

rainbow Mill-Metal 2nd

User Manual



Dentium
For Dentists By Dentists

Read before reading this user guide

This product is intended for the purpose of cutting a titanium rod for the dental CAD-CAM to produce a dental restoration.

This user manual explains how to properly use the product. Please read the manual thoroughly before using the product.

- ✓ Keep this user manual in an easily accessible location for future reference.

Meaning of symbols

	WARNING
Represents a precaution to prevent a dangerous situation that can result in severe injury or death.	
	CAUTION
Represents a precaution to prevent a dangerous situation that can result in injury.	
Represents a precaution to prevent damage to the product.	

- ✓ It is also used to explain additional information and features that are helpful when using the product.

Copyright

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Safety instructions

Safety instructions are to protect the user’s safety and prevent property damages. Be sure to read the safety instructions before using the product, and properly use the product.

Be careful upon installation!



WARNING

- To install or move the product, be sure to contact the manufacturer for assistance or request help from a professional.
- The product shall only be used with AC 200 to 230 V, 50/60 Hz, and 2 A. If a different power supply is needed, use a step-up or step-down transformer.
- The product shall not be installed in the following places:
 - ū area with severe vibration
 - ū on a slope
 - ū place with much dust in the air
 - ū area prone to flooding or water leak
 - ū near inflammable substances



CAUTION

- Make sure that the cooling vent is installed facing a well ventilated area.
- Make sure that the install location allows easy insertion/removal of the power cord.
- Connect the cables and tubes correctly according to the directions in the manual.
- There should be a sufficient gap (at least 20 to 30 cm) from the wall or window so that the **EMERGENCY** button can be easily accessed when necessary.
- The desk used to support the product must be from the manufacturer.

Be careful when connecting a power supply!



WARNING

- Be sure to use the power cord provided with the product or purchase a certified power cord.
- Make sure that the outlet is grounded.
- If a power strip is used to extend the power cord, it must have anti-surge protection and it must be grounded.
- If the power plug or the power cord is damaged, contact the distributor or the manufacturer of the product for replacement.
- When removing the power cord, be sure to pull on the power plug itself not the power cable.
- Insert the power cord firmly into the outlet with the cable downward. If the cable is upward, the cable may bend and the wire can get cut.
- Be sure to insert the power plug fully into the outlet. Do not use a damaged one or a loose outlet.
- Do not excessively bend, pull out, twist, or bind the power cord. Do not hang the power cord on a metal part. Do not place a heavy object on the power cord. Do not place the power cord between heavy objects.
- Do not touch the power plug with a wet hand.



CAUTION

- Remove the power cord when the product will not be used for a long period or before lightning storms.

Be careful when maintaining the product!



WARNING

- For checks or repairs of the product, contact the distributor or manufacturer of the product.
- Before inspection, be sure to wear protective clothing and turn off the product.
- If a wire is damaged or water has penetrated the product, contact the manufacturer for service



CAUTION

- Wind the wires in a circle for storage.
- When cleaning the product, use a soft cloth or brush. Do not use a sharp tool or compressed air.

Be careful when using the product!



WARNING

- Do not operate the product with a wet hand.
- Do not use the product for purposes other than machining dental accessories.
- Make sure that the product is only used by individuals who received a proper training from the manufacturer.
- Open or close the front door only after the product is completely stopped.
- Always keep a fire extinguisher nearby.
- If any abnormality such as abnormal noise and overheating, contact the manufacturer for inspection.
- Do not use or store the product close to a combustible spray or inflammable substances.
- Do not touch the spindle, collet or driving axis when the product is operating.
- Replace the machining tool only after the product is completely stopped.



CAUTION

- Do not arbitrarily disassemble, repair or modify the product.
- For stable performance, always use the most recent version of software.
- Manipulate or operate the product only after the front door is closed.
- The compressed air must be clean and must not contain moisture or foreign materials. Always keep the pressure above 6 bar (0.6 MPa).
- Do not insert a sharp tool or instrument into the cooling vent.
- Do not apply a shock nor scratch the screen with a sharp object.
- Use consumables and accessories that are recommended by the manufacturer.
- Be careful not to allow lubricants or cutting oil to come into contact with your body.

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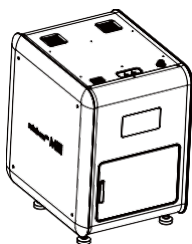
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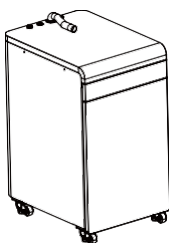
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1 Components

1.1 Basic components



Main body of product
[qty: 1]



Desk and Water tank
(Include connecting accessories
and pneumatic regulator)
[qty: 1]

1.2 Accessories



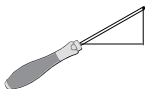
Pneumatic tube (Ø8.0 mm)
[qty: 1]



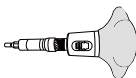
User Manual
(Electronic document)
[qty: 1]



Power cable
[qty: 1]



Hex wrench driver
[qty: 1]



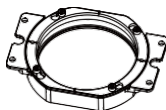
Torque wrench
[qty: 1]



Spindle maintenance kit
[qty: 1]



Beaker
[qty: 1]



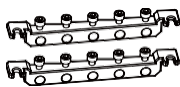
Disk jig
[qty: 1]



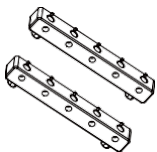
Calibration jig set
[qty: 1]



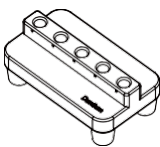
Ti rod Fixing bolt
[qty: 10]



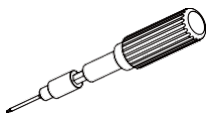
LINKLESS jig (Options)
[qty: 2]



Bar block jig (Options)
[qty: 2]



LINKLESS assemble jig (Options)
[qty: 2]



LINKLESS Torque wrench
(Options)
[qty: 2]



Spindle Cover
(Options)
[qty: 1]

1.3 Consumables



Working tools



Cutting oil



Circular-filter



LINKLESS Adapter



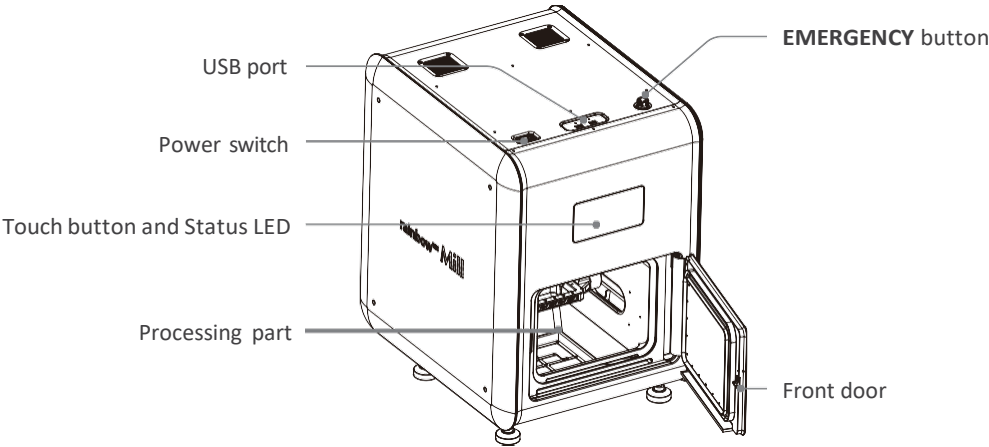
Purchasing consumables

- If you want to purchase additional consumables contact the distributor or manufacturer of the product.
- Contact the manufacturer for compatibility specifications of the LINKLESS adapter.

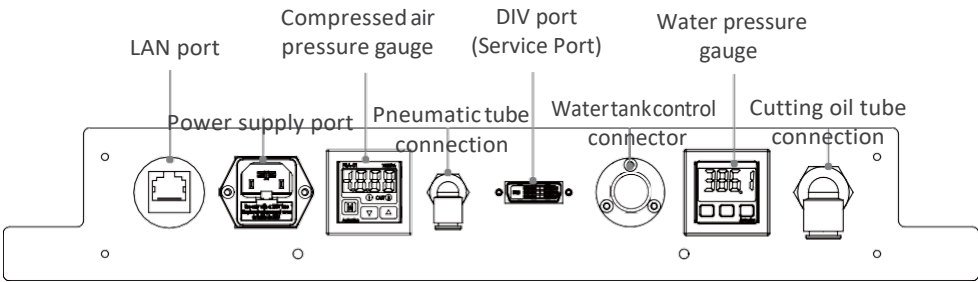
2 Descriptions of parts

2.1 Outside of the product

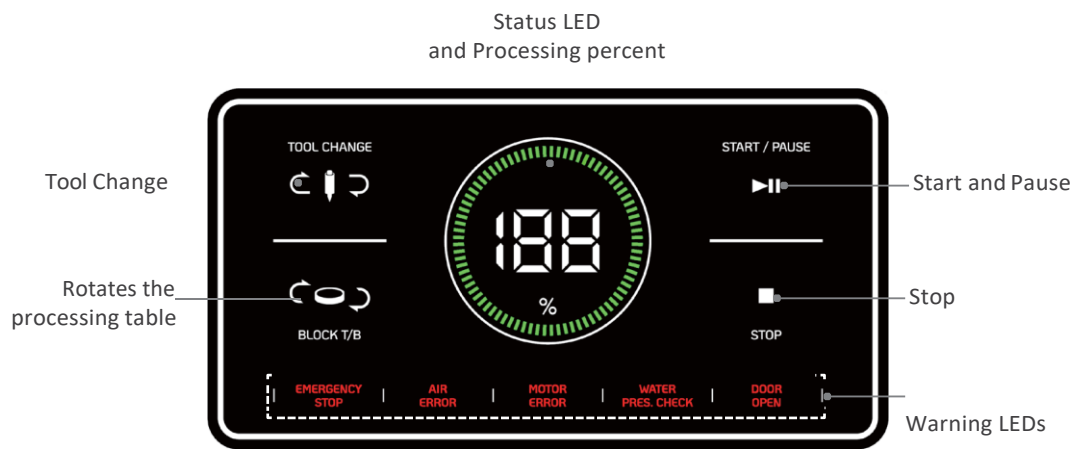
2.1.1 Front and side



2.1.2 Rear connection



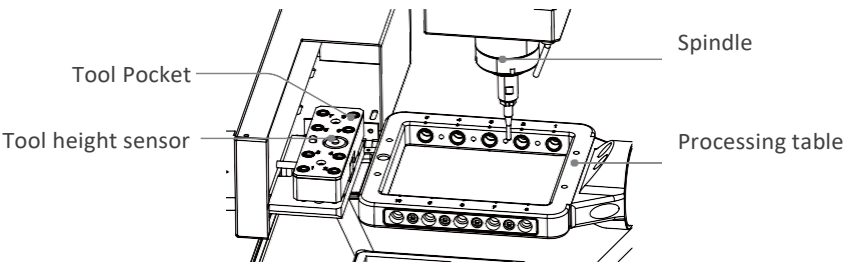
2.1.3 Front Touch Button



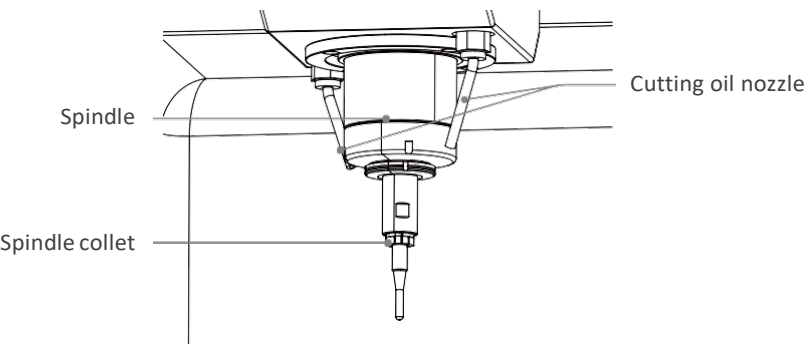
- **Touch buttons**
 - ū **START/PAUSE**: Start processing in waiting status / Pause in processing status
 - ū **STOP**: Stop processing
 - ū **TOOL CHANGE**(Longer then 2 seconds): Wait for new tool change after returning the current tool
 - ū **BLOCK T/B**: Rotate the top/bottom view of the processing table, tilt the processing table when entering longer than 2 seconds
- **Status LED**
 - ū **Waiting**: Green light up
 - ū **Proocessing**: Blue light rotation and progress number display
 - ū **Pause**: Progress number display and start button light blink
 - ū **Moving**: Blue light rotation
 - ū **Error**: Red light blink
- **Warning LEDs**
 - ū Lights up when each error condition occurs

2.2 Inside of the product

2.2.1 Processing part



2.2.2 Spindle



2.3 User Software

- For stable performance, always use the most recent version of software. For software update, contact the distributor or manufacturer of the product.

2.3.1 Action buttons

1 MILLING page



MILLING/MAINTENANCE/SETTING
Change page

READY: Initialize of product
LOAD: Loads an NC file
STOP: Stop processing
START/PAUSE: Start or Pause processing

BLOCK TOP/BOTTOM/TILT: Function to change the viewing mode of the processing table
- Top and bottom view of processing table : **one click**
- Tilted view : **double click**

CONTINUOUS MILLING: Enable/Disable continuous machining
DEL: Delete files while waiting for processing

2 MAINTENANCE page



CALIBRATION: Equipment origin correction function
CLEANING: Processed part cleaning
NEW TOOL: Manual replacement of the current tool with a new tool
WARM UP: Equipment test operation
FEED UP/DOWN/RESET: Feed control
RESET: Reset usage time for each tool
TOOL 1~8: Tool change with selected number of tools

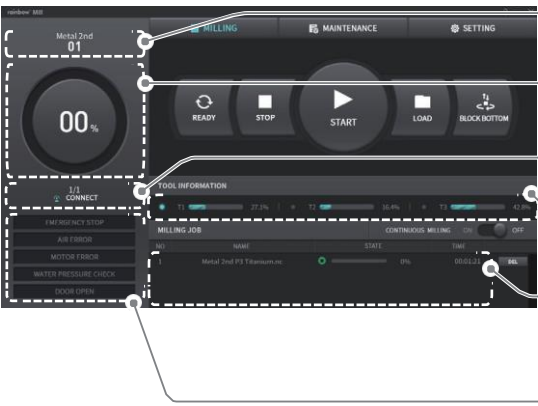
3 SETTING page



- MACHINE LIST:** Machine connection settings
- USER INFO:** User information management
- LOG DATA:** Machine usage log
- TOOL SETTING:** Tool life setting
- LANGUAGE:** Language setting

2.3.2 Status indications

1 MILLING page



- The currently connected machine name and number
- Processing progress and operation status display
- Machine connection status and number of connected units
- Display of tool and usage amount inserted in collet
- List of files waiting to be processed, file transfer status, and processing time
- Warning LED indication

2 MAINTENANCE page



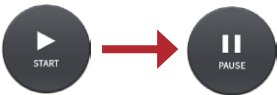
- Current machining coordinate value
- Spindle rotation speed, machining speed, current rotation speed display
- Display of tool inserted in collet
- Display of tool usage and usage time

2.4 User software convenience functions

2.4.1 Pausing and restarting

- By performing a pause function during processing, you can check the status of the workpiece and exchange worn tools.
- Pressing the **STOP** button ends the processing or pause state.

1 Press the **START** button to start processing, and the **START** button changes to the **PAUSE** button.



2 Press the **PAUSE** button switches the ongoing processing operation to a paused state.



- The pause operation takes a certain amount of time after the button is pressed until the pause operation is completed.

3 In the paused state, limited functions can be performed.

- BLOCKTOP/BOTTOM
- NEW TOOL

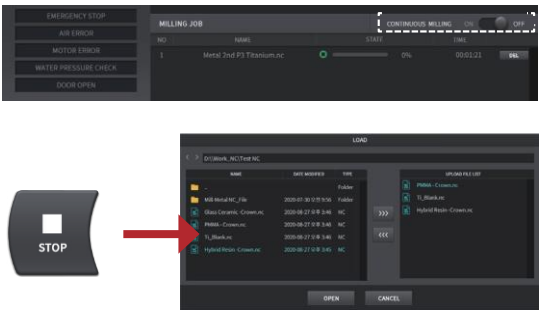
4 Press the **START** button to perform a restart operation.

- The restart operation starts again from the processing start position of the current tool process.

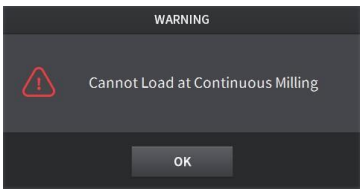
2.4.2 Processing the continuous milling

- Continuous processing is used when processing other prostheses on the material being processed.
- The next processing NC file can be loaded while processing is in progress.

1 When the **CONTINUOUS MILLING** function is **OFF**, press the **LOAD** button to register and delete the NC files waiting for continuous processing.



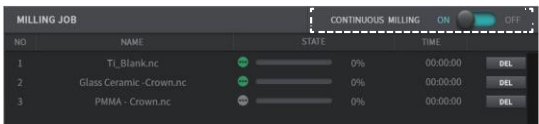
- Registration and deletion of continuous processing NC files are performed while the function is turned off.
- The following warning window is displayed when loading a NC file in continuous milling mode.



CAUTION

Be sure to register only processing NC files of the same material currently being processed. machine may be damaged due to collision during processing.

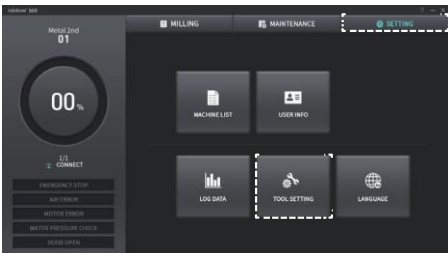
2 When the registration of the processing file is completed, the **CONTINUOUS MILLING** function is changed to **ON** to activate continuous processing.



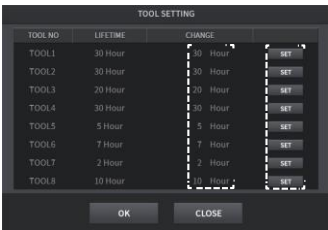
- Registration and deletion of continuous processing NC files are performed while the function is turned off.

2.4.3 Managing the tool life

- 1 Press the **TOOL SETTING** button in the **SETTING** menu displays the tool life setting window.

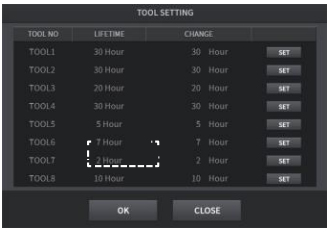


- 2 After updating the **CHANGE** item value of the tool life setting window to the desired time for each tool, press the **SET** button.



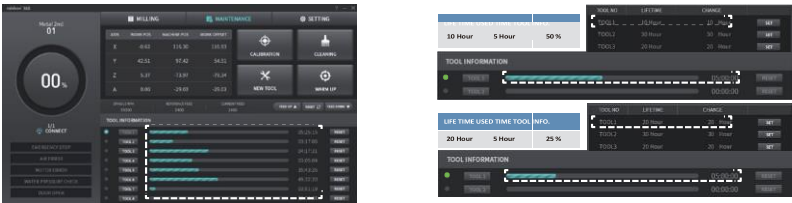
- ✓ The minimum time unit for tool usage time setting is 1Hour.

- 3 When the life time of all tools is changed, press the **OK** button to save the settings.



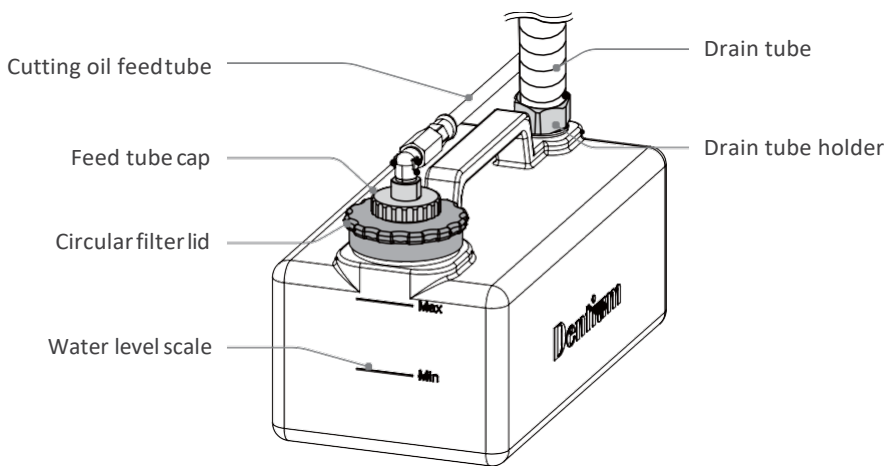
- ✓ After changing the tool usage time setting, be sure to click **OK**. If the window is closed with **CLOSE**, the setting value is not saved.

- 4 Life information is displayed in **TOOL INFORMATION** in the **MAINTENANCE** menu.

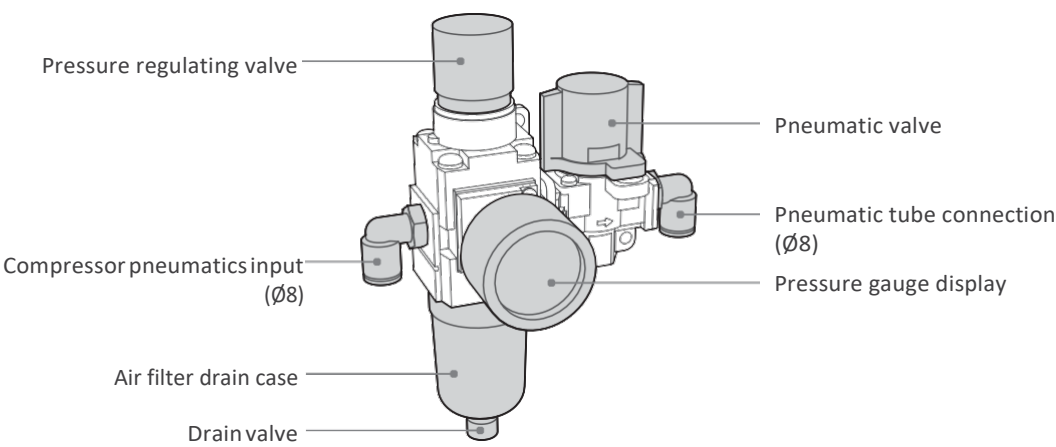


- ✓ The tool usage time can be initialized through the **RESET** button.

2.5 Water tank



2.6 Pneumatic regulator



3 Installing the product

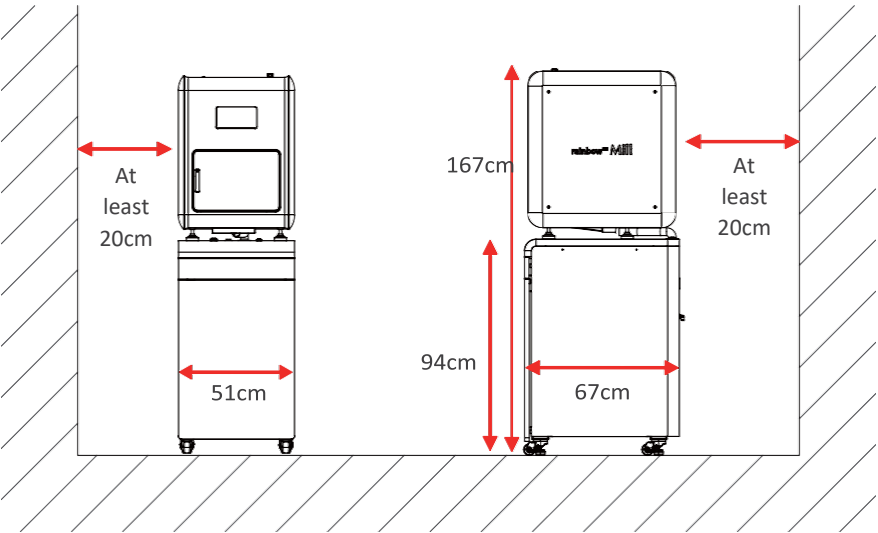
**WARNING**

To install or move the product, be sure to contact the manufacturer for assistance or request the help from a professional.

3.1 Installing the main body

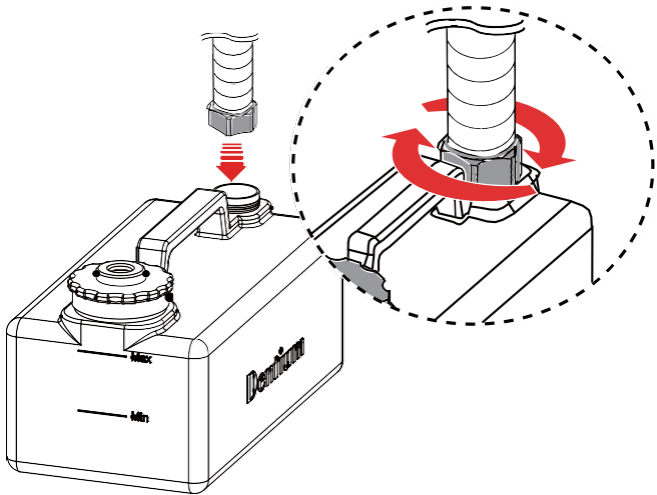
As shown in the figure below, install the product in a well ventilated location on a flat floor and make sure there is a sufficient gap from the wall.

- Use only the table provided with the product.

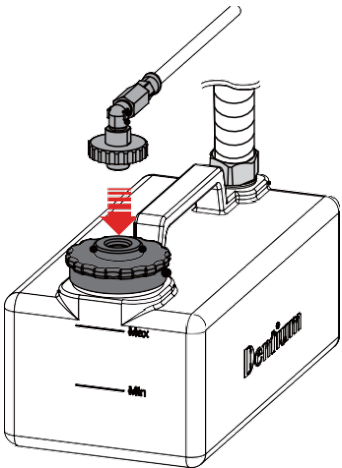


3.2 Connecting the water tank

- 1 Connect the drain tube connected under the dedicated table to the drain tube holder of the water tank.



- 2 Connect the feed tube cap under the dedicated table to the water tank circular filter lid.

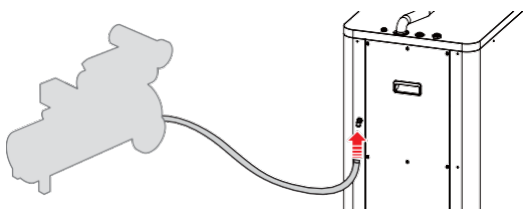


3.3 Connecting the pneumatic regulator

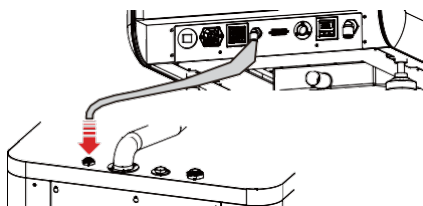
Be sure to install a pneumatic regulator in order to prevent component damage from higher external air pressure.

- Be sure to use pneumatic parts that are recommended by the manufacturer, or that meet certified qualification tests.
- Make sure that the air compressor is installed along with the peripheral devices (air dryer, air filter, etc.).
- The spindle is susceptible to corrosion from moisture. Make sure that the compressed air does not contain moisture or foreign materials.
- The pneumatic regulator is located inside the bottom of the desk.

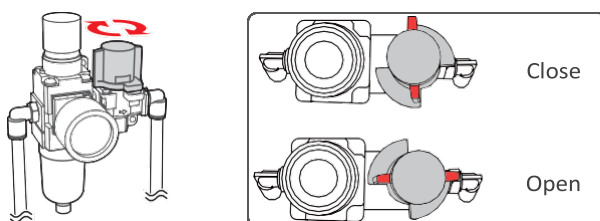
- 1 Connect the pneumatic output of the air compressor and the pneumatic input of the dedicated desk.



- 2 Use the pneumatic tube to connect the pneumatic output of the dedicated desk to the **AIR [6.0-6.5 bar]** port on the rear connection.



- 3 Open the pneumatic valve of the pneumatic regulator inside the dedicated desk.

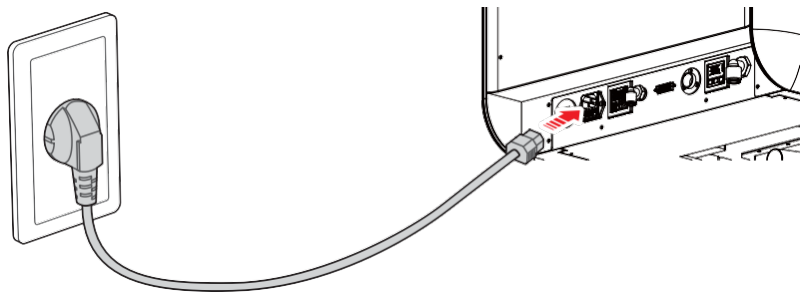


Do not arbitrarily adjust the pneumatic regulating valve. It may cause a problem with product operation.

- ✓ Recommended conditions for compressed air are as follows:
- Flow rate: 300L/min
 - Pressure: 6.0~6.5 bar(0.6~0.65 MPa)
 - Impurity: Class 3(Particle size $\leq 5\mu\text{m}$)
 - Moisture content: Class 4(max dew point 3 °C)
 - Oil content: Class 3(1mg/m³)

3.4 Connecting the power supply

Connect the power cord provided with the product to the power supply port on the rear connection, then insert the power plug into the outlet.



⚠ WARNING

The product shall only be used with AC 200 to 230 V, 50/60 Hz, and 2 A. If a different power supply is needed, use a step-up or step-down transformer.

⚠ CAUTION

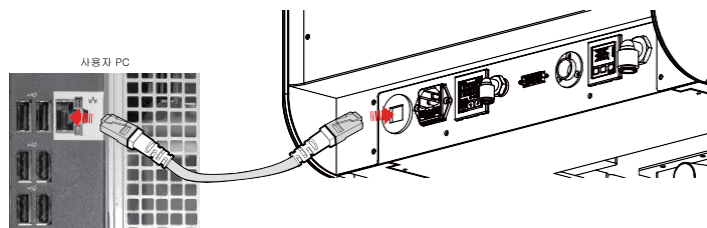
- Be sure to use an outlet that is grounded.
- Be sure to use the power cord provided with the product or purchase a certified power cord.

3.5 Connecting the userPC

- ✓ • Proceed with the product powered on and the LAN cable connected.
- When the LAN cable is not connected to the device or the power is cut off, it is not connected to the user PC.

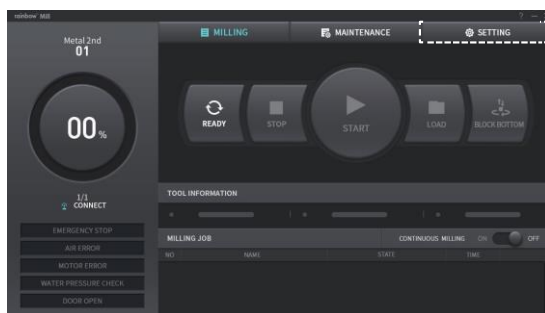
3.5.1 Connecting the LAN cable

Connect the cable to the LAN terminal on the rear connection and to the LAN terminal of the user PC where the control program is installed.



3.5.2 Setting the connection

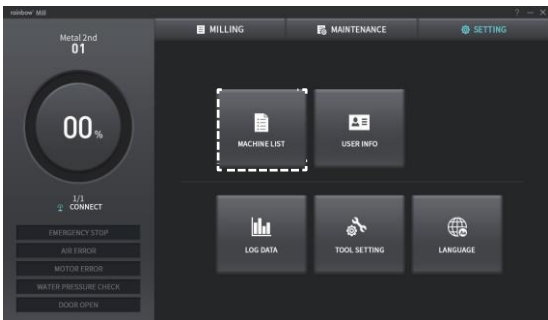
- 1 Turn on user PC, run the rainbow Mill program , and move to the SETTING page.



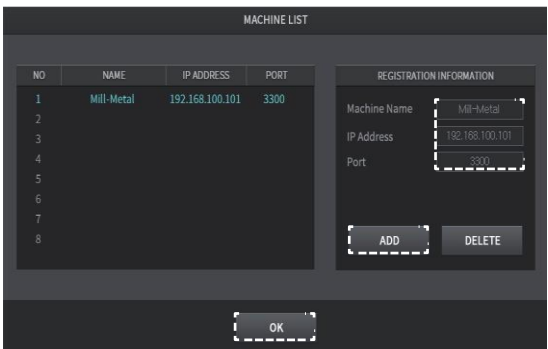
- ✓ When Windows boots up, rainbow Mill program is automatically executed.

If the program does not run automatically, run the rainbow Mill icon  on the desktop.

2 Click the **MACHINE LIST** button

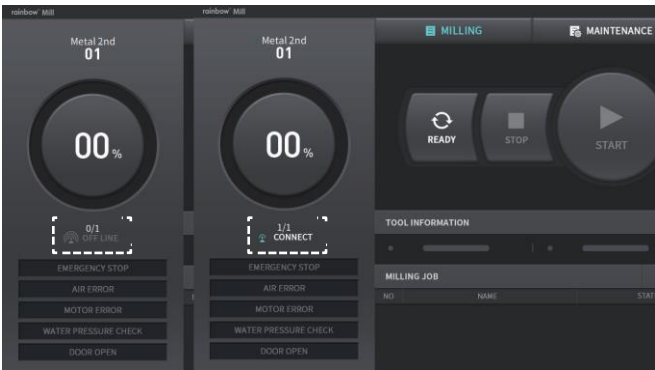


3 After entering the equipment name IP and PORT information in the right registration window, click the **ADD** button to register.



- The equipment name can be up to **12 characters in English**.
- Factory default IP of Mill-Metal 2nd product is **192.168.100.101** and port is **3300**.

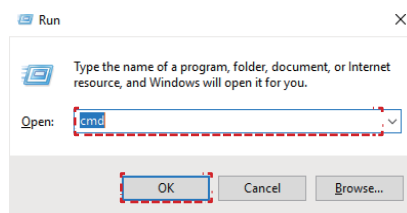
4 Check that the communication status text in the center left of the control program is changed to '**CONNECT**' status.



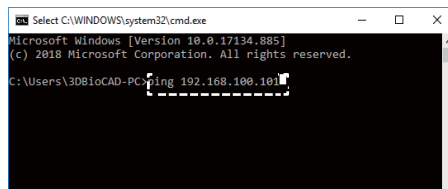
- When connected to the product, the '**CONNECT**' phrase and the communication icon animation are displayed.
- If '**OFFLINE**' is output, check the power status of the machine and the connection status of the cables.

3.5.3 Check the connection status

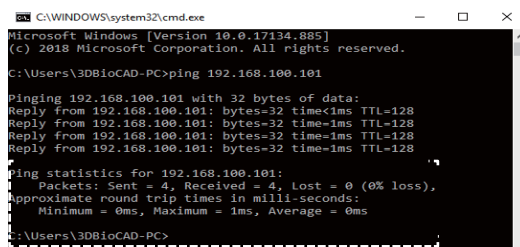
- 1 Press the **Windows key + R** on the keyboard on the user PC and enter '**cmd**' in the execution window.



- 2 When the DOS window opens, enter '**ping 192.168.100.101**' or the IP address set in the product and press Enter.



- 3 Check the status of '**Loss=0<0% Loss>**' in the result of the Ping test.

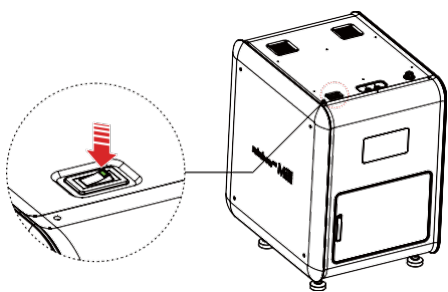


- 1:1 wired connection is recommended for the machine and user PC. Contact the manufacturer for wireless installation.
- If the ping test does not work normally, check the equipment control IP settings.
- If you are using an Internet network or more than one machine, please contact the retailer or manufacturer..

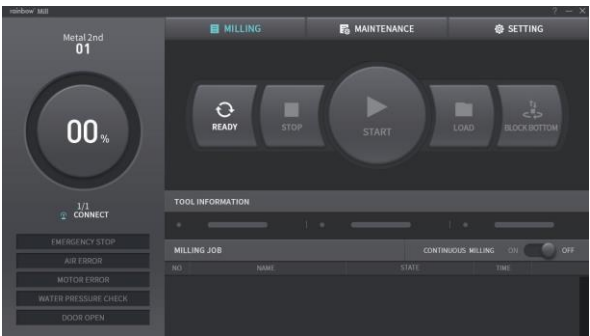
4 Preparing before use

4.1 Running and initializing the programme

- 1 Turn on the power switch.



- 2 Run the rainbow Mill program and check the status of '**CONNECT**', which indicates the connection status.



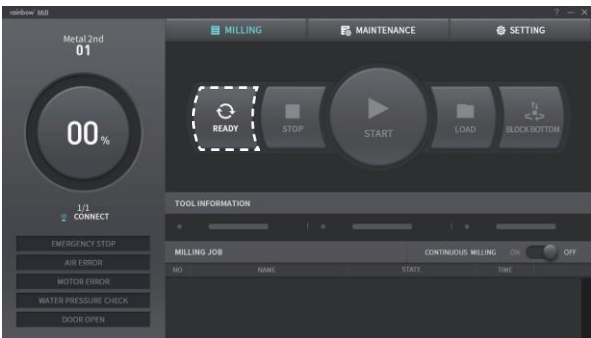
- 3 Press the **READY** button to initialize the position of each axis



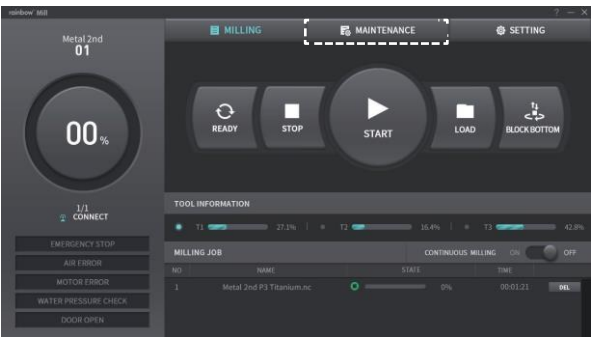
✓ When initialization is normally completed, all control buttons are activated.

4.2 Inserting a tool into the tool pocket

- 1 Press the **READY** button to initialize the position of each axis.



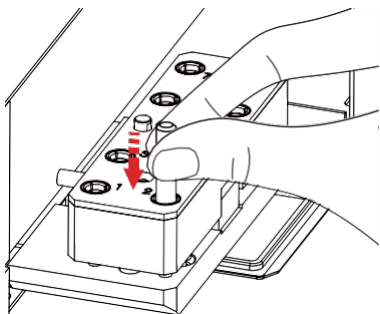
- 2 Press the **MAINTENANCE** button to switch the screen.



- 3 Press the **NEW TOOL** button to switch to the tool change standby state.



4 Refer to the table below and insert the specified tool all the way into the tool pocket.



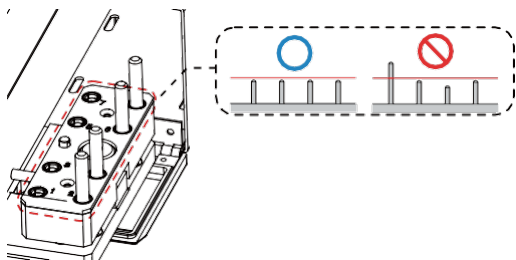
✓ For detailed specifications, see the table below.

Pocket number	Type	Blade diameter	Tool diameter	Applied materials
1	BE6D3.0-T	Ø3.0	Ø6.0	Titanium
2	BE6D2.0-T	Ø2.0	Ø6.0	
3	BE6D1.5-T	Ø1.5	Ø6.0	
4	BE6D1.0-T	Ø1.0	Ø6.0	
5	BE6D2.0-T	Ø2.0	Ø6.0	PMMA
	BE6D2.5-ED	Ø2.5		Glass Ceramic
6	BE6D1.0-T	Ø1.0	Ø6.0	PMMA
	BE6D1.5-ED	Ø1.5		Glass Ceramic
7	BE6D0.8-ED	Ø0.8	Ø6.0	Glass Ceramic
8	CALIBRATION PROBE	Ø2.0	Ø6.0	Calibration

NOTICE

- Do not use a tool that is not permitted by the manufacturer. Use of a wrong tool may result in severe damage to the processed work piece or the product. The manufacturer is not responsible for the damages.
- Remove a unused tool from the tool pocket and store it in the storage case after being dried. If a unused tool is not removed from the tool pocket, it may cause damage to the tool and product due to rust..

- 5 Check the heights of the tools that have been inserted into the tool pocket.



✓ Make sure that the heights of all the tools inserted into the pocket are constant. If the heights are different, re-insert the tools.

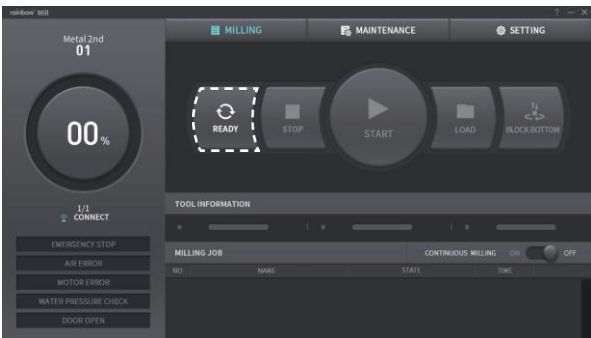
- 6 After inserting the tool, press the touch button to complete the operation.



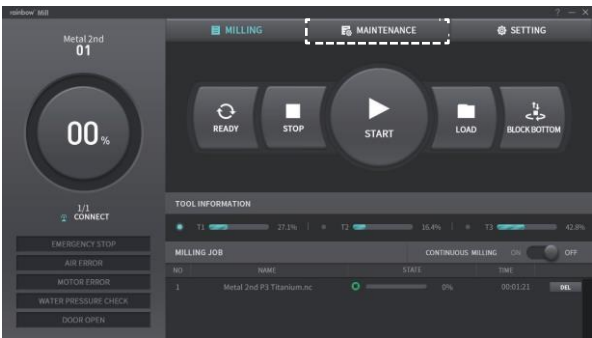
When the touch button is pressed after the tool change is completed, automatic replacement is performed with the last inserted tool.

4.3 Conducting a test run

- 1 Press the **READY** button to initialize the position of each axis.



2 Press the **MAINTENANCE** button to switch the screen.



3 Check that the front door is completely closed, then press the **WARM UP** button to start a test run.



- ✓ Conduct a test run before use every day, in order to maximize the product life and maintain the quality of the processed work piece.
- A test run lasts about 30 minutes, then automatically stops when completed.

 **WARNING**

Do not go near the spindle or driving axis during a test run. There is a risk of fatal injury.

 **CAUTION**

Do not open the front door during a test run.

If the front door is open and test run is stopped, close the front door and press the **WARM UP** button to start again.

5 Operating the product

5.1 Processing the titanium abutment rod

5.1.1 Mounting the titanium round rod

 **WARNING**

Remove or insert the round rod only after the product is completely stopped. There is a risk of fatal injury.

 **CAUTION**

Be careful not to touch the tool inserted into the collet when removing or inserting a round rod. It may cause an injury.

- 1 Press the **READY** button to initialize the position of each axis.



- 2 Press the **BLOCK TOP/BOTTOM** button to adjust the position of the processing table to facilitate the mounting of the round rod.



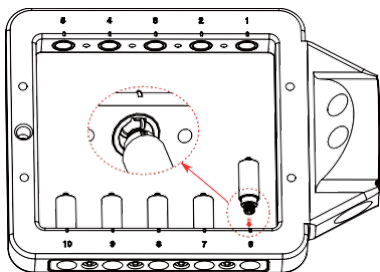
NOTICE

- The **BLOCK TOP/BOTTOM** button is displayed according to the table status.



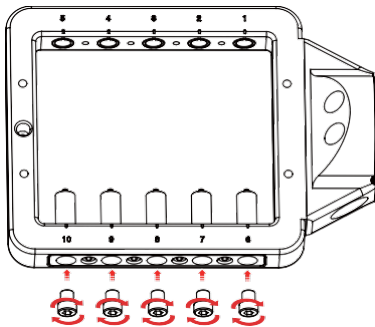
- If the button is double-clicked or the touch button is pressed for a long time (more than 2 seconds), the processing table is tilted.

- 3 Insert the round rod into the keyway in the mounting hole of the processing table.



When installing the round rod, check the keyway position on the table.

- 4 Fasten the round rod fixing bolts using by exclusive bolts and torque wrench to tight



When assembling the fixing bolt, be careful not to detach the round rod from the keyway. It may cause a damaged.

5.1.2 Mounting the LINKLESS jig and titanium round rod (Option)

- 1 Press the **READY** button to initialize the position of each axis.



- 2 Press the **BLOCK TOP/BOTTOM** button to adjust the position of the processing table to facilitate the mounting of the round rod.



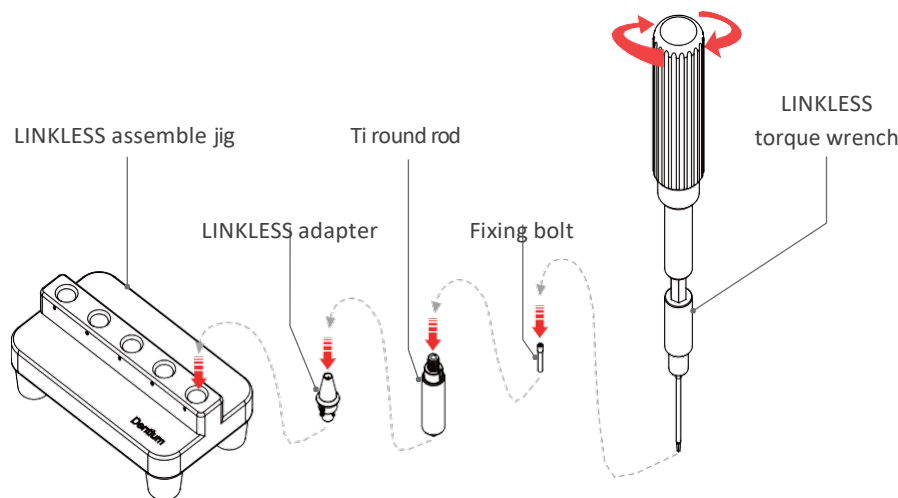
NOTICE

- The **BLOCK TOP/BOTTOM** button is displayed according to the table status.



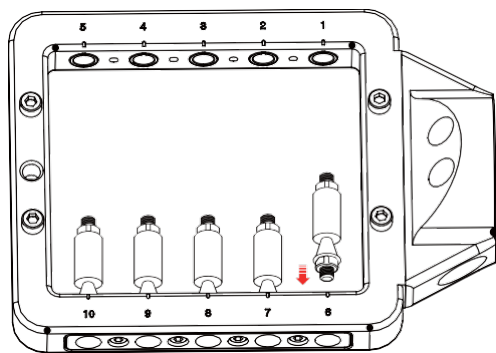
- If the button is double-clicked or the touch button is pressed for a long time (more than 2 seconds), the processing table is tilted.

- 3 Tighten the round rod and the LINKLESS adapter with the fixing bolts included with the round rod using the Linkless torque wrench.



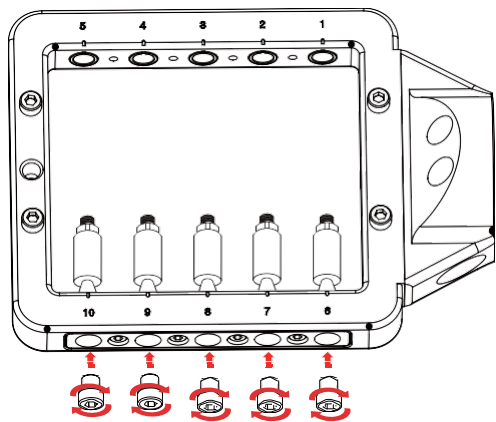
If the fixing bolt is loosely assembled, it may the round rod adapter and the round rod can be separated during processing

- 4 Install the LINKLESS adapter with the round rod connected to the keyway in the table mounting hole.



For LINKLESS processing, the fixed part of the LINKLESS adapter must be joined to the keyway position of the processing table..

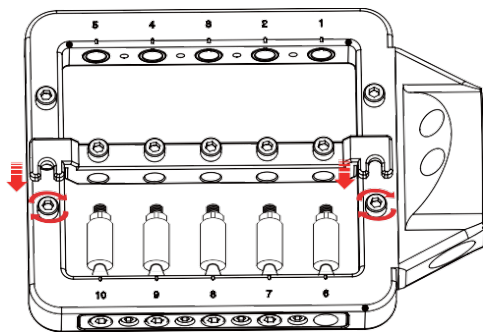
- 5 Fasten the round rod fixing bolts using by exclusive bolts and torque wrench to tight.



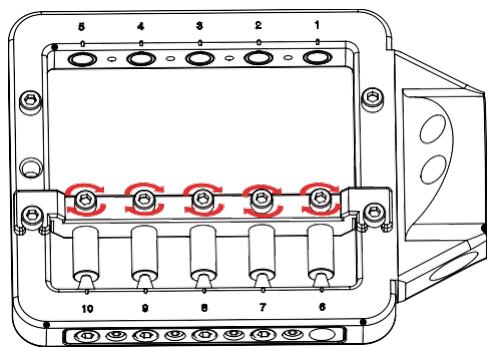
- 6 Press the **BLOCK TOP/BOTTOM** button twice or long press the touch button to adjust the position of the processing table so that the LINKLESS jig is easy to install.



- 7 Mount the LINKLESS jig in close contact with the fixed position of the processing table, and tighten it with fixing bolts so that it does not come off.



- 8 Fasten the LINKLESS jig fixing bolts using by torque wrench to tight



5.1.3 Processing the titanium abutment rod

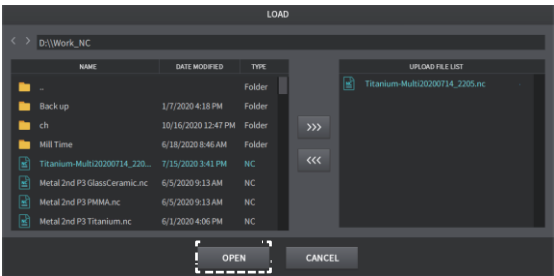
- 1 Press the **READY** button to initialize the position of each axis.



- 2 Press the **LOAD** button.



- 3 Select the *.NC file to process in the LOAD window and press the **OPEN** button.



- Be sure to select only a '*.nc' file. Selecting a file with different format may cause a programme error or product malfunction.
- Select/delete a file can be done by drag & drop, double click, or move button.

- 4 After confirming that the front door is completely closed, press the **START** button in the user program or the touch button on the machine to start processing.



- Check the wear condition of the tool before processing, and replace the tool with severe wear with a new tool.
- The **START** button changes to the **PAUSE** button during processing.
- To pause during processing, press the **PAUSE** button or touch button. If you press the **START** button while paused, it will restart.
- Never open the door during processing. When the door is opened, it is processed in a paused state..
- If stopped by pressing the **STOP** button, processing must be restarted from the beginning.
- If abnormal operation or noise occurs during processing, press the **EMERGENCY** button located on the top of the product.
::5.4 Emergency stop during a process (51p)
- Machining will not start while the warning LED is on.
::8.1 Troubleshooting of warning LEDs (73p)



5.2 Processing the bar blocks(Optional)

5.2.1 Mounting the bar block jig and blocks

**WARNING**

Mount or remove the processing jig only after the product is completely stopped. There is a risk of fatal injury.

**CAUTION**

Be careful not to touch the tool inserted into the collet when removing or inserting a bar block. It may cause an injury.

- 1 Press the **READY** button to initialize the position of each axis.



- 2 Press the **BLOCK TOP/BOTTOM** button or press the touch button to adjust the position of the processing table so that the bar block jig is easy to install



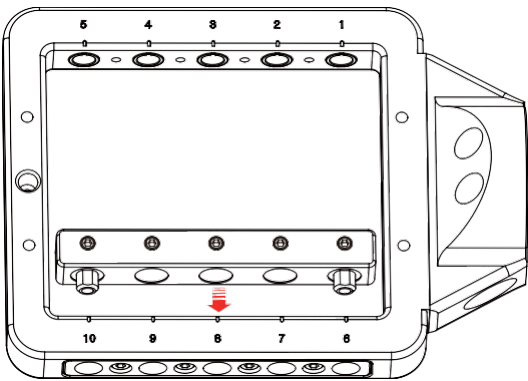
NOTICE

- The **BLOCK TOP/BOTTOM** button is displayed according to the table status.

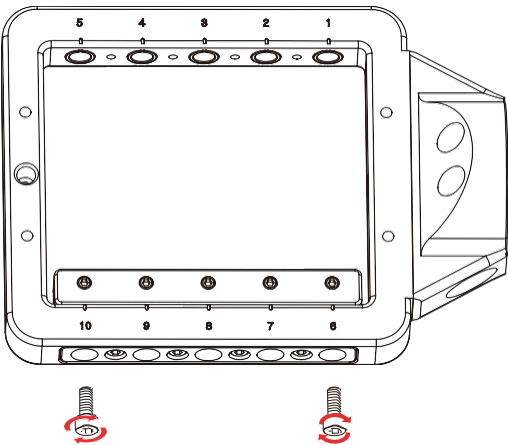


- If the button is double-clicked or the touch button is pressed for a long time (more than 2 seconds), the processing table is tilted.

- 3 Insert the bar block jig to the mounting hole in the processing table.



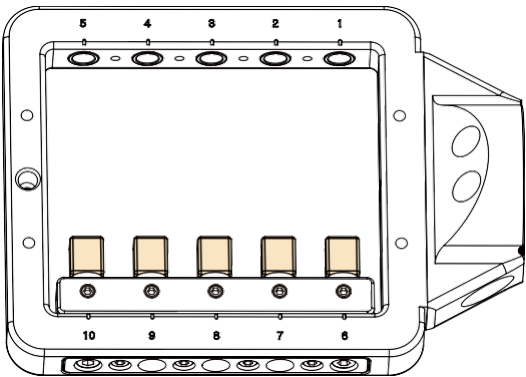
- 4 Fasten the bar block jig fixing bolts using by torque wrench to tight



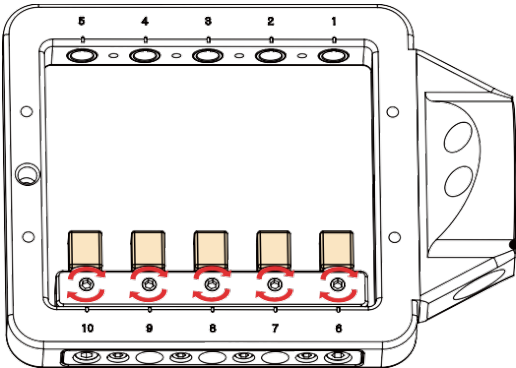
- 5 Press the **BLOCK TOP/BOTTOM** button twice or long press the touch button to adjust the position of the processing table so that the bar block is easy to mount.



- 6 Mounting the bar block to be processing.



- 7 Fasten the bar block fixing bolts using by torque wrench(use wrench tip of 3mm) to tight..



5.2.2 Processing the bar block

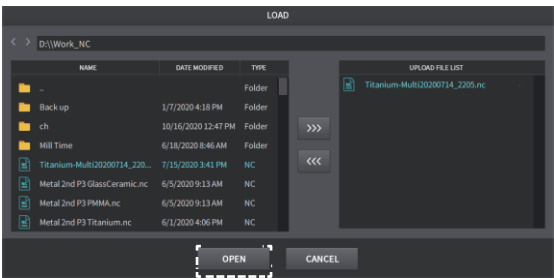
- 1 Press the **READY** button to initialize the position of each axis.



- 2 Press the **LOAD** button.



- 3 Select the *.NC file to process in the LOAD window and press the **OPEN** button.

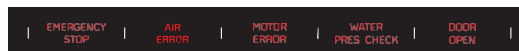


- Be sure to select only a '*.nc' file. Selecting a file with different format may cause a programme error or product malfunction.
- Select/delete a file can be done by drag & drop, double click, or move button.

- 4 After confirming that the front door is completely closed, press the **START** button in the user program or the touch button on the machine to start processing.



- Check the wear condition of the tool before processing, and replace the tool with severe wear with a new tool.
- The **START** button changes to the **PAUSE** button during processing.
- To pause during processing, press the **PAUSE** button or touch button. If you press the **START** button while paused, it will restart.
- Never open the door during processing. When the door is opened, it is processed in a paused state..
- If stopped by pressing the **STOP** button, processing must be restarted from the beginning.
- If abnormal operation or noise occurs during processing, press the **EMERGENCY** button located on the top of the product.
::5.4 Emergency stop during a process (51p)
- Machining will not start while the warning LED is on.
::8.1 Troubleshooting of warning LEDs (73p)



5.3 Processing the disk block

5.3.1 Mounting the disk jig and disk block

 **WARNING**

Mount or remove the disk block only after the product is completely stopped. There is a risk of fatal injury.

 **CAUTION**

Be careful not to touch the tool inserted into the collet when removing or inserting a disk block. It may cause an injury.

- 1 Press the **READY** button to initialize the position of each axis.



- 2 Press the **BLOCK TOP/BOTTOM** button twice or long press the touch button to adjust the position of the processing table so that the disk jig is easy to install



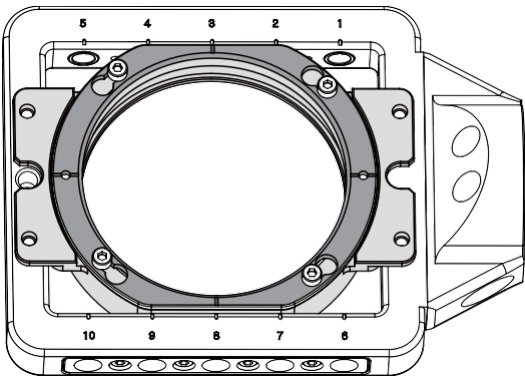
NOTICE

- The **BLOCK TOP/BOTTOM** button is displayed according to the table status.

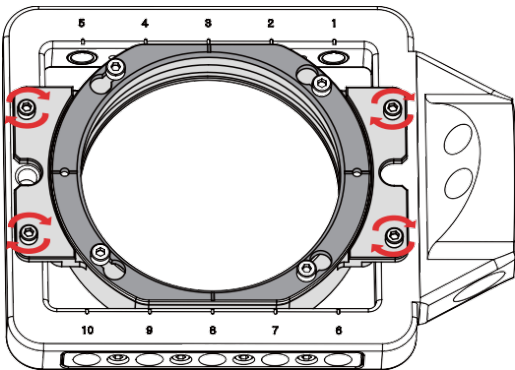


- If the button is double-clicked or the touch button is pressed for a long time (more than 2 seconds), the processing table is tilted.

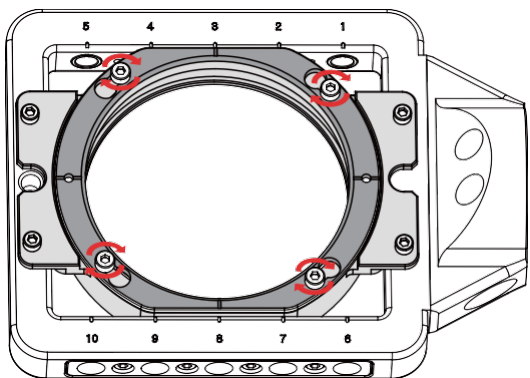
- 3 Insert the disk jig to the mounting into the processing table.



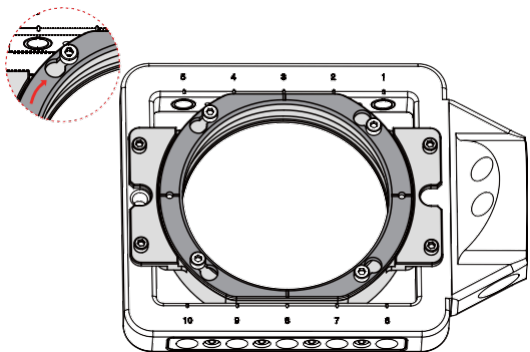
- 4 Fasten the disk jig fixing bolts using by the torque wrench to tight.



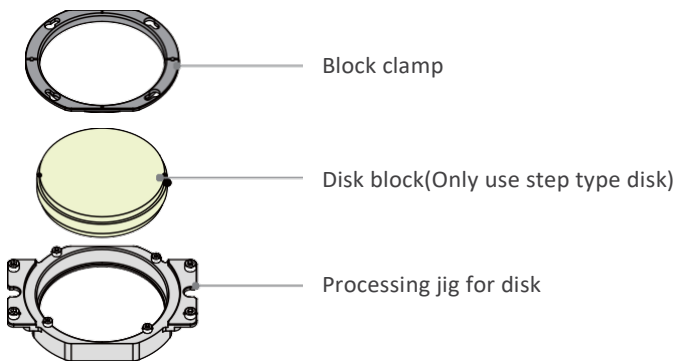
- 5 Loosen the clamp bolts with the hex wrench driver provided with the product.



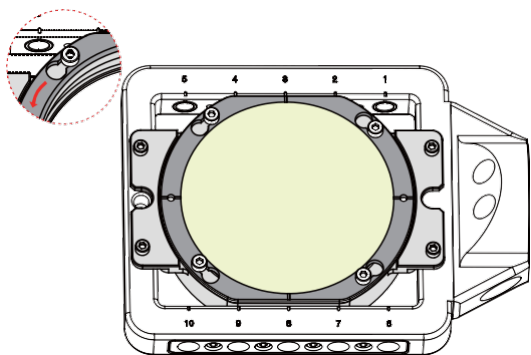
- 6 Turn the block clamp clockwise, then remove it from the processing table.



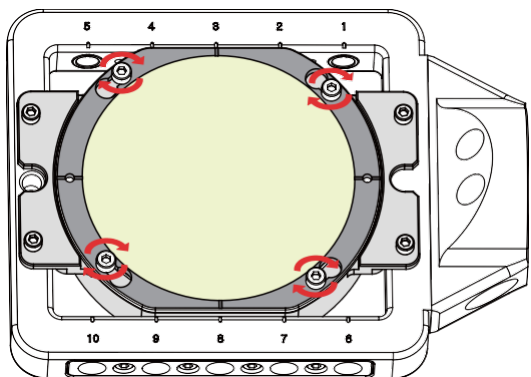
- 7 Insert the disk block into the mounting hole in the processing table.



- 8 Insert the block clamp to the processing table, then turn the clamp anticlockwise to fix it



- 9 Fasten the clamp bolts using by the hex wrench driver.



5.3.2 Processing a disk block

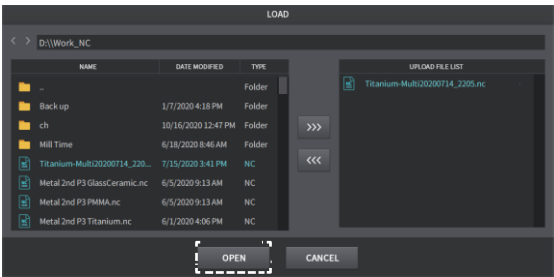
- 1 Press the **READY** button to initialize the position of each axis.



- 2 Press the **LOAD** button.



- 3 Select the *.NC file to process in the LOAD window and press the **OPEN** button.

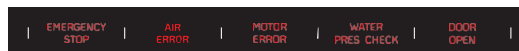


- Be sure to select only a '*.nc' file. Selecting a file with different format may cause a programme error or product malfunction.
- Select/delete a file can be done by drag & drop, double click, or move button.

- 4 After confirming that the front door is completely closed, press the **START** button in the user program or the touch button on the machine to start processing.

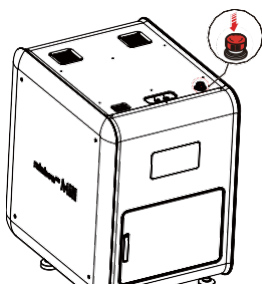


- Check the wear condition of the tool before processing, and replace the tool with severe wear with a new tool.
- The **START** button changes to the **PAUSE** button during processing.
- To pause during processing, press the **PAUSE** button or touch button. If you press the **START** button while paused, it will restart.
- Never open the door during processing. When the door is opened, it is processed in a paused state..
- If stopped by pressing the **STOP** button, processing must be restarted from the beginning.
- If abnormal operation or noise occurs during processing, press the **EMERGENCY** button located on the top of the product.
::5.4 Emergency stop during a process (51p)
- Machining will not start while the warning LED is on.
::8.1 Troubleshooting of warning LEDs (73p)



5.4 Emergency stop during a process

If there is any abnormality during a process, press the **EMERGENCY** button.



- During an emergency stop, the product does not operate. None of the buttons work.
- Pressing the **EMERGENCY** button immediately stops the process and lights the following warning LEDs



5.5 Cancelling emergency stop

- 1 Turn the **EMERGENCY** button clockwise.



- After the emergency stop state is released, the warning LED turns off after a while.

- 2 Press the **READY** button on the touch screen to initialize the positions of each axis

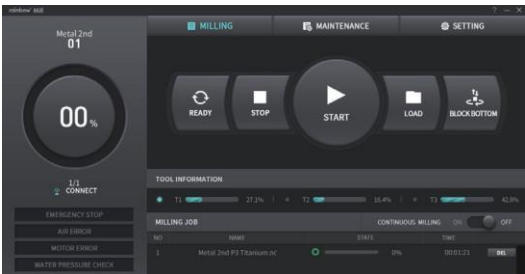


- Do not initialize them until all the warning LEDs turn off.
- After initialization is complete, you can start processing.

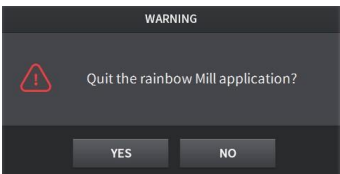
5.6 Ending the programme

- When the user program is terminated, the machine is automatically shut down.
- Turn off the machine after the machine's shutdown operation is normally performed. Otherwise, data loss may occur.
- If the equipment is being processed, even if the user program is terminated, the machine is terminated after the current processing is completed. If you need to shut down the machine immediately, press the **STOP** button to stop the machine and end the user program.

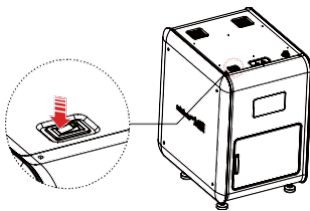
1 Press the **X** button in the upper right of the user program window.



2 When the exit confirmation pop-up window appears, click **YES**.



3 Turn off the machine's main power switch



- ✓ • When the user program is terminated and the machine is normally shut down, the touch and interior lights are turned off.
- Turn off the power switch after the lights are completely turned off

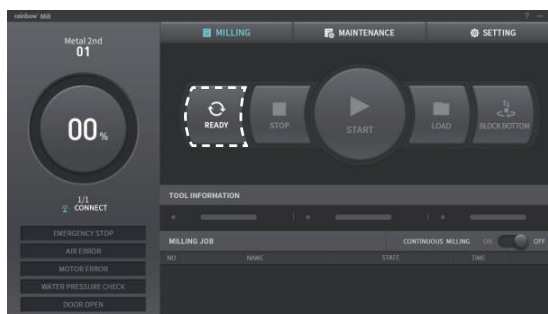
6 Processing the auto calibration

The following conditions can cause a twist of the driving axis. Be sure to correct a twisted driving axis.

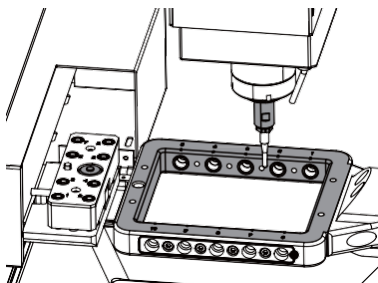
- A step arises in the processed work piece.
- A shock is applied to the product.
- The product is moved.

6.1 Preparing before the auto calibrating

- 1 Press the **READY** button to initialize the position of each axis.

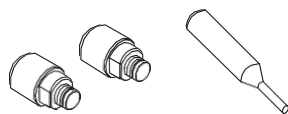


- 2 Clean the processing table and spindle.(coolant water and foreign substances)

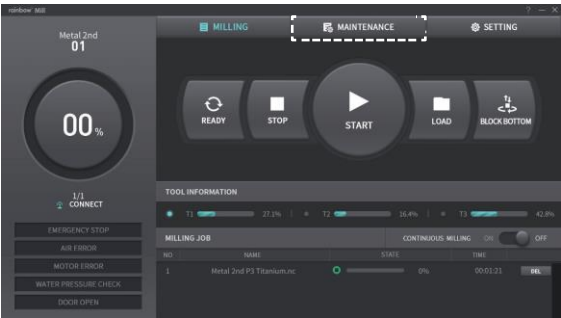


- ✓ • Wipe the processing table and spindle clean from coolant moisture.
- If there is moisture at the measuring point, the correction value is not reliable.

- 3 Prepare a calibration jig set. (Calibration tool, measuring rod jig).



- 4 Press the **MAINTENANCE** button to switch the screen.

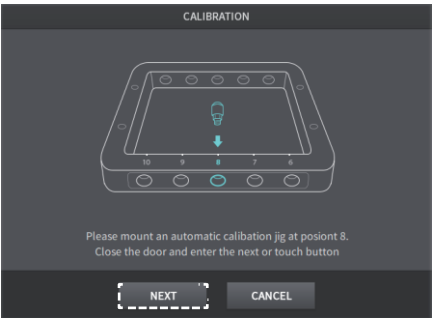


- 5 Press the **CALIBRATION** button to start the automatic calibration procedure.



6.2 Processing the auto calibration

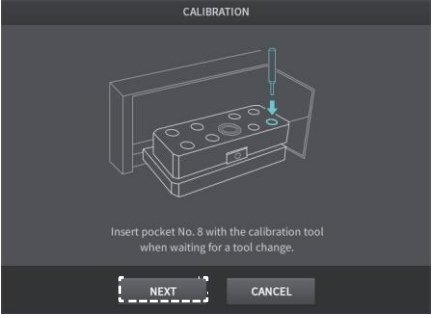
- 1 When the processing table movement is complete, install the jig at position 8 and press the **NEXT** button or touch button.



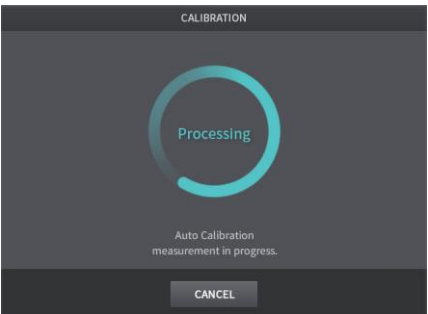
- 2 When the processing table movement is complete, install the jig at position 3 and press the **NEXT** button or touch button.



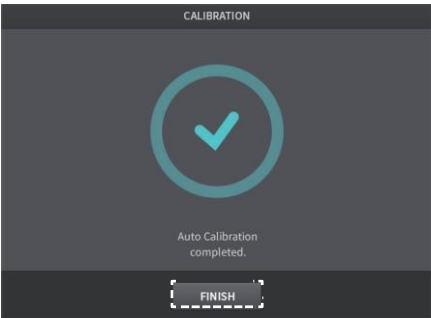
- 3 After returning the tool, it is in a waiting state for replacement. Insert the measuring tool into tool pocket #8 and press the **NEXT** button or touch button.



- 4 When calibration is in progress, the screen in progress is displayed.



- 5 When calibration is complete and the completion screen is displayed, press the **FINISH** button.



The calibration progresses for about 30 to 60 minutes depending on the calibration status.

6.3 Ending the auto calibration

- 1 Press the **BLOCK TOP/BOTTOM** button or press the touch button to adjust the position of the processing table and remove the calibration jig.



7 Cleaning and maintaining the product

**WARNING**

Clean the product after the product is completely stopped. There is a risk of fatal injury

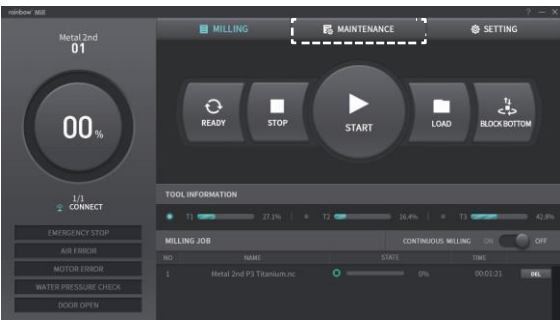
- Do not use pneumatic systems for cleaning.
- Do not use a cleaning tool that has a rough surface or sharp edge.

7.1 Cleaning the inside of the product

- 1 Press the **READY** button to initialize the position of each axis.



- 2 Press the **MAINTENANCE** button to switch the screen.



- 3 Check that the front door is completely closed, then press the **CLEANING** button to start cleaning.

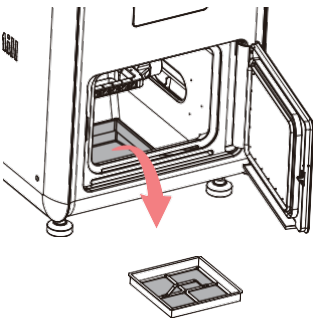


- 4 Finished cleaning then remove any processing residues.

 **CAUTION**

Dispose any processing residues in accordance with legal disposal procedures.

- 5 Hold and lift handles of the pre-filter to remove it from inside the product.



- 6 Discard the internal process residue and clean the pre-filter with a soft brush.

 **WARNING**

Be sure to clean the pre-filter. When the cutting oil overflows in the body due to no cleaning of the filter, there is a risk of electric shock.

- 7 After cleaning, assemble the pre-filter in the reverse order of disassembly.
- 8 With a soft wet towel, wipe the inside of product.
- 9 Use a dry cloth to wipe off water from the product.

7.2 Cleaning the spindle and collet

Do not rotate the spindle when the collet is ejected or when a tool is not inserted in the collet. The spindle may get damaged.

- Before cleaning the spindle and collet, prepare a spindle maintenance kit, a dry cloth, and a new tool for replacement in advance.

7.2.1 Checking the spindle maintenance kit

Check the items in the spindle maintenance kit.



Spanner



Collet brush



Cleaning brush

7.2.2 Cleaning the spindle

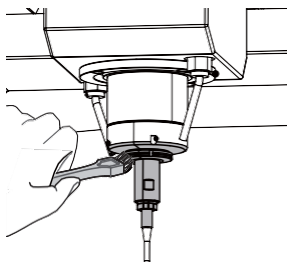
**CAUTION**

- Be careful not to touch the tool in the collet. It may cause an injury.
- Be cautious not to press any process-related buttons while cleaning. It may cause an injury.

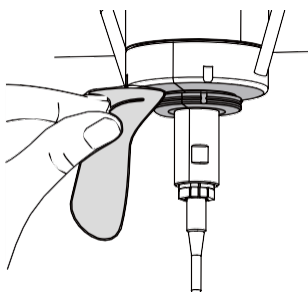
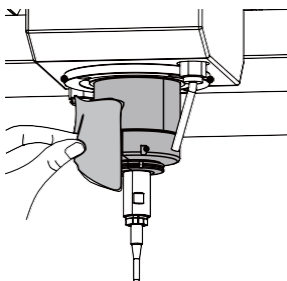
- Press the **READY** button to initialize the position of each axis.



- 2 Remove foreign substances from the spindle rotation part with a brush.

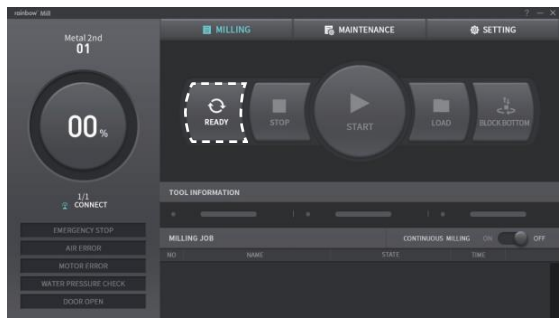


- 3 Wipe the spindle body and its rotation part clean with a dry cloth..

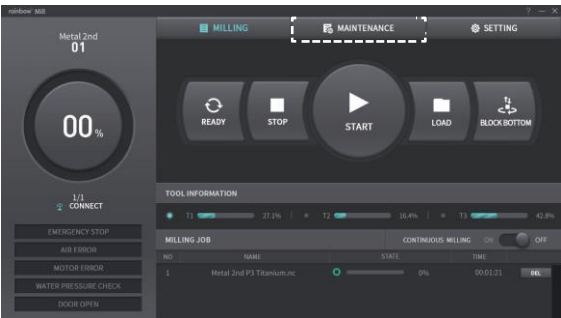


7.2.3 Removing the collet

- 1 Press the **READY** button to initialize the position of each axis.



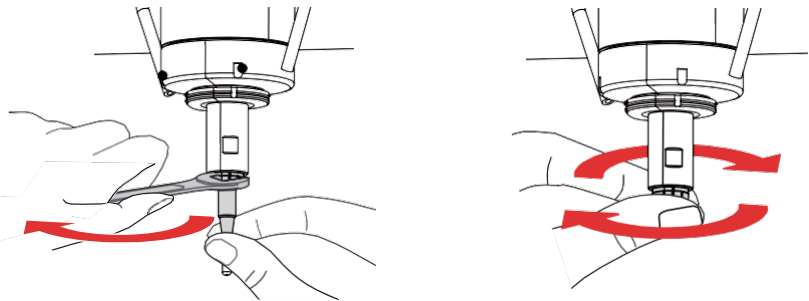
- 2 Press the **MAINTENANCE** button to switch the screen.



- 3 Press the **NEW TOOL** button to proceed with the removal of the current tool.



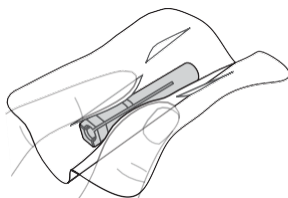
- 4 After the collet tool is discharged, it is in the standby state, and then separate the collet using a spanner.



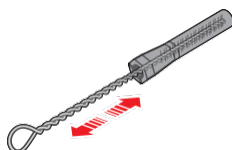
✓ The spanner is in the spindle maintenance kit.

7.2.4 Cleaning the collet

- 1 Wipe the collet clean with a dry cloth.



- 2 Use a collet brush to remove foreign materials from the inside of the collet.



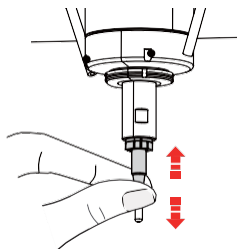
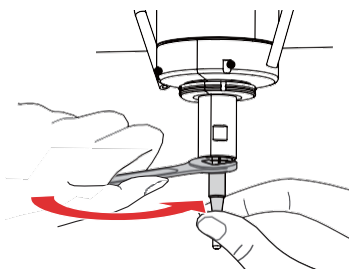
✓ The collet brush is in the spindle maintenance kit.

7.2.5 Combining the collet

- 1 Insert the collect into the spindle and turn it all the way for fixing.



- 2 After inserting a new tool into the collet, fasten the collet tightly to the right using the spanner.



- ✓ In order to prevent a spindle collet locking, repeat inserting and removing the tool and ensure smooth removal. Then remove the tool from the collet.

Tightly fasten the collet with a spanner. If loosely fastened, the collet may come loose from the spindle. If fastened too tightly, the collet may get damaged or have a spindle collet locking, which can prevent normal replacement.(Proper torque: 0.5 N·m)

- 3 After keeping the collet empty, exchange it with an existing tool by pressing the touch button.

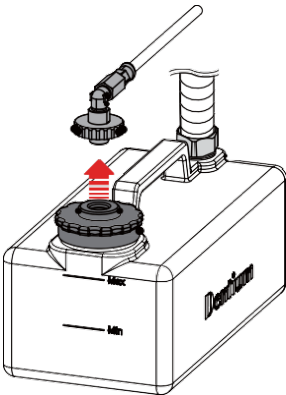


7.3 Cleaning the water tank

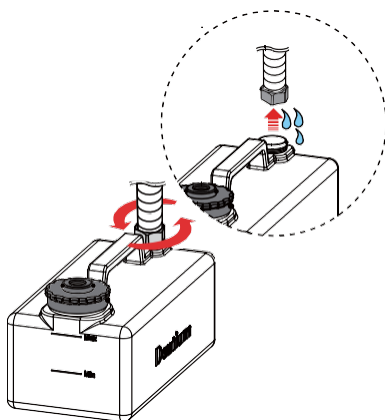
- ✓ When the product is not used for a long time (3 weeks or more), keep the water tank clean and empty.

7.3.1 Disconnecting the tube

- 1 Remove the feed tube cap from the circular filter lid.



- 2 Turn the drain tube holder counterclockwise to disconnect the drain tube.

**CAUTION**

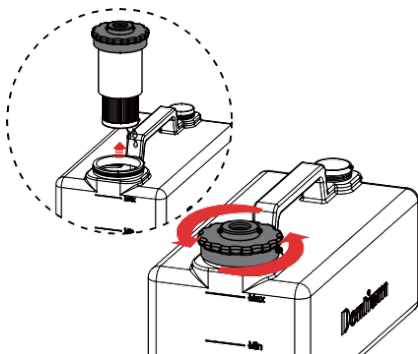
When removing the drain tube, be careful because the processing residues and cutting oil in the tube may drip.

7.3.2 Cleaning the water tank and changing the cutting oil



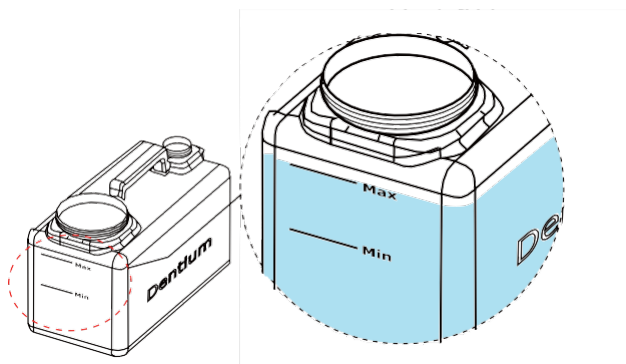
Clean the tank periodically to prevent precipitation from excessive accumulation that hinders the supply of cutting oil.

- 1 Remove the tubes from the water tank.
::7.3.1 Disconnecting the tube (63p)
- 2 Turn the circular filter lid counterclockwise to remove the circular filter lid.



3 Cleaning the water tank

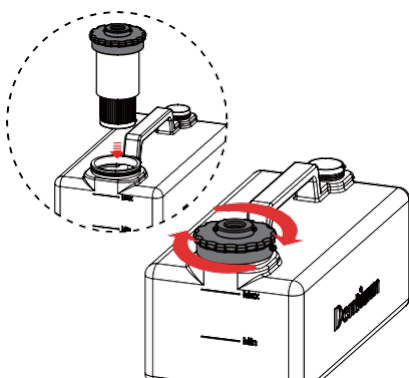
4 Fill the water tank with water to the MAX scale mark.



5 Dilute the cutting oil with water using the beaker provided with the product

- The dilution ratio of cutting oil should be adjusted to the ratio recommended by the manufacturer (10ℓ of water + 1ℓ of cutting oil).
- Do not arbitrarily change the dilution ratio for the cutting oil. It may cause a problem in the product.
- Only use the cutting oil provided by the manufacturer.

6 Combine the circular filter lid with the circular filter into the water tank and tighten it.



7 Connect the removed tubes to the water tank.
::3.2 Connecting the water tank (22p)

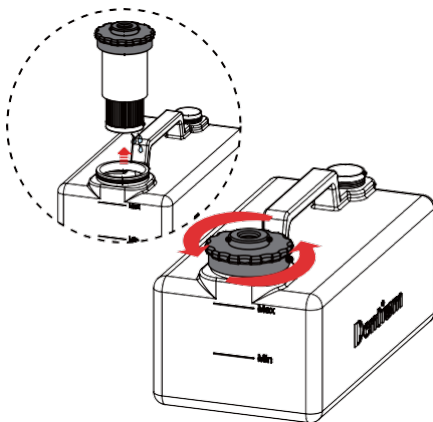
7.3.3 Cleaning and replacing the circular filter



- Replace the filter periodically. Immediately replace if the warning LED for WATER PRESSURE CHECK lights on the touch screen.
- When replacing the filter, be sure to clean the water tank. Otherwise, it may cause filter clogging by floats in the water tank.

When replacing, be careful as dropping the circular filter lid on the floor may damage it.

- 1 Turn the circular filter lid counterclockwise to remove the circular filter lid



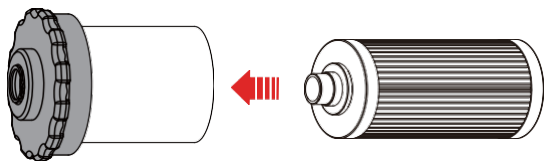
- 2 Remove the circular filter from the circular filter lid and clean the processing residue inside the circular filter lid..



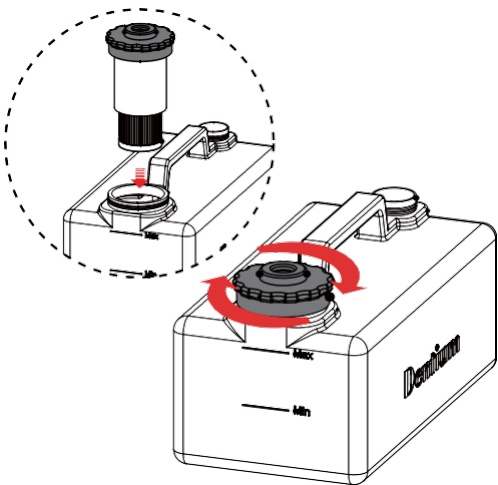
CAUTION

- When removing the circular filter, be careful because the processing residues and cutting oil may drip.
- Dispose any processing residues in accordance with legal disposal procedures.

- 3 Insert the new circular filter by pushing it all the way into the circular filter lid..



- 4 Combine the circular filter lid with the circular filter into the water tank and tightly lock it clockwise.

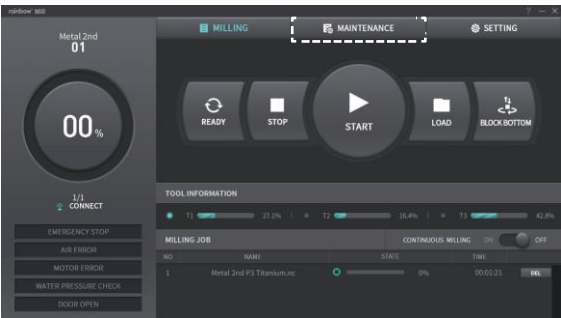


7.3.4 Checking cutting oil supply

- 1 Press the **READY** button to initialize the position of each axis.



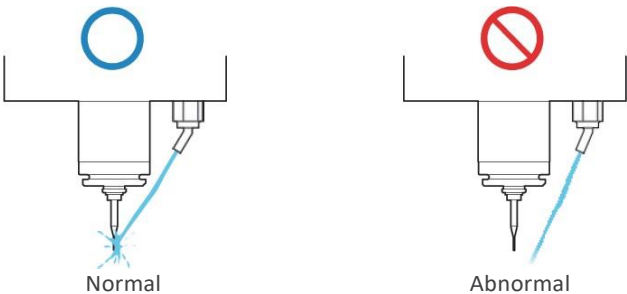
2 Press the **MAINTENANCE** button to switch the screen.



3 Check that the front door is completely closed, then press the **CLEANING** button to start cleaning.



4 Check the pump operation and the cutting oil discharge condition of the nozzle.



- The cutting oil supply is checked using the cleaning function.
- If the cutting oil supply is not smooth, check the connection and perform the cleaning function again.

7.4 Maintaining the pneumatic regulator

7.4.1 Discharging the drain

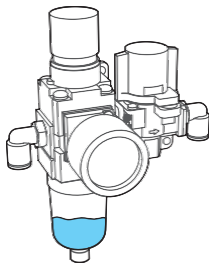
- Be sure to stop operation before discharging. It may cause a processing error due to a lower air pressure.
- If the drain is not frequently discharged, liquid may enter the inside of the product from the air filter drain case. It can cause a failure.



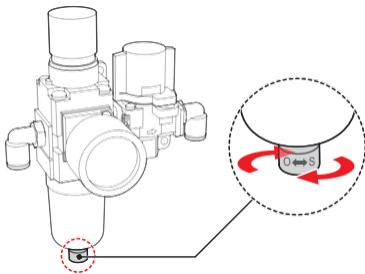
CAUTION

Upon drain discharging, be careful not to make drained liquid contact electrical devices. It may cause electric shock or fire.

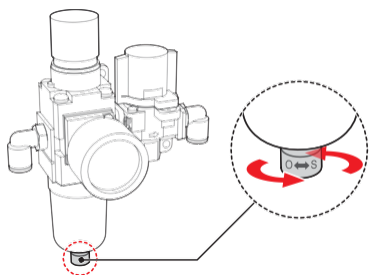
- 1 Check whether there is any liquid in the air filter drain case.



- 2 Turn the drain valve to drain the liquid.

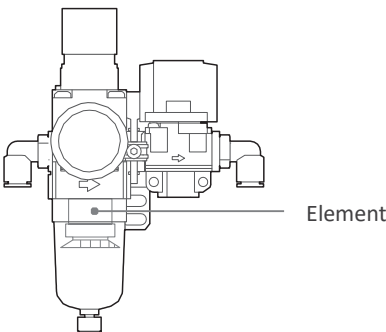


- 3 After discharging, turn the drain valve to close it.



7.4.2 Replacing the element

Contact the manufacturer to replace the element.



- ✓
- It is recommended that the element be replaced after 2 years of use.
 - Be sure to replace it when the pressure is less than the specified value by 0.1 Mpa.

7.5 Maintaining with a checklist

- 
- Inspect the product periodically in order to maximize the product life, maintain the quality of processed work pieces, and keep the product operating in the proper conditions.
 - Clean the inside of the product every day in order to maximize the product life and maintain the quality of processed work pieces.

Items	Details	Frequency
Spindle	Is there a tool in the collet?	Daily
	Does tool replacement function normally?	
	The spindle became dirty with foreign materials?	
	Does air normally come out around the collet?	
	Is there overheating?	
	Is the number for CURRENT TOOL the same as the number of the tool inserted into the spindle collet?	
Collet	Has a test run been conducted?	Daily
	Is the collet stained with foreign materials?	
	Is the fastening status OK?	
	Is the collet cleaned after removal?	Monthly
Tool pocket	Is it stained with foreign materials or processing residues?	Daily
	Is the tool inserted properly?	
	Is the tool pocket of CURRENT TOOL empty?	
	Does the touch screen display an error message during tool replacement?	
	Is the tool properly inserted according to the specified dimensions for the number?	
Tools	Is replacement required due to severe wear?	Daily
	Is the tool rusted?	Weekly
Pneumatic regulator	Are there any liquid or foreign materials in the air filter drain case?	Daily
	Is the pressure maintained between 6.0 and 6.5 bar (between 0.6 and 0.65 MPa)?	
Water tank	Does the water tank contain a quantity of coolant (Min / Max)?	Daily
	Is the cutting oil supply smooth?	
	Is there a noise or heat?	
	Is the pressure level of the cutting oil decreased?	Weekly
	Is there a sign of leakage in the connections?	

	Is the water tank contaminated? Is the water tank cleaned? Is the cutting oil has contaminated and does it need replacement? Is the circular filter replaced?	Monthly
Wires and tubes	Are they damaged or broken?	Daily
Processing part cleaning	Is the processing part cleaned? Has a CLEANING been conducted?	Daily

8

Troubleshooting during operation

8.1 Troubleshooting of warning LEDs

Types of warning LEDs	Cause	Remedy
EMERGENCY STOP	The LED lights when the EMERGENCY button is pressed.	Turn the EMERGENCY button clockwise to release it.
AIR ERROR	The LED lights when the pressure of the supplied compressed air falls below 4.0 bar (0.4 MPa).	Check the compressor for operation status and pneumatic valve status.
MOTOR ERROR	The LED lights when there is a collision during motor driving or there is an overload.	Press and release the EMERGENCY button, then press the READY button to initialize the positions of each axis.
WATER PRESSURE CHECK	The LED lights when the supply of cutting oil decreases due to decreased oil pressure during a process.	Replace the circular filter. ::7.3.3 Cleaning and replacing the circular filter (66p)
DOOR OPEN	The LED lights when the front door is open.	Close the front door.

8.2 Troubleshooting of error messages

No	Type of error message	Cause	Remedy
01	Invalid NC File	This error message appears when try to load a file that is not an NC file	Only use that *.nc file.
02	IP Address Empty	This error message appears when IP Address is not entered in the machine list setting window	Input the IP address associated with the machine. ::3.5.2 Setting the connection (25p)
03	Port Number Empty	This error message appears when Port Number is not entered in the machine list setting window	Input the port number. ::3.5.2 Setting the connection (25p)

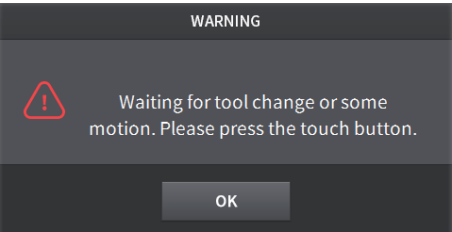
No	Type of error message	Cause	Remedy
04	Server Name Empty	This error message appears when Machine Name is not entered in the machine list setting window	Input the machine name. ::3.5.2 Setting the connection (25p)
05	Server Connection status is bad. Check the Network status.	This error message appears when the network status is not good	Check the Network connection status. ::3.5.3 Check the connection status (27p)
06	Cannot load at Continuous milling mode	This error message appears when clicking load button in continuous milling mode	Deactivate continuous milling mode and load the NC files. Loading is complete, enable continuous milling.
07	No milling job loaded	This error message appears when an NC file is not loaded then clicking start button.	Press the START button after loading one or more NC files
08	Please check the Air pressure	This error message appears when the pressure of the supplied compressed air falls below 4.0 bar (0.4 MPa).	Check the compressor for operation status and pneumatic valve status.
09	Water pressure check has occurred. Please check the watertank and pump	This error message appears when the cutting oil supply is reduced due to low cutting oil pressure during processing.	Check the water tank and nozzle. ::7.3 Cleaning the water tank (63p)
10	Activate EMERGENCY button on machine	This error message appears when the EMERGENCY button is pressed	Turn the EMERGENCY button clockwise to release it.
11	Please check the motor	This error message appears when there is a collision during motor driving or there is an overload	Press and release the EMERGENCY button, then press the READY button to initialize the positions of each axis. If the symptoms persist, contact the manufacturer.
12	Please check the Ready State	This error message appears when the machine needs to be initialized.	Please proceed with the initialization of the machine.
13	Waiting for tool change or some motion. Please press the touch button.	This error message appears when a verification action related to calibration progress or tool change(new tool change, tool length error detection, etc) is required.	Click the OK button and follow the instructions of the machine to proceed with the touch button.

8.3 Troubleshooting upon tool replacement error

8.3.1 Troubleshooting upon tool breakage while processing

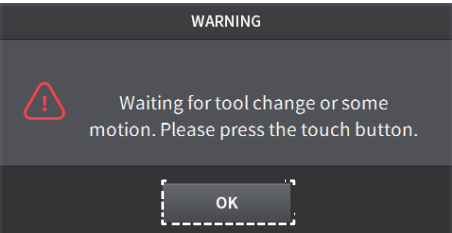
- ✓ If the tool broken while processing, replace it with a new one according to the following procedure.
- Prepare a new tool that meets specifications for replacement.
- If a new tool is replaced due to a tool breakage during processing, the process of the damaged tool starts again.

1 This error message is displayed if a problem with a tool length error occurs during processing.

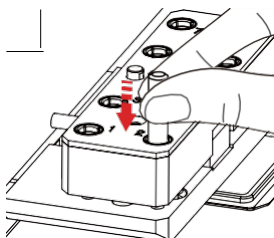


- If a tool breakage is detected during tool change during processing, the broken tool is discharged and the standby status is maintained for a new tool change.
- Processing is stopped when the user program or the **STOP** button is pressed while waiting for tool change.

2 Click the **OK** button to close the window and check the condition of the machine.



- 3 Replace the returned tool with a new tool.

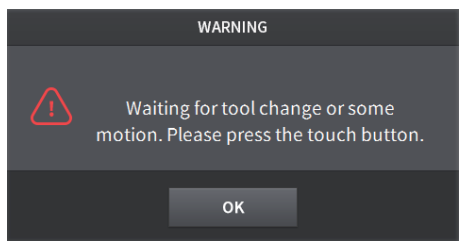


- 4 Continue tool change by processing START button of user program or machine.

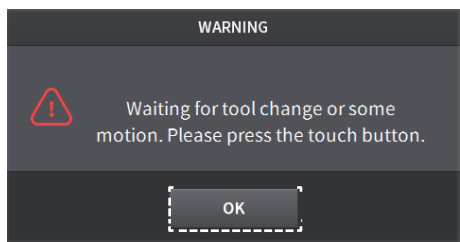


8.3.2 Troubleshooting upon spindle collet locking

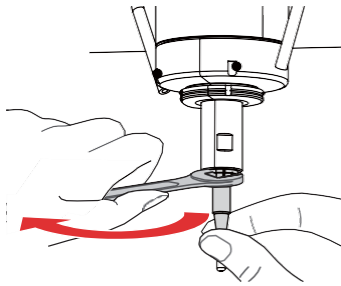
- 1 This error message is displayed if a problem with a tool length error occurs during processing.



- 2 Click the **OK** button to close the window and check the condition of the machine.



- 3 Use a collet spanner to separate the collets.

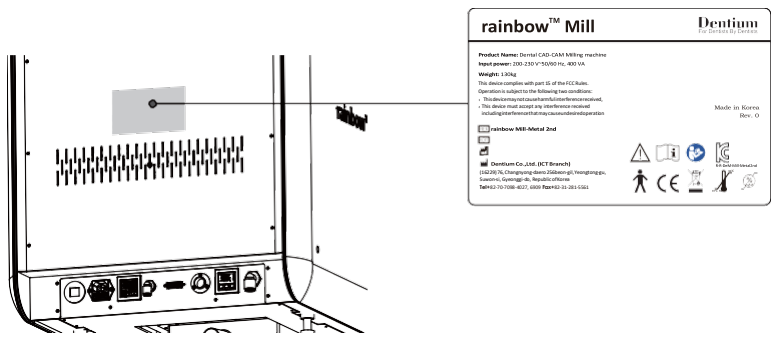


✓ The spanner is in the spindle maintenance kit.

- 4 Perform ::7.2.4 Cleaning the collet (62p).
- 5 Perform ::7.2.5 Combining the collet (62p).

9 Appendix

9.1 Labeling



Label	Use	Application location
	Address where the equipment was manufactured	Label
	This symbol indicates that electrical and electronic equipment must not be disposed of as unsorted municipal waste and must be collected esparately	Label
	Attention: consult accompanying documents.	Label
	The CE symbol indicates that this product complies with the Machinery Directive 2006/42/EC.	Label
	Consult instruction for use	Label
	This symbol indicates the operating humidity range.	Label
	This symbol indicates the category temperature range.	Label
	Non-patient conacting equipment	Label



EC Declaration of Conformity

According to EMC Directive 2014/30/EU

Applicant's Name : Dentium Co., Ltd. (ICT Branch)
Applicant's Address : (16229) 76, Changyong-daero 256beon-gil, Yeongtong-gu,
 Suwon-si, Gyeonggi-do, Republic of Korea
Manufacturer's Name : Dentium Co., Ltd. (ICT Branch)
Manufacturer's Address : (16229) 76, Changyong-daero 256beon-gil, Yeongtong-gu,
 Suwon-si, Gyeonggi-do, Republic of Korea

Declares that the product:

Product Name : Dental CAD-CAM Milling machine
Base Model : rainbow Mill-Metal 2nd
Variant Model : -

To which this declaration relates is in conformity with the following standard(s) or other normative document(s):

EN 61326-1:2013	Electrical equipment for measurement, control and laboratory use EMC requirements Part 1 : General requirements
EN 61000-3-2:2014	Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)
EN 61000-3-3:2013	Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection

following the provisions of Directive(s);

2014/30/EU Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (recast) Text with EEA relevance.

OJ L 96, 29.3.2014, p. 79–106 (BG, ES, CS, DA, DE, ET, EL, EN, FR, HR, IT, LV, LT, HU, MT, NL, PL, PT, RO, SK, SL, FI, SV)

Korea / Oct. 29. 2020

(Place and date of issue) (name and signature or equivalent making of authorized person)

European Contact (for regulatory topics only):

Supply's Declaration of Conformity

Product Description: Dental CAD-CAM Milling machine
Model/Brand Name: rainbow Mill-Metal 2nd
Variant Model: -
FCC Rule Part(s): FCC Part 15 Subpart B Class A
Part 15.107(b) & Part 15.109(b)

Applicant Name: Dentium Co., Ltd. (ICT Branch)
Applicant Address: (16229) 76, Changyong-daero 256beon-gil,
Yeongtong-gu, Suwon-si, Gyeonggi-do, Republic of
Korea

Manufacturer Name: Dentium Co., Ltd. (ICT Branch)
Manufacturer Address: (16229) 76, Changyong-daero 256beon-gil,
Yeongtong-gu, Suwon-si, Gyeonggi-do, Republic of
Korea

Test Report Reference No.: KES-EM-20T0750

Dental CAD-CAM Milling machine, Model rainbow Mill-Metal 2nd has been tested in accordance with the measurement procedures specified in FCC Part 15 Subpart B class A and has been shown to be complied with the electromagnetic emission limits specified in FCC Rule Part 15 Subpart B class A. A testing of the sample product has been valid for the sample tested based on the reference test report, KES-EM-20T0750

Responsible Party – U.S. Contact Information

Company Name: Dentium USA
Company Address: 6731 Katella Ave Cypress, California, 90630, United States
Telephone: 714-2260229-111
Contact name:

Date of Issue: Oct. 29, 2020

President:

Signature:

Dentium Co., Ltd.

8F, 9F, 76, Changyong-daero 256beon-gil, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16229, Republic of Korea

9.2 Product specifications

Item	Discription
Product size	Main body: 51.2 cm(W) x 73 cm(H) x 64 cm(D)
	Desk: 52 cm(W) x 94 cm(H) x 70 cm(D)
Weight	Main body: 130 kg
	Desk: 90 kg
Processing block size	Disk type: Ø98 mm Step x 10~24T
	Bar type: See the CAM software
Spindle rotation speed	60,000 rpm
Spindle power	650 W
Mode of processing	Wet
Tool pocket	Qty: 8
Mode of tool exchange	Automatic
Quantity of axes in use	4
Power consumption	400 VA
Rated input	AC 200-230 V, 50/60 Hz, 3.5 A
Tool size in use	Ø6.0 mm
Operating conditions	Indoor use only
	Air pressure: 800 ~ 1100 hPa
	Temperature: 10 ~ 30 °C
	Humidity: 30 ~ 80 %
Storage and transporting conditions	Altitude: Maximum 2000 M
	Air pressure: 800 ~ 1100 hPa
	Temperature: 10 ~ 40 °C
	Humidity: 30 ~ 80 %
Insallation category	Overvoltage category : Category II
	Pollution degree : 2
	Short-Term Temporary Over Voltage : 1430 V
	Long-Term Temporary Over Voltage : 480 V
Protection type against electric shock	Class I device
Protection degree against electric shock	Type B equipment

rainbow Mill-Metal 2nd

User Manual

Dentium
For Dentists By Dentists

Manufacturer
(16229) 76, Changnyong-daero 256beon-gil, Yeongtong-gu, Suwon-si, Gyeonggi-do, Republic of Korea
Tel. +82-70-7098-4027, 6909 Fax. +82-31-281-5561

Website
www.dentium.co.kr

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