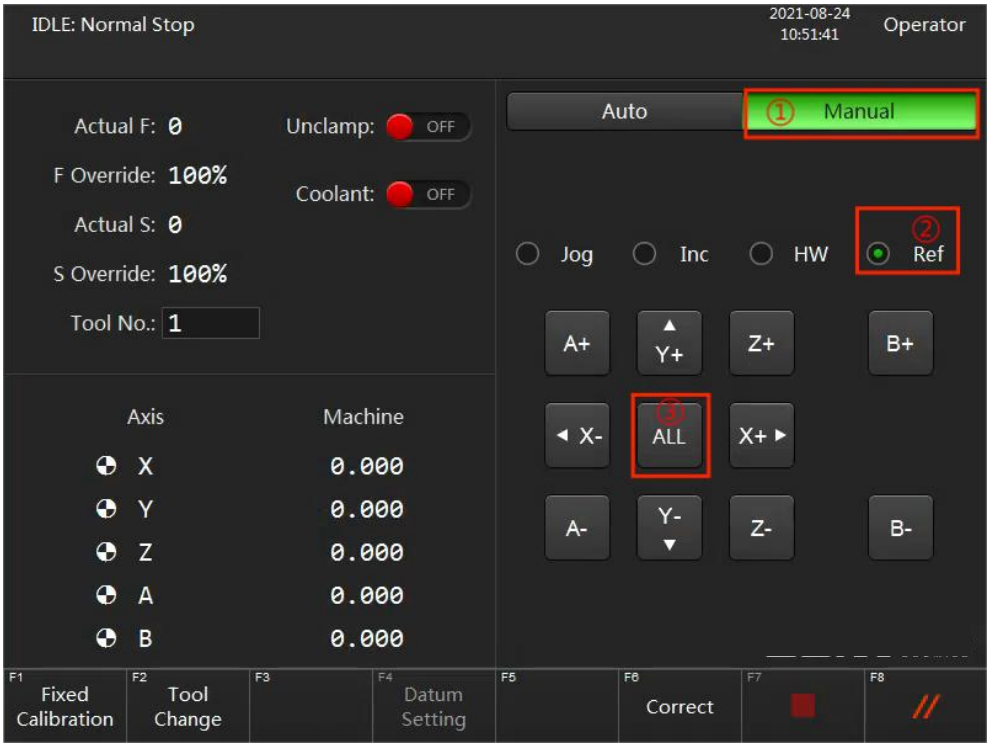
1)Power on
2)Transfer the milling file to device (USB or Internet)
3)Load the blank to the holder with hex screwdriver
4)Click “Start” to start milling
5)After milling, remove the blank
6)After daily work, power off

5-1-1 Power on/off

1. Please refer to Section 2-2-2 to find the power switch (No.9). In your daily work, you just need to power on/off the device by this switch.
If the device is going to be not used for a long time, please unplug the power cable.

2.Return to origin: Every time after power on the device, the system requires a ‘Return to origin’ operation which means moving all the 5 axes back to origin (0 position).

Before that, it is necessary to ensure that the mechanical coordinate of the X, Y, Z axes are positive, the A axis is around 0 degrees or 180 degrees, and the B axis is around 0 degree (Bigger than -5 degree).
If yes, please do it as follow:
Click “Manual”, choose “Ref”, the click “ALL”, wait until it finishes.



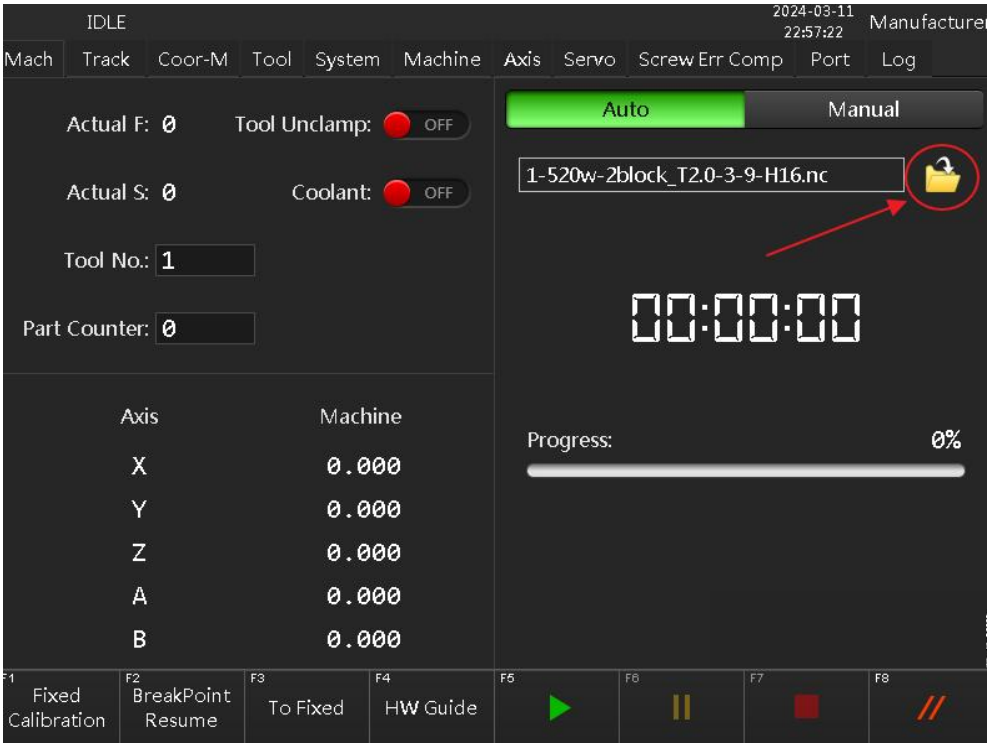
If not, please contact BSM or BSM authorized dealer.

Start from here if you didn't power off the device:

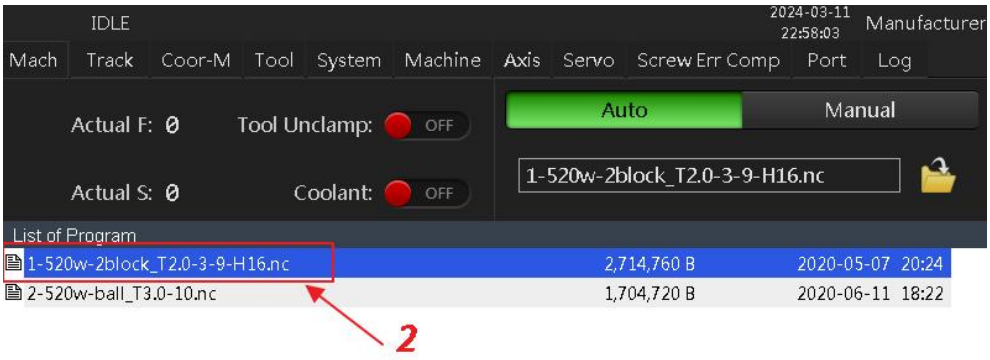
5-1-2 Transfer the milling file to device

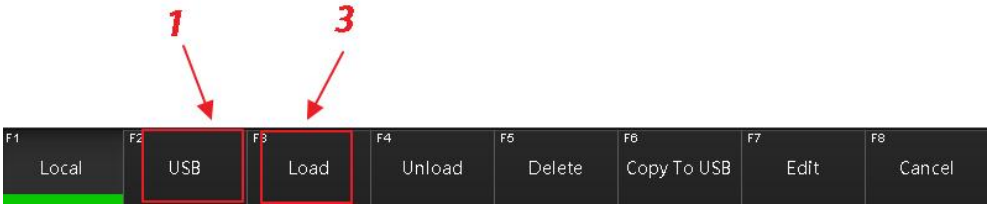
There are 2 ways to transfer the milling file to device, USB or Internet.
USB:

- Copy the milling file from nesting software to USB.
- Insert the USB drive to the device's USB port and click file load button in Auto mode.

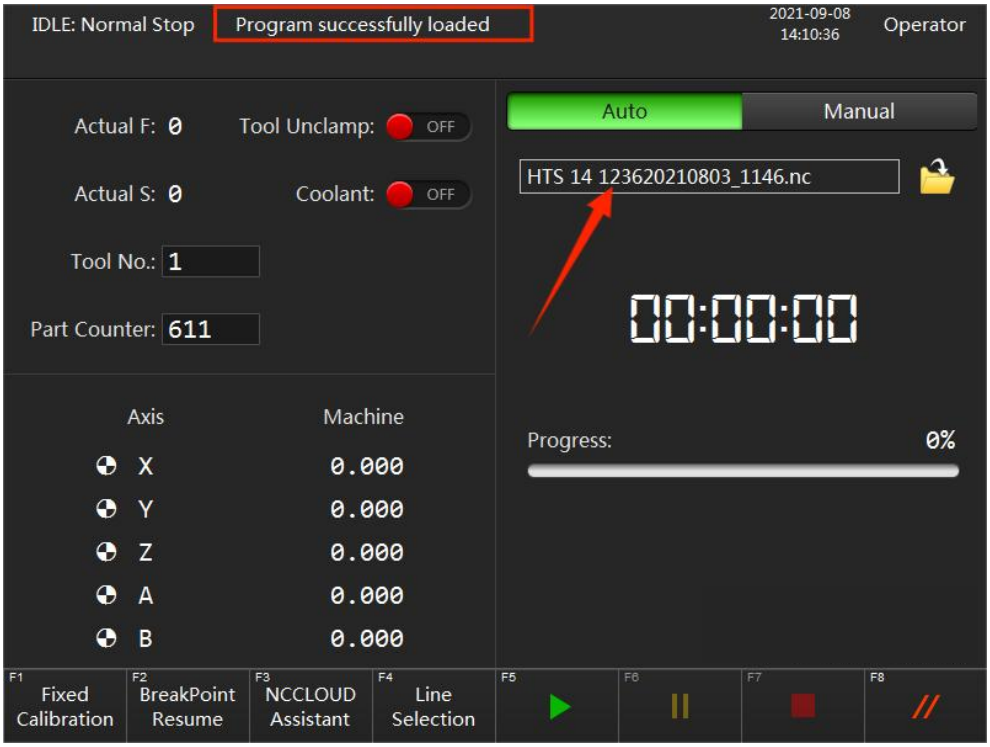


- Select the program from the USB and load.





- When the device's information bar displays "Processing file loaded successfully," it indicates that the program has been successfully imported, and the name of the imported program file will be shown on screen



Internet:

If you connect Internet to device and want to transfer the milling file by Internet, please contact BSM or BSM authorized dealer.

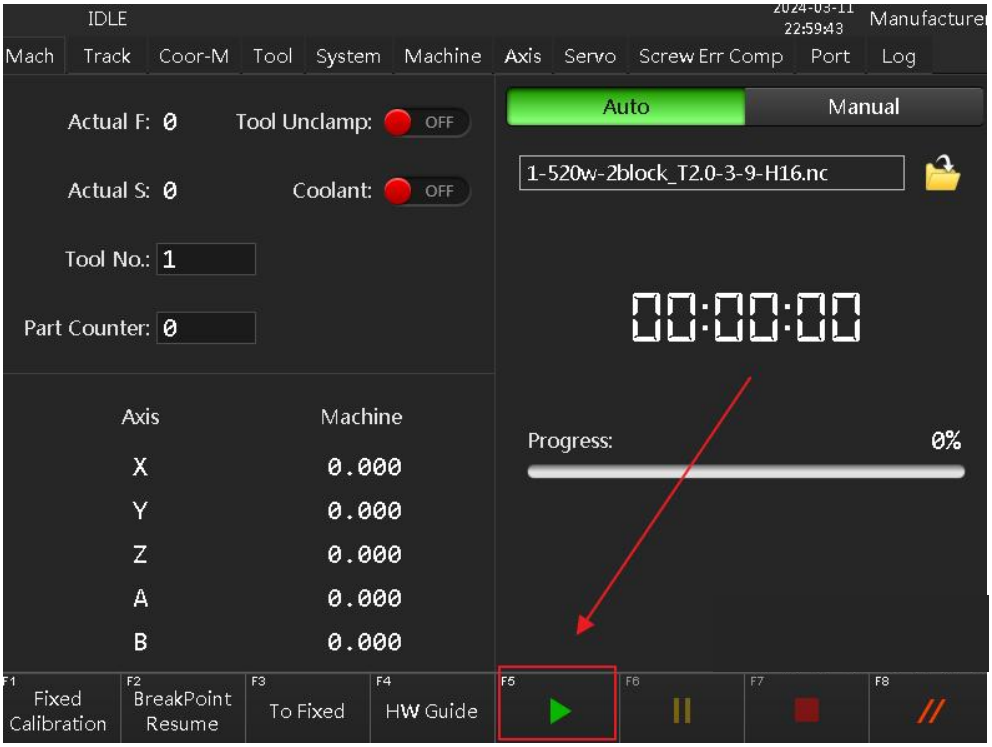
5-1-3 Disc loading

The following requirements shall be noted for loading disc to the holder:

- Ensure no chips remain inside the holder.
- If the holder is deformed due to damage, do not use it. Please contact BSM or BSM authorized dealer.
- When tightening the holder, evenly tighten each screws. Do not tighten one screw completely before tightening the others to prevent uneven stress affecting machining quality.
- Replace the screw on holder immediately if the screw is worn.

5-1-4 Start milling

Click the "F5" (Start) on the device operation interface to process the current program.



5-2 Tool Replacement

When the tool has been used for a period of time or when the milling quality is affected (Abnormal sound, spark fire, knife edge chipping, large chips during the processing), follow the steps to replace the tools:

1) First, perform the "Return to Origin" operation to ensure the system has returned to the 0 position.
2) Hold the old tool on spindle with your hand and click “Tool Unclamp”, then you can remove the old tool
3) Insert the corresponding new tool to spindle and click “Tool Unclamp” again
4) Click “Fixed Calibration” --“Start Calibration” --“Yes” to measure and record the length of new tool
5) Take out the old tools in tool magazines and insert the new tools. Please make sure all the tools are in their correct position， refer to Section 4-3 for detailed information.
6) Click “Manual”, do tool change and “Fixed Calibration” for all the new tools.

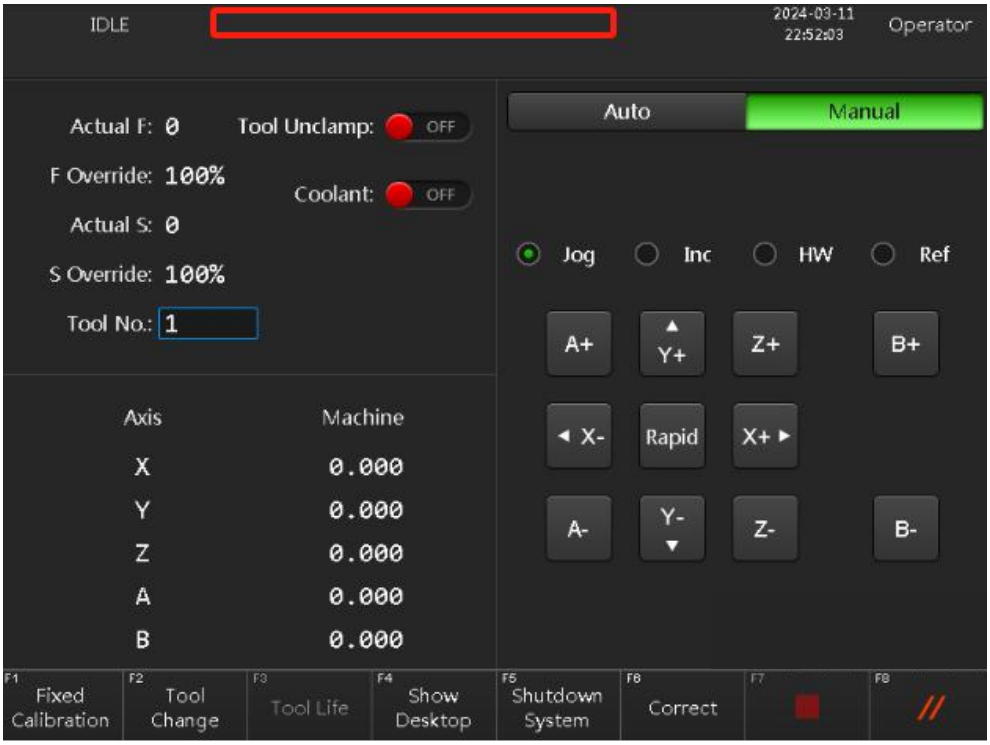
After the tool has been used for sometimes, it is necessary to strictly monitor tool wear. If a 20x microscope is available, inspect the tool coating and edge for chipping and sharpness, as some high-difficulty products require guaranteed tool quality.
Caution with T6 tools:
Since T6 tools are 0.5mm, and the material itself has high hardness and low toughness, please be careful to avoid breaking the tool nose during tool change.

5-3 Mode Introduciton

For easier operation and maintenance， the equipment provides two modes : Operator mode and Manufacturer mode. Operator mode is for the daily work of end users and Manufacturer mode is only for engineers.

5-3-1 Operator Mode Introduction

5-3-1-1 Operator-Manual



Information bar: The alarm or error message will appear here.
Actual F: The actual feed rate in the NC program during cutting.
Tool Unclamp: Button for loosening/tightening the tool, only used during manual tool change. Remember not to click this button during non-manual tool changes or when the device is running, as it may cause tool breakage or personal injury.
F override: The current cutting feed rate, this value defaults to 100%.
Actual S: The current spindle rotating speed.
Coolant: Button for the cooling system, used for the spindle coolant.
S override: The current spindle rotating speed, this value defaults to 100%.
Tool No: The tool number currently on the spindle.

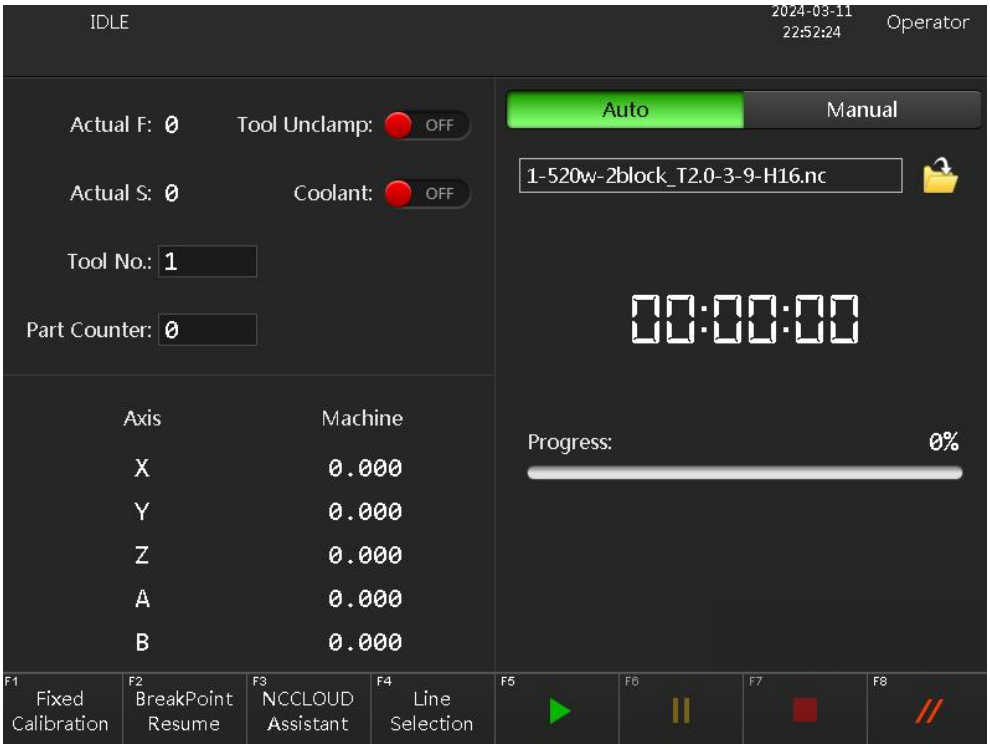
X: The current mechanical coordinate of the X axis.
Y: The current mechanical coordinate of the Y axis.
Z: The current mechanical coordinate of the Z axis.
A: The current mechanical coordinate of the A axis.
B: The current mechanical coordinate of the B axis.
Auto: Automatic mode under the operator interface.
Manual: Manual mode under the operator interface.
Jog: Move the axis continuously
Ref: Move axis back to the origin
HW: Move axis by hand-wheel guidance, generally used for debugging.
Inc: Move axis step by step
A+: Rotation of the A axis in the positive direction.
A-: Rotation of the A axis in the negative direction.
X+: Movement of the X axis in the positive direction.
X-: Movement of the X axis in the negative direction.
Y+: Movement of the Y axis in the positive direction.
Y-: Movement of the Y axis in the negative direction.
Z+: Movement of the Z axis in the positive direction.
Z-: Movement of the Z axis in the negative direction.
B+: Rotation of the B axis in the positive direction.
B-: Rotation of the B axis in the negative direction.

Fixed calibration: Measure and record the length of tool on spindle
Tool Change: Change the tool on spindle
Show Desktop: Display the system desktop.
Shutdown system: To shut down the windows system
Correct: Calibration operation (Only for engineer and BSM authorized dealer).

Stop 

Reset

5-3-1-2 Operator Auto Mode



Breakpoint resume: Continue processing from the breakpoint.

Line selection: Select and process from specific line (use with caution! Requires manually setting the position of the program line).

00:00:00: Processing time.

Progress: A progress bar indicating the completion status of the processing task.

: Start / Pause / Stop / Reset

5-3-2 Manufacturer Mode

For detailed information about Manufacturer mode, please contact BSM authorized dealer or BSM.

5-4 Pre-operation Preparation

5-4-1 Air Pressure Check:

Inspect whether the pressure indicated on the digital pressure display and the air-water separator is above 0.65 MPa. If the air pressure is below 0.65 MPa, check whether the air compressor is functioning properly or consider replacing it with a larger air storage

tank.

5-4-2 Screen Check:

Check for any alarm messages. If there are any alarms, please refer to "Chapter 8 Trouble Shooting"

5-4-3 Tool Magazine Check:

Check if the tools are placed in the tool magazine and if the tool sequence is correct. Refer to 4-3 for more details.

5-4-4 Spindle Check

Check if the tool on the spindle (Figure 2) matches the tool number displayed on the screen (Figure 1).

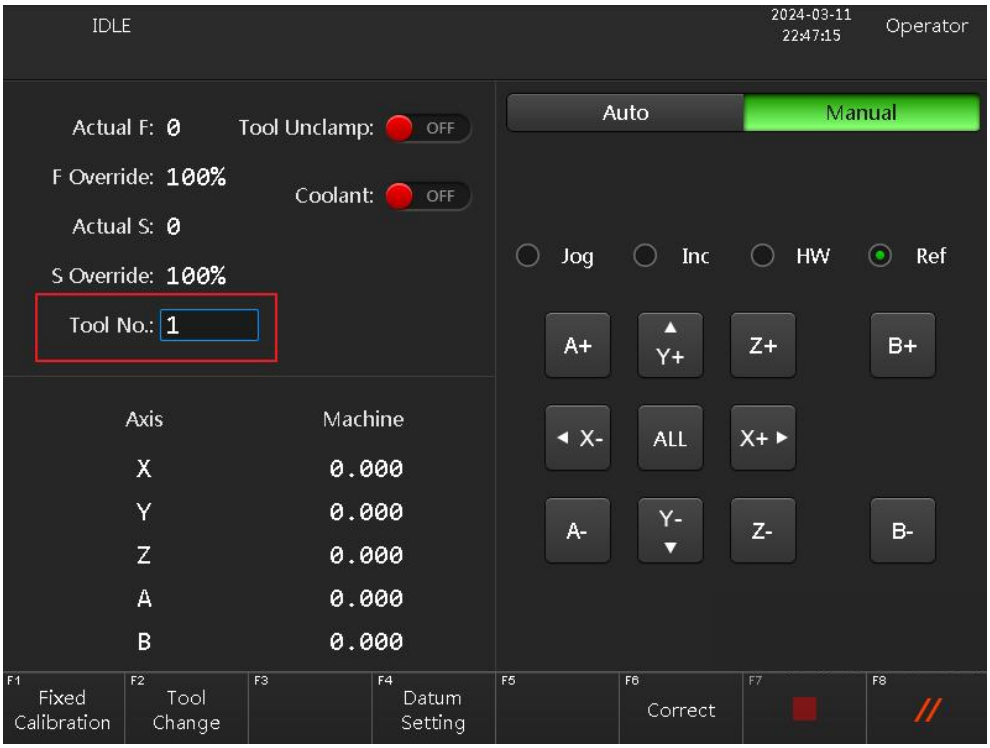


Figure 1

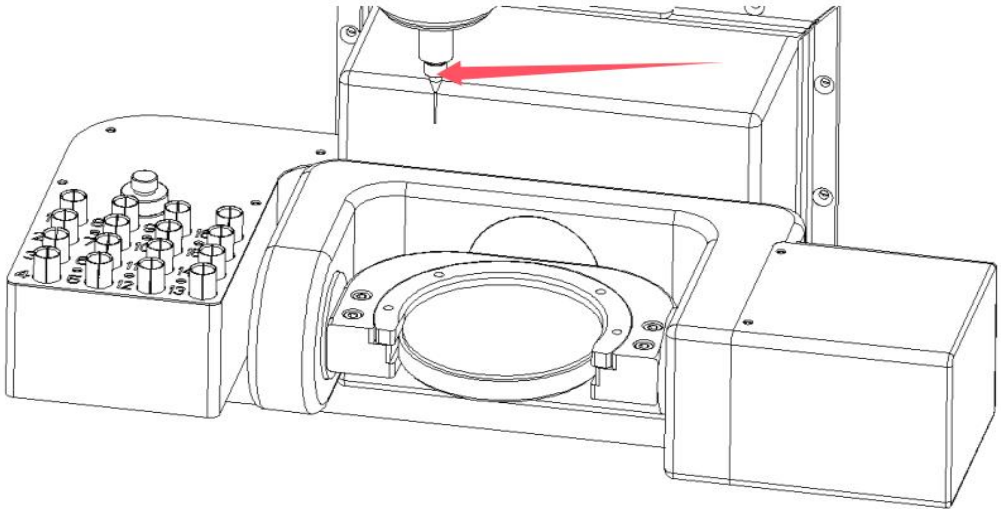


Figure 2

For example: In Figure 1, the current tool number in the system is tool number 1 (3mm ball-mill). Check if the tool on the spindle in Figure 2 matches the current tool number shown in Figure 1. If they are not matched, please contact BSM authorized dealer or BSM technical support.

5-5 Precautions for Use

Before powering on and operating the product, please ensure the following precautions are taken to avoid irreversible damage to the device:

DANGER

Before powering on the device, ensure that the cutting fluid lines are clear. When the milling starts, please make sure the cutting fluid is spraying to the surface of milling tools, or it may lead to bad milling result or tool broken.

DANGER

The device must be reliably grounded to prevent personal injury.

DANGER

The operating environment should have compressed air pressure within the range of 0.65—0.8MPa to ensure sufficient pressure for tool changes and to prevent tool collisions and damage to the device.

DANGER

During machining, do not open the dust cover to prevent personal injury. In case of an emergency, press the “Stop” button.

DANGER

If processing is accidentally interrupted and the operation is not continued from the break-point, press the reset button to reset and return the processing program to its initial state. Otherwise, processing errors may occur, and in severe cases, machine collision could cause damage to the device.

After starting the device, check whether the tool is the corresponding tool number and whether it is correctly placed in the tool magazine.

Special Statement

- If you purchase our company's equipment for processing materials other than those specified above, please assess based on the equipment parameters. The user bears all responsibility for accidents arising from processing other materials.
- Without our company's consent and permission, disassembling any external and internal parts and electrical components of the equipment is strictly prohibited. The company will not bear responsibility for any resulting equipment damage.
- Our equipment is assembled with precision electronic components, requiring a high level of cleanliness for the air source. All our equipment is installed with a triple air filter upon delivery and installation. To ensure the stability and lifespan of the equipment, it is crucial to maintain the cleanliness of the air source and install air filters as required.

Chapter 6 Maintenance

6-1 Daily maintenance

1. Before starting the machine, check if the compressed air pressure is sufficient; The pressure should be higher than 0.65MPa.
1) If the air pressure is insufficient (<0.35MPa), the device cannot start milling.
2) If the air pressure becomes insufficient during operation, the device will automatically pause. Once the air pressure meets the requirements, pressing the “start” button to continue its operation.
3) Insufficient air pressure during the tool change process may lead to a failure in changing tools, and it could even cause a collision or tool damage. **In such cases, follow the procedure for handling interruptions during tool changes!**

Check if the spindle holds a tool. If not, check the tool number on screen, insert the corresponding tool to spindle manually.

2. Make sure the water chiller is working during milling
3. Make sure the cutting fluid is spraying to the surface of milling burs
4. Keep the milling chamber clean after daily work.

If there are chips on the tool detection device, it will affect the tool measuring data, leading to inaccurate milling; thick chips may cause tool measuring failure.

1) Clean fixtures, tool magazines, and viewing windows daily before processing to ensure the processing area is clean.

2) Clean the processing area, tool magazine, and tool detection device's surface promptly after processing each day.

5. Before processing each day, pay attention to check

1) Whether the spindle collet is clamping the tool normally;
2) Whether there are chips attached to the collet surface;
3) If chips are present, gently clean them with a small brush;
4) Regularly clear chips from inside the spindle collet (three-petal nozzle).

Note: Avoid getting the brush bristles stuck in the collet slots! Use a special disassembly tool to remove the three-petal spring for cleaning, and blow out the chips inside with compressed air.
When reinstalling the three-petal spring into the spindle, pay attention to the tightness; it should not be too loose or too tight. Ideally, the tool handle can be easily inserted into the spindle without any jamming when it is loosened.

6-2 Regular maintenance

1) Make sure the water level is in the range of “Full” and make sure the water chiller is working normally during milling——Every week

2) Clean the debris in the cutting fluid tank strainer——Every month

3) Clean the inside of machine and brush lubricants on ball screws and guide rail——Every 3months

4) Clean the collet and brush some lubricants——Every 3months

5) Check if there are any jamming or slipping phenomena in the screw drive and belt drive components;

6) Check if there is a noticeable temperature rise in the electric spindle and if the spindle's sound is significantly abnormal.

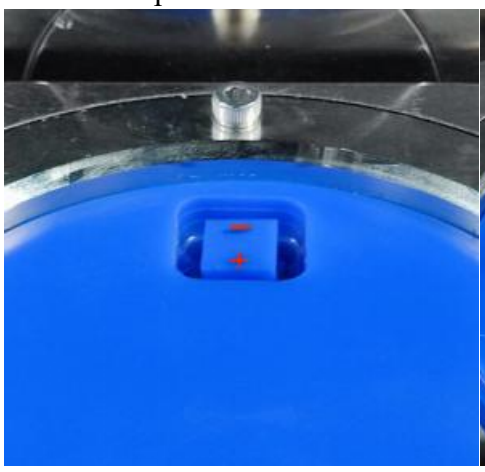
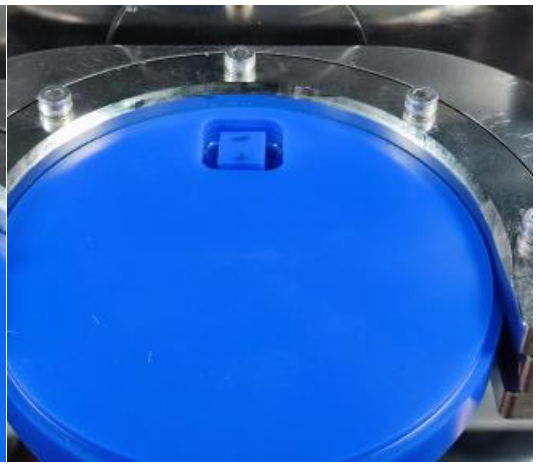
Chapter 7 Equipment Calibration

This device has gone through strict technical quality inspection in the factory to meet its precision for dental milling use. For newly installed device, or after used the machine for a long time, or when the milling has problem, you can mill some specific objects to calibrate the accuracy.
If the difference between the measured size and the size of the block in STL file is not more than 0.02mm, the equipment accuracy is normal. If the difference between the measured size and the size of the block STL file is more than 0.02mm, the equipment accuracy needs to be calibrated.
Please do the calibration under the guidelines of BSM authorized dealer or BSM.

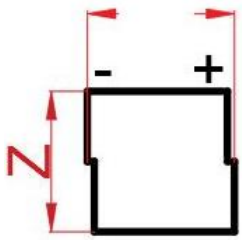
7-1 Y&Z axes Accuracy Calibration

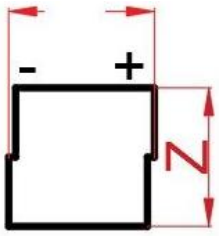
Standard (10mm*10mm*10mm) cube calibration:

a) Import the calibration file YZ axis 12 H14-12 to mill a cube at 12 o'clock position from 12/14 mm wax disc. After milling, please mark '-' & '+' on the cube as shown below, then take out the cube and measure the thickness with the vernier caliper:

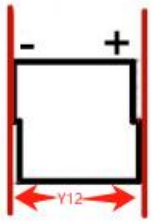



b) If the Y-axis accuracy loss, the cube will be divided into 2 parts, and there will be 2 different situations as follows:

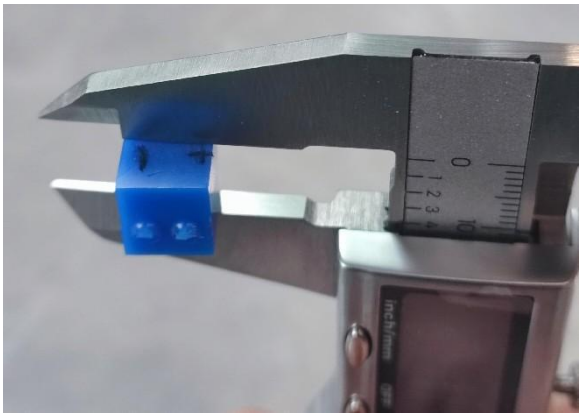




c) First, measure the thickness of Y axis as Y_{12}.



d) Then measure the thickness of Z axis as Z_{12}



e) Check the origin numbers for Y&Z axes on machine and calculate through a specific conversion formula (please contact BSM authorized dealer or BSM for the formula details), then write the new numbers into the system G54
f) Y&Z axes calibration complete

7-2 B-axis accuracy calibration

a) Import the calibration file  1-520w-2block_T2.0-3-9-H16.nc to mill 2 cubes at 3 o'clock and 9 o'clock position from 12/14mm Ti disc;

b) Measure the height in the Z direction of the milled block separately as Z_3 and Z_9
c) Calculate the difference in the Z direction and write the final data result into the system G54 coordinate offset through a specific conversion formula(please contact the manufacturer for the formula details);
a) B-axis calibration complete

7-3 Linkage inspection

Execute the linkage test program  2-520w-ball_T3.0-10.nc, to test the surface smoothness of the block after milling, and the thickness of the bur's pattern at the quadrant junction to finally check whether the Y-axis and A&B-axis are accurately calibrated. If the milled block surface is rough and the carving pattern is obvious, you need to re-check the axis.

Chapter 8 Troubleshooting

Trouble Description	Diagnosis/ Analysis	Solutions
No display on the panel screen after power on	The power supply is disconnected	Check the power supply to machine and the power supply to screen
X/Y/Z/B Limit alarm	The axis will reach or has reached the limit position	Check if the plastic ring of bur has moved; Check the CAM software settings about axis moving
Spindle alarm	Spindle malfunction or spindle control system is abnormal	Rotate the spindle manually, if it is stuck, the spindle needs to be replaced; If not, please contact with BSM authorized dealer or BSM
Air-pressure alarm	Insufficient compressed air pressure (<0.35MPa)	Check if the air compressor is running normally
The screen can not be controlled by touch	1. System crash 2. Touch screen USB interface has a bad connection	1. Restart system 2. Re-plug the USB connection of screen
Tool broken during milling	1. Tool life is over 2. Improper nesting (the undercut is too large /the placement of the connectors is not correct/Too large rotating angle) 3. Incomplete tool-path	1. Replace new tools 2. Re-nest the restorations 3. Check the tool-path
The fit is too tight	1.Improper cement gap during designing 2.Improper milling strategy	1.Increase the cement gap 2.Contact BSM to change the milling strategy
The fit is too loose	1.Improper cement gap during designing 2.Improper milling strategy 3.Spindle shaking 4.Controller parameters do not match	1.Decrease the cement gap 2.Contact BSM to change the milling strategy 3.Tighten the fixing screws of spindle 4.Contact BSM
Abnormal friction sound of during milling	The moving of ball screws, guide rail or belt is not smooth	Brush lubricants on the ball screws, guide rail and belt
Abnormal tool change	1.Insufficient compressed air pressure (<0.35MPa) 2.Position of the plastic ring of	1.Check the air pressure 2.Replace tools

	tool has changed 3.The bur is severely worn	

Note: For any faults not mentioned above, please contact the technical center immediately.

*The use of this device for functions beyond the manufacturer's specified range is prohibited and will void the warranty.

Chapter 9 Contact information

9-1 Company information

Thank you for choosing the intelligent wet milling machine BSM-520W from Chengdu Besmile Biotechnology Co., Ltd again. For any questions or additional support, please contact BSM technical service center/BSM local dealers and we are looking forward to assisting you.

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2. Chengdu Besmile Biotechnology Co., Ltd
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9-2 Technical support

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