

WJAC-70 Instruction Manual

2nd Edition

Weihong Electronic Technology Co., Ltd.

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Preface

About This manual

This manual is intended for operators / manufacturers. If you use Weihong CNC system for the first time, it is suggested to read through this manual. If not, however, you can search for the desired information via the contents.

With 3 chapters, this manual can be divided into 4 parts, as follows:

- 1) Part 1: preface, introducing the precautions about transportation and storage, installation, wiring, debugging, usage and so on. You need to read them first carefully to ensure safe operations.
- 2) Part 2: an overview of the product, including chapter 1. This chapter gives general description of packing list, product name and model, precautions in transportation and storage, structural diagram of the product as well as relevant technical parameters, etc.
- 3) Part 3: introduction to installation and commissioning, including chapter 2. This chapter introduces installation and commissioning of the cutting head.
- 4) Part 4: maintenance part, referring to chapter 3.

Applicable Product Model

This manual is applicable to high-precision AC five-axis waterjet cutting head. Refer to the table below for details.

Product Model	Remarks
High-precision AC Five-axis Waterjet Cutting Head	WJAC-70-xxxx-03 series

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Revision History

You can refer to the following table for the revision records of each edition.

Date	Edition	Revision
2016.08	R2	1) Naming rules in section 1.1 updated, and dimensional drawings in section 2.1 updated. 2) Other revisions.
2016.04	R1	Released for the first time.

Precautions

Precautions can be divided into caution and warning according to the degree of possible loss or injury in case of negligence or omission of precautions stipulated in this manual.



CAUTION: general info, mainly for informing, such as supplementary instructions and conditions to enable a function. In case of negligence or omission of this kind of precautions, you may not activate a function. Note that in some circumstances, negligence or omission of this kind of precautions could cause physical injury or machine damage.



WARNING: warning info requiring special attention. In case of negligence or omission of this kind of precautions, you may suffer physical injury, or even death, machine damage or other losses.

WARNING

1) Precautions Related to Storage and Transportation

- The products should be transported properly in terms of the weight and method offered on packing box;
- An excess of specified quantity of stacking products is prohibited;
- Use forklift to carry the packing box and prevent it from falling in transit;
- Place or stack the packing boxes as instructions on the box and handle with care, avoiding upside-down or collision;
- It is suggested to keep packing box properly for further use;
- Keep the product free of moisture during transportation and storage.

 **CAUTION**

1) Precautions Related to Product and Manual

- Matters related to restrictions and functions available stipulated in the manuals issued by the machine manufacturer are prior to those in this manual;
- This manual assumes all the optional functions are available, which you must confirm through manuals issued by the machine manufacturer;
- Please refer to manuals issued by the machine manufacturer for the instructions of machine tools;

2) Precautions When Opening the Package

- Please make sure that the products are what you have ordered;
- Check if the products are damaged in transit.

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1 Overview

Independently developed by Weihong Company, WJAC-70 is a type of AC five-axis waterjet cutting head facing high precision waterjet cutting. Embedded in three axes platform, it can realize 2D and 3D machining, featuring advantages such as high machining efficiency and once-through shaping. Used together with Weihong waterjet cutting control system, it can be applied in varied industries covering metal cutting, glass cutting, stone cutting, etc.



Damage to the main body or precision error due to artificial factors is not covered in warranty.

1.1 Product Name and Model

◆ **Product Name**

Device name: High-precision AC five-axis waterjet cutting head

◆ **Model**

Naming rule: Short name + Code + Waterjet type + Motor type + Function indicator+ Version. See Fig. 1-1 for details.

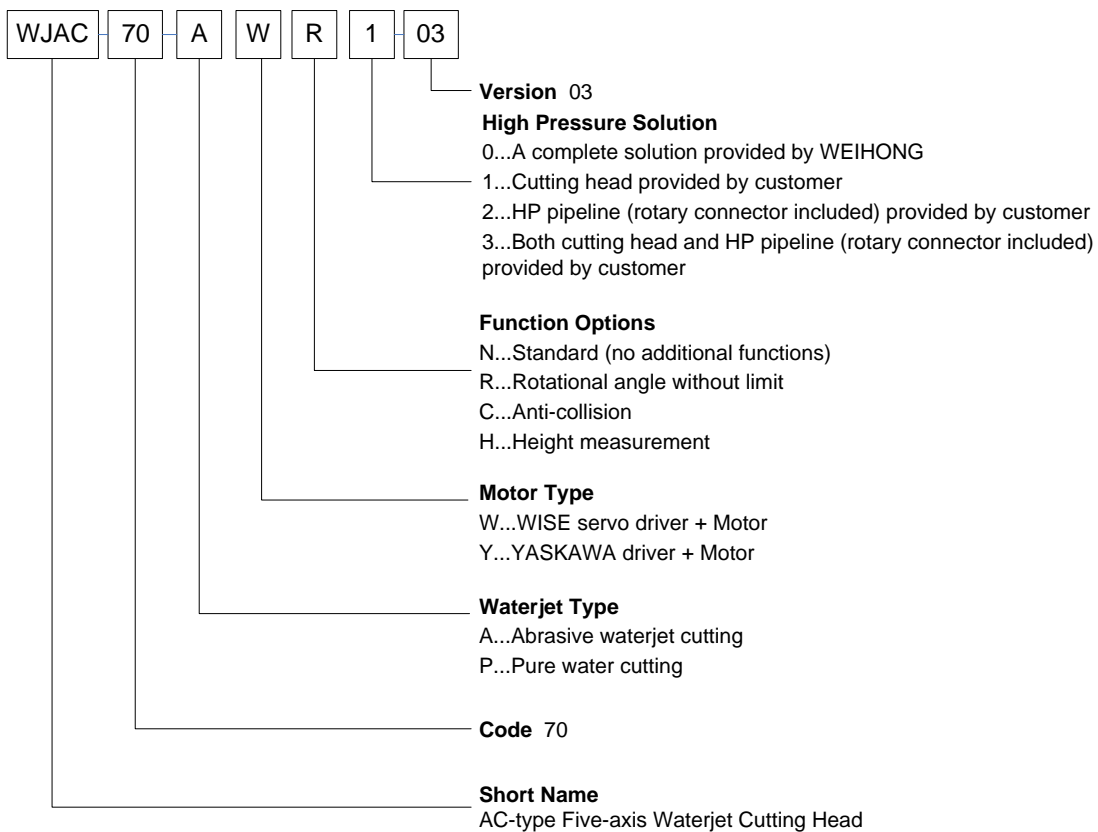
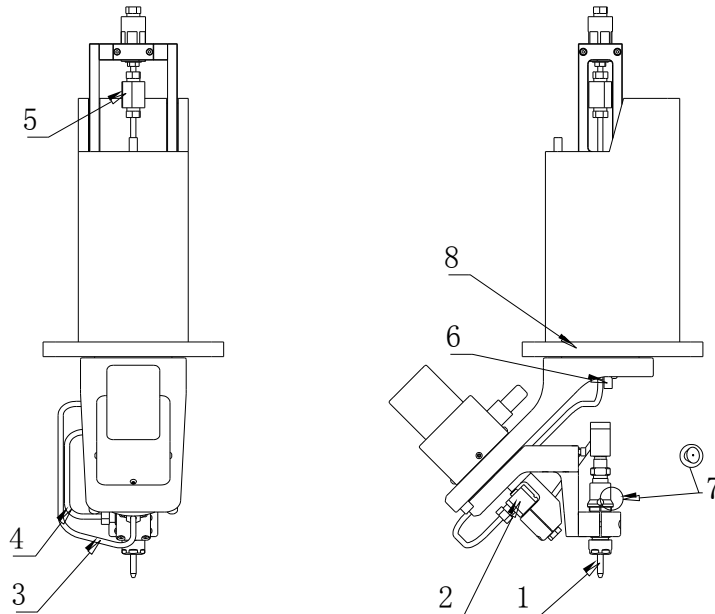


Fig. 1-1 Model designation

1.2 Structural Diagram

See Fig. 1-2 for structural diagram of WJAC-70, among which 1~7 refer to replacement parts, namely, easily worn-out components, and 8 refers to docking section between the cutting head and machine.



- 1 Mixing Tube
- 2 180° Rotary Connector
- 3 C-axis HP Water Pipe
- 4 A-axis HP Water Pipe
- 5 Straight Rotary Connector
- 6 Abrasive Outlet
- 7 Jewel Orifice
- 8 Lower Connecting Plate



Fig. 1-2 Structural drawing of AC five-axis waterjet cutting head



Unauthorized disassembling of WJAC-70-xxxx-03 is PROHIBITED, except for easily worn-out components!

1.3 Relevant Technical Parameters

Here are some relevant technical parameters, see Table 1.

Table 1 Technical parameters

Name	High-precision AC Five-axis Waterjet Cutting Head
Model	WJAC-70-xxxx-03
Dimensional Size	386*222*698 mm
Rotational Radius	266 mm
A-axis Rotational Angle	$\pm 70^\circ$ (or $16^\circ \sim -196^\circ$)
A-axis Rotational Angle	Unlimited (or $\pm 540^\circ$)
Positioning Precision of Rotary-axis	3arcmin
Max Rotational Speed of Rotary-axis	60rpm
Cutting Precision at Fixed Point	$\pm 0.05\text{mm}$
Weight	29 kg
A-axis Motor Horsepower	100 W
C-axis Motor Horsepower	400 W

2 Installation and Commissioning

2.1 Installation

- On opening the product package, please firstly make sure the model is what you have ordered and all accessories are included.
- Please install each component as the dimensional drawing and mounting method offered by Weihong Company.

◆ **Dimensional Drawing**

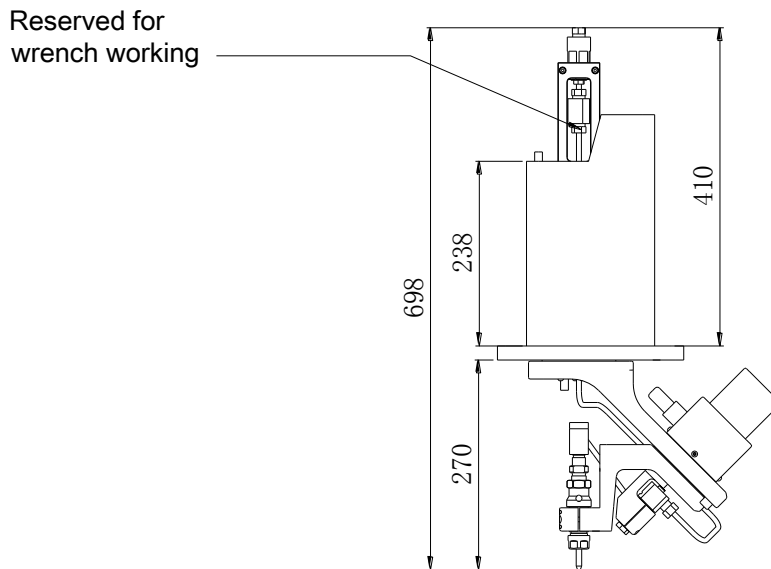


Fig. 2-1 Dimensional drawing of WJAC-70-xxxx-03 (Front view)

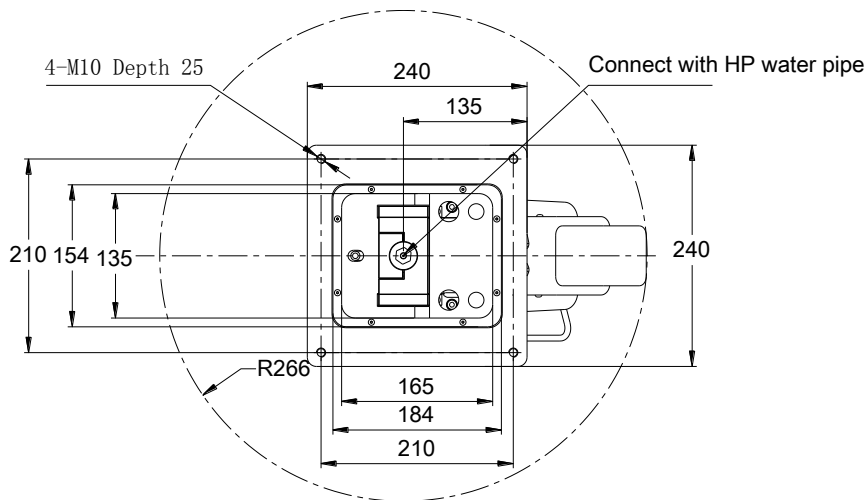


Fig. 2-2 Dimensional drawing of WJAC-70-xxxx-03 (Cross-section view)

◆ **Docking with the Machine**

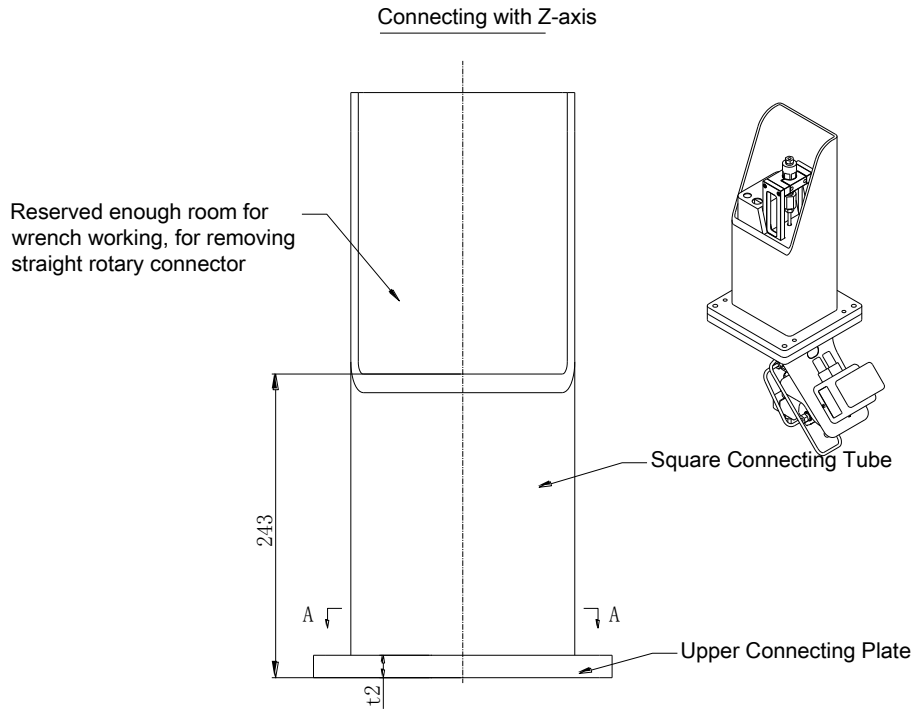


Figure 1

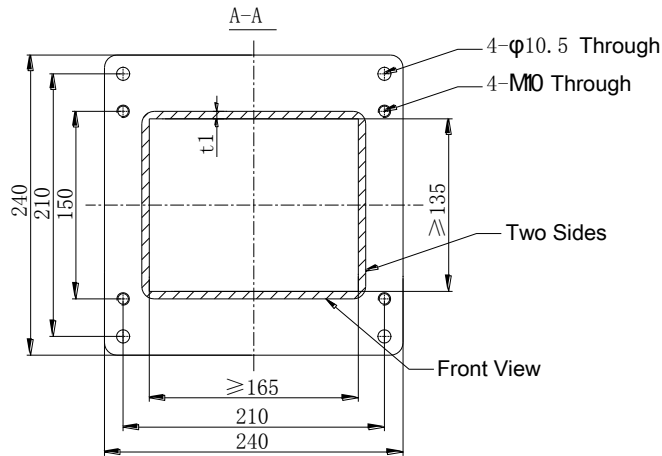


Figure 2

Fig. 2-3 Dimensional drawing of docking section between Z-axis and the cutting head

◆ **Technical Requirements for Docking**

- 1) As shown in figure 1, enough room should be reserved on the front or side for wrench working, in order to remove through-type high pressure rotary connector.
- 2) As shown in Fig. 2-3, figure 1 on the upper part shows the recommended connecting method. Note that dimension of upper connecting plate in figure 1 must be in line with that offered in figure 2, while net size of the square connecting tube should be larger than the size of rectangle (165mm*135mm) in figure 2. "t1=6mm, t2=18mm" is recommended.
- 3) Please connect the square connecting tube of Z-axis with the upper connecting plate, which should be jointed with the lower connecting plate of WJAC-70-xxxx-03 via a M10 screw.

- 4) When setting travelling range for X/Y axis, rotational radius of cutting head should be taken into consideration, to make sure there will be no interference to the machine anytime the cutting head is rotating.
- 5) Cutting precision is influenced by perpendicularity of C-axis relative to XY-plane of the machine, therefore, it is recommended to adjust the C-XY perpendicularity by fine tuning fixed screw and other screws. For detailed information, see chapter 2.2.
- 6) Initial pose of C-axis or the cutting head is as shown in Fig. 2-1.



- 1) High pressure water control valve is not contained in WJAC-70.
- 2) Should you change the connecting method, please inform us in advance.

◆ **Electrical Wiring**

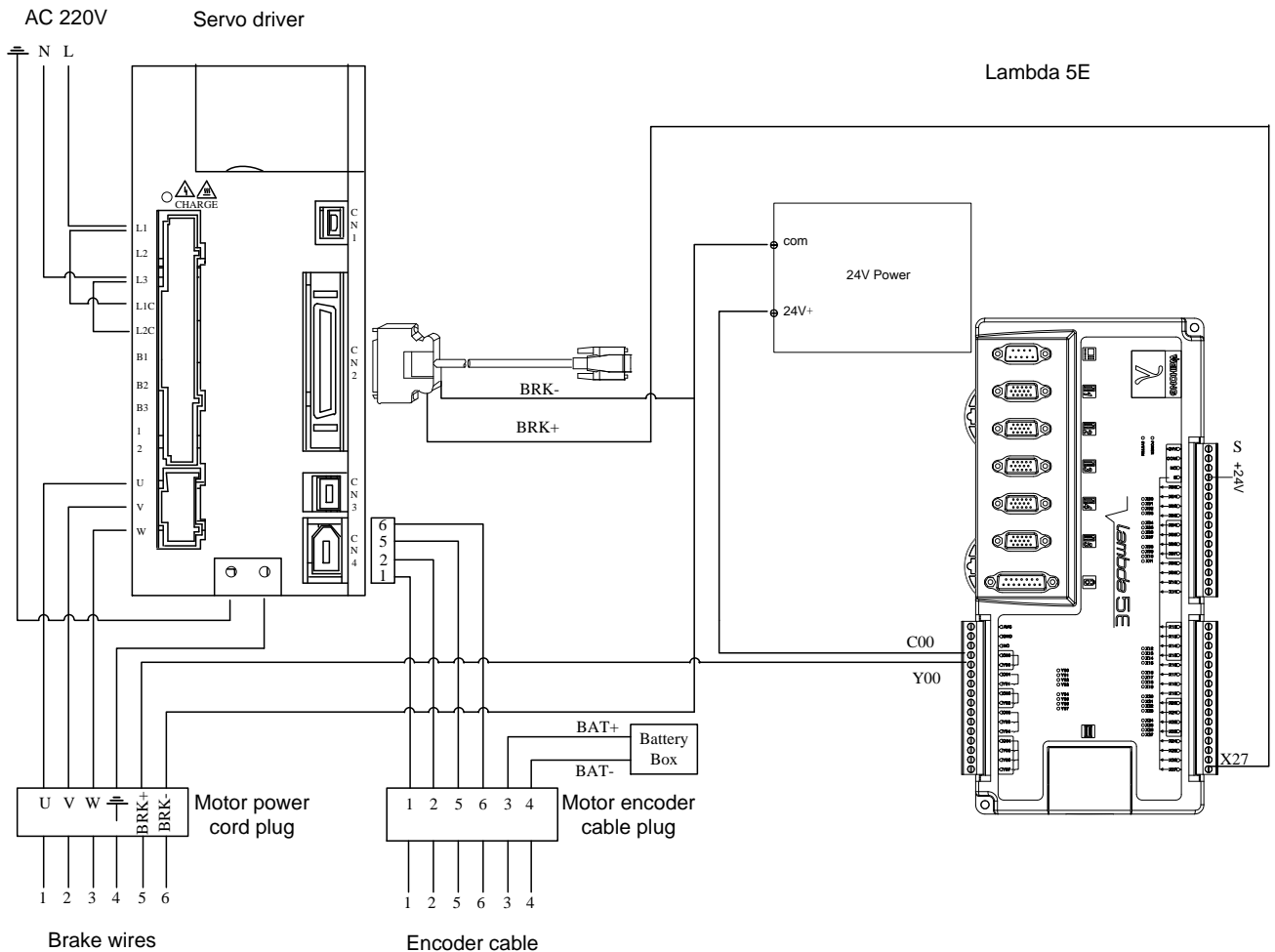


Fig. 2-4 Electrical wiring diagram between the driver and terminal board

◆ **Wiring Specification of Connectors**

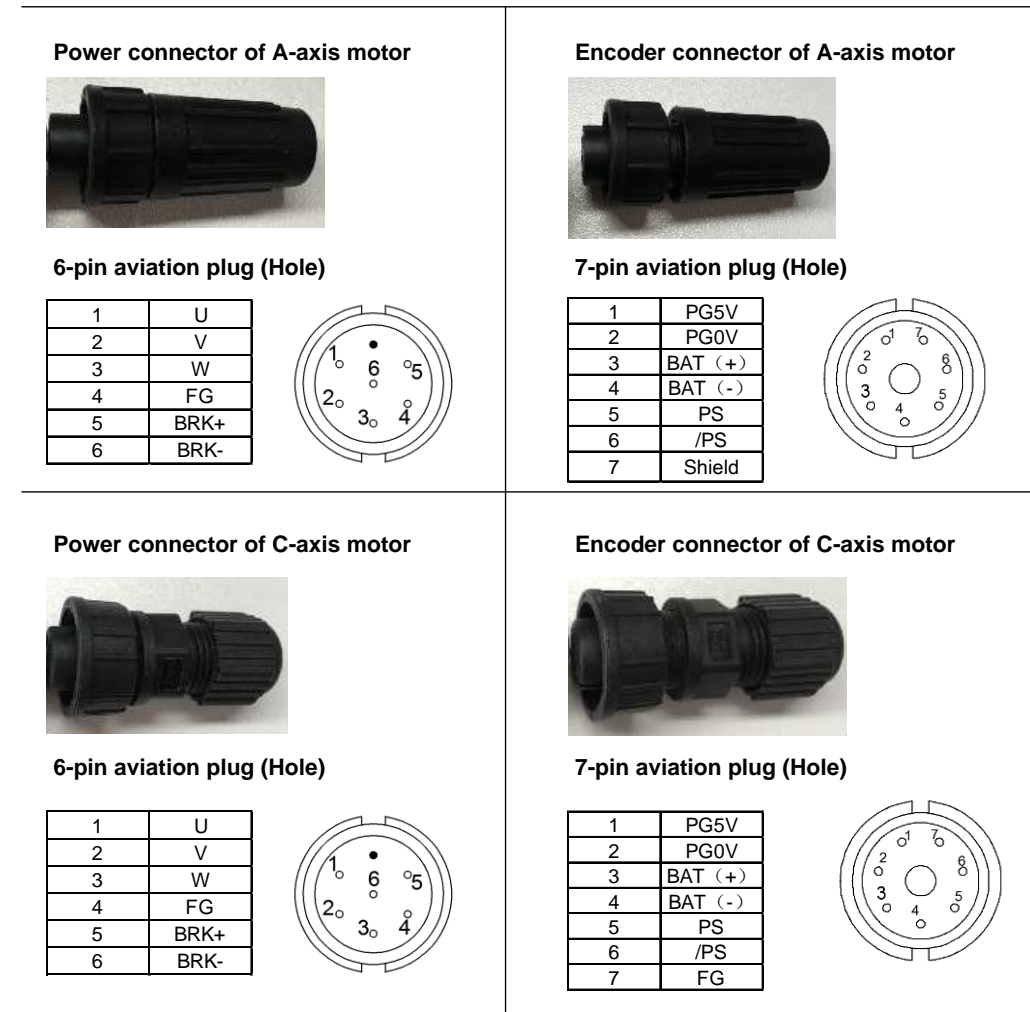


Fig. 2-5 Wiring specification of connectors for WJAC-70-xxxx-03

2.2 Commissioning

Commissioning of WJAC-70-xxxx-03 is divided into two parts: perpendicularity adjustment of C-axis relative to XY-plane of the machine; adjustment of the reference point of C-axis.

Tools must be prepared in advanced: one round dial indicator, one flat dial indicator, one set of hexagonal wrench, two adjustable wrench, three jacks, marble platform (flatness of the test surface $\leq 0.002\text{mm}$).

◆ How to Adjust Perpendicularity of C-axis Relative to Machine XY-plane

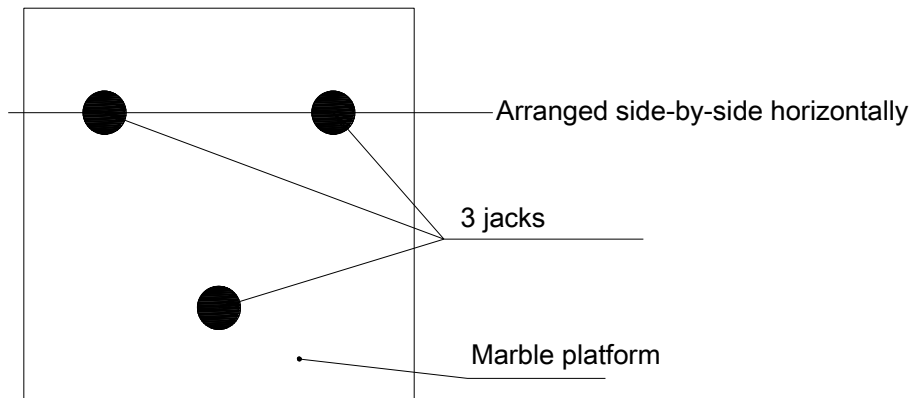


Fig. 2-6 Allocation of three jacks

Please do as following adjustment procedures.

- 1) Place marble platform on three jacks, with test surface up. Allocation of three jacks is shown as Fig. 2-6.
- 2) Fix round dial indicator on the lower connecting plate, see Fig. 2-7. Move the dial indicator as rectangle-shaped or cross-shaped testing route as shown in Fig. 2-8 to test parallelism of marble platform to XY-plane of the machine. Keep the third jack unmoved and slightly adjust height of two side-by-side jacks to make sure the parallelism of marble platform to XY-plane $\leq 0.02\text{mm}$.

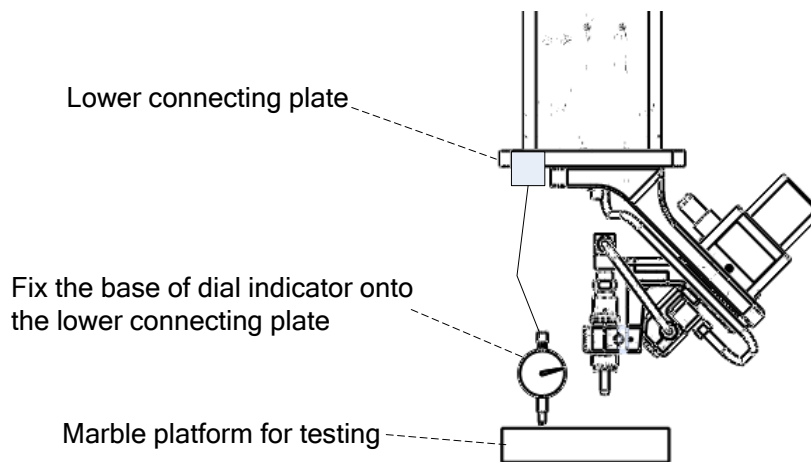
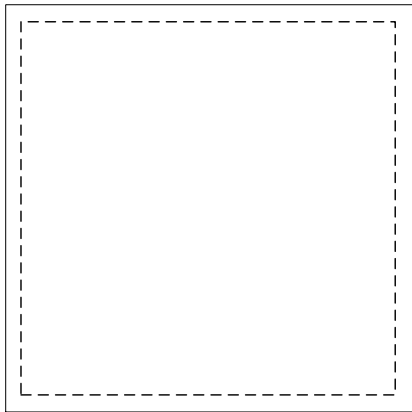
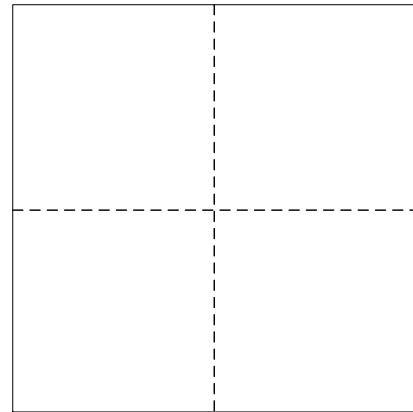


Fig. 2-7 Fix the dial indicator (method 1)



Rectangle-shaped (like Chinese character “口”, meaning mouth).

Dotted line refers to actual testing route of the dial indicator.



Cross-shaped (like Chinese character “十”).

Dotted line refers to actual testing route of the dial indicator.

Fig. 2-8 Testing route of the dial indicator

- 3) Remove the round dial indicator and fix it to the inclined connecting plate of cutting head, as shown in Fig. 2-9, making the indicator touch the marble platform. Rotate C-axis by 90 degrees each time, as rotating route A-D in Fig. 2-10. Observe the moving direction and value of the pointer, and adjust four screws on connecting plate at the same time, ensuring pointer of round dial indicator jumping within range of 0.02mm all the time.

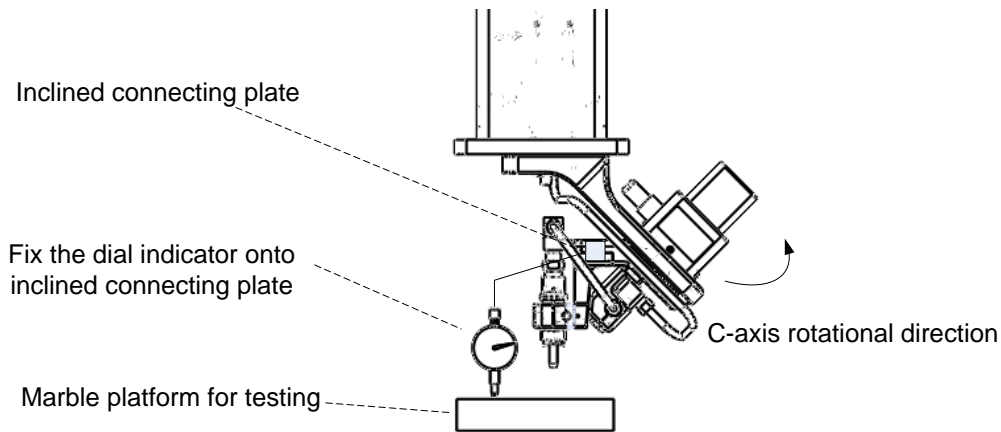


Fig. 2-9 Fix the dial indicator (method 2)

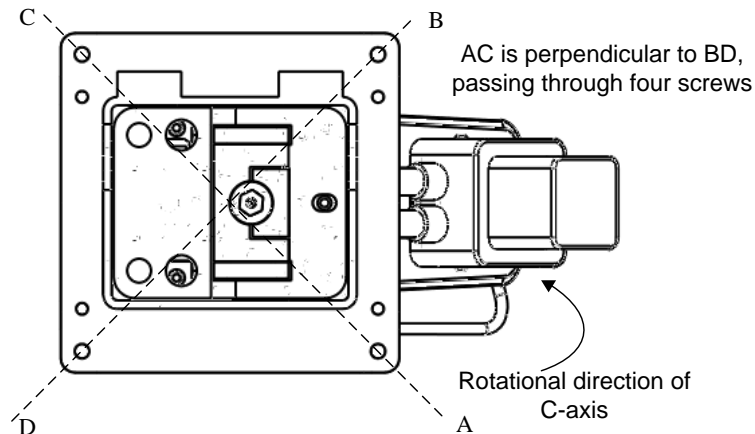


Fig. 2-10 Rotating position of C-axis

◆ How to Adjust the Reference Point of C-axis

After successful adjustment of perpendicularity of C-axis to machine XY-plane, please correct the reference point of C-axis as following procedures shown in Fig. 2-11. See Fig. 2-12 for adjusting example.

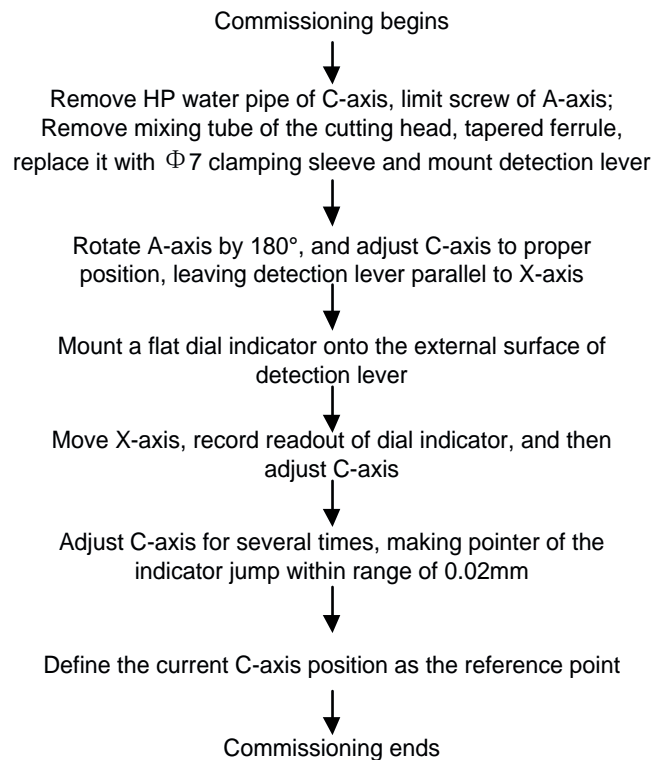


Fig. 2-11 Flowchart of commissioning



Fig. 2-12 Commissioning example



- 1) Installation and commissioning **MUST** be completed by qualified operators.
- 2) Before rotating A-axis by 180 degrees, change the soft limit setting of A-axis rotational angle. After setting of the C-axis reference point, set A-axis soft limit to default value.
- 3) The reference point of A-axis has been well defined before leaving factory, to put it in other words, the user only needs to adjust and set the reference point of C-axis. To prevent the A-axis reference point from disappearing or mislocating, we have saved and backup the data in the system, for your convenience.

3 Maintenance and Service

3.1 Precautions

◆ Inspection Items before Running

- Check whether mixing tube needs to be replaced or not. Make sure correct installation of the mixing tube during replacement.
- Check whether jewel orifice needs to be replaced or not.
- Make sure limit switch screw of A-axis have been installed in-position.
- Make sure all connectors have been tightly clamped, including high pressure water pipe, abrasive inlet hose and rotary connectors. Cover connecting thread area with blue glue to avoid possible damage to the thread.
- Make sure A-axis and C-axis are exactly at the reference points, and check all parameters related with machining.

◆ Inspection Items in Running

- Before machining, turn to manual low-speed mode, operate on each axis to test whether rotational direction is the same with its setting or not, and then perform the operation of returning to the reference point.
- If rotary axis works abnormally or stops, please stop the cutting head immediately and carry out inspection.
- Turn to high pressure state, and check whether there is water leakage at each connector of rotary axis. Shut down the intensifier pump immediately if water leakage occurs, and turn off power to perform maintenance.

◆ Inspection Items after Running

- After machining finishes, lift Z-axis to a certain height to avoid possible collision with mixing tube when loading/unloading parts.
- Clear remaining abrasive on the cutting head, and check if there is any damage to HP water pipe, abrasive inlet hose and wires.

3.2 Maintenance of Easily Won-out Parts

◆ Easily Worn-out Parts

In order to secure the best performance of WJAC-70, following parts need to be replaced timely, whose replacement cycle varies depending on the actual operating conditions, e.g. water pressure of intensifier pump. Defective parts should be replaced or repaired when any error have occurred.

Easily Worn-out Parts
180° Rotary Connector
Straight Rotary Connector
Seal Assembly for 180° Rotary Connector
Seal Assembly for Straight Rotary Connector
Abrasive Inlet Hose
High Pressure Water Pipe for A/C-axis (6.35*1.02)
Jewel Orifice
Mixing Tube
Abrasive Ring seal (Rotation without limit)
Abrasive Ring bearing (Rotation without limit)

◆ Maintenance

Routine maintenance and inspection of the cutting head are essential for proper and safe operation. Here are notes on maintenance and inspection.

- Perform routine inspection of precision of the whole device, namely, WJAC-70.
- Check if there is worn-out of HP water pipe and abrasive inlet hose, and make timely replacement as actual needs.
- Check the reference points of A-axis and C-axis.



Please make sure that the machine stops running during parts replacement or maintenance.

3.3 General Troubleshooting

Phenomenon	Possible Causes	Countermeasures
Cutting result is not good enough because of badly split stream.	<ol style="list-style-type: none"> Jewel orifice has worn out badly. Mixing tube has worn out badly. 	<ol style="list-style-type: none"> Replace the jewel orifice. Replace the mixing tube.
Abrasive does not flow out.	<ol style="list-style-type: none"> Abrasive inlet hose or abrasive ring has been blocked. Abrasive inlet hose has worn out badly. 	<ol style="list-style-type: none"> Clear with air, and dry the abrasive inlet hose and abrasive ring. Replace the abrasive inlet hose.
Water leakage occurs.	<ol style="list-style-type: none"> Water leaks at the rotary connector. High pressure water pipe is broken. 	<ol style="list-style-type: none"> Check the sealing condition and replace seal assembly. Replace the high pressure water pipe.
There is obvious dislocation or deviation of the A/C-axis reference points.	<ol style="list-style-type: none"> The reference point of A-axis disappears. The reference point of C-axis disappears. 	<ol style="list-style-type: none"> Find back the reference point of A-axis with the help of backup file. Reset and define the reference point of C-axis again.
Note: Any other type of error occurs, please contact with our sale engineer.		



If cutting precision of WJAC-70-xxxx-03 is found decreased after detection, please contact with your supplier to make timely adjustment. Do not remove or dismantle the device by yourself without permission.