WJAC-70 Instruction Manual

3rd 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 product name and model, structural diagram of the product as well as relevant technical parameters, etc.
3) Part 3: introduction to installation and commissioning, including chapter 2 and 3. This chapter introduces installation and commissioning of the cutting head.
4) Part 4: maintenance and troubleshooting, referring to chapter 4 and 5.
5) Part 5: appendix, introducing packing.

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

Contact Us

You can contact us by the following info for technical support and pre-sales / after-sales service:

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Revision History

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

Date	Edition	Revision
2018.10	R3	Add contents about packing.
2016.08	R2	1) Naming rules in chapter 1 and dimensional drawings in chapter 2 are updated. 2) Other revisions.
2016.04	R1	Release 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.

: 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.

Contents

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 has the following advantages:

- It can realize 2D and 3D machining.
- 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.

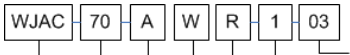
1.1. Device Name and Model

Name: High-precision AC five-axis waterjet cutting head

Short name: WJAC

Model: WJAC-70-xxxx-03

Naming rule of model: Short name + Code + Waterjet type + Motor type + Function indicator+ Version.



Version 03

High Pressure Solution
0: A complete solution provided by WEIHONG
1: Cutting head provided by customer
2: HP pipeline (rotary connector included) provided by customer
3: Both cutting head and HP pipeline (rotary connector included) provided by customer

Function Options
N: Standard (no additional functions)
R: Rotational angle without limit
C: Anti-collision
H: Height measurement

Motor Type
W: WISE servo driver + Motor
Y: YASKAWA driver + Motor
D: Other drivers + Motor

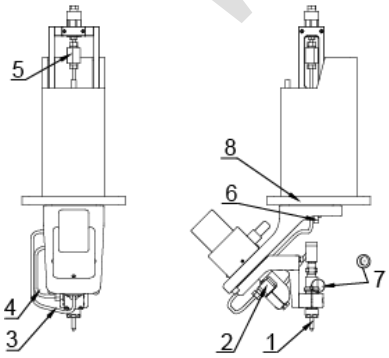
Waterjet Type
A: Abrasive waterjet cutting
P: Pure water cutting

Code 70

Short Name
AC-type Five-axis Waterjet Cutting Head

1.2. Structural Diagram

Structural diagram of **WJAC-70** is as follows:



- **1** ~ **7** refer to replacement parts, namely, easily worn-out components.

    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: refers to docking section between the cutting head and machine.

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

Note: High pressure water control valve is not contained in **WJAC-70**.

1.3. Relevant Technical Parameters

Relevant technical parameters is as follows:

- 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: ±70°
- C-axis Rotational Angle: Unlimited (or ±540°)
- Positioning Precision of Rotary-axis: 3arcmin
- Max Rotational Speed of Rotary-axis: 60rpm
- Cutting Precision at Fixed Point: ±0.05mm
- Weight: 29kg
- A-axis Motor Horsepower: 100W
- C-axis Motor Horsepower: 400W

2. Install WJAC-70 to Machine

This part introduces how to install **WJAC-70** to the machine tool.

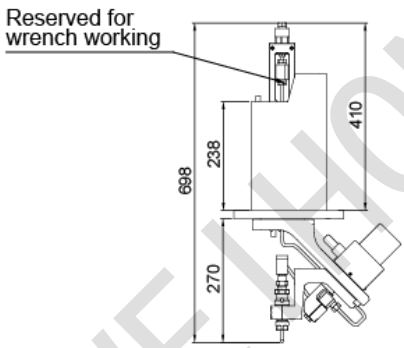
The installation MUST be completed by qualified operators.

Before installing **WJAC-70** to the machine tool, do the following:

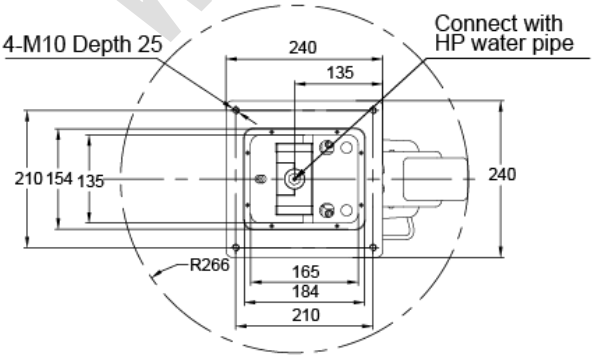
1. On opening the product package, make sure the model is what you have ordered and all accessories are included.

2. Install each component as the dimensional drawing offered by us:

Front View

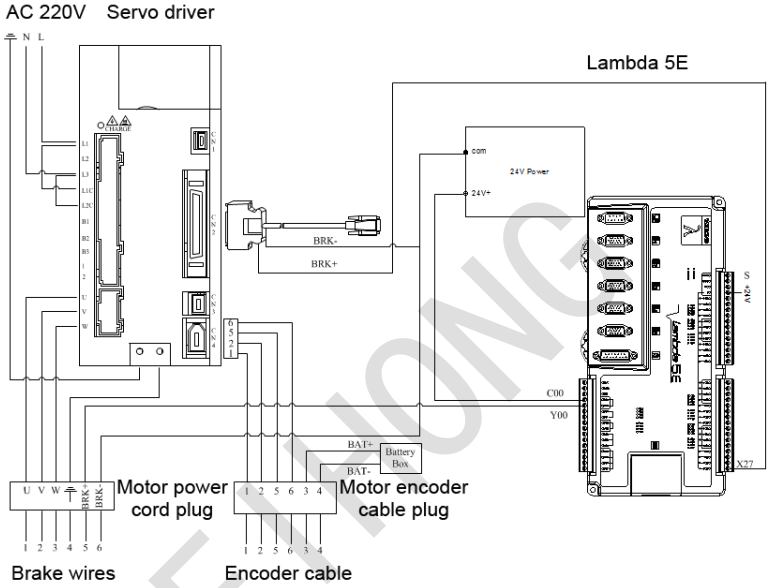


Cross-section View



To install **WJAC-70** to the machine tool, do the following:

1. See the following figure and connect the servo driver and Lambda 5E terminal board:

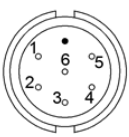


2. See wiring specification of connectors and connect the motor:

Power connector of A-axis motor

6-pin aviation plug (Hole)

1	U
2	V
3	W
4	FG
5	BRK+
6	BRK-



Encoder connector of A-axis motor

7-pin aviation plug (Hole)

1	PG5V
2	PG0V
3	BAT（+）
4	BAT（-）
5	PS
6	/PS
7	Shield

Power connector of C-axis motor

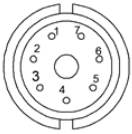
6-pin aviation plug (Hole)

1	U
2	V
3	W
4	FG
5	BRK+
6	BRK-

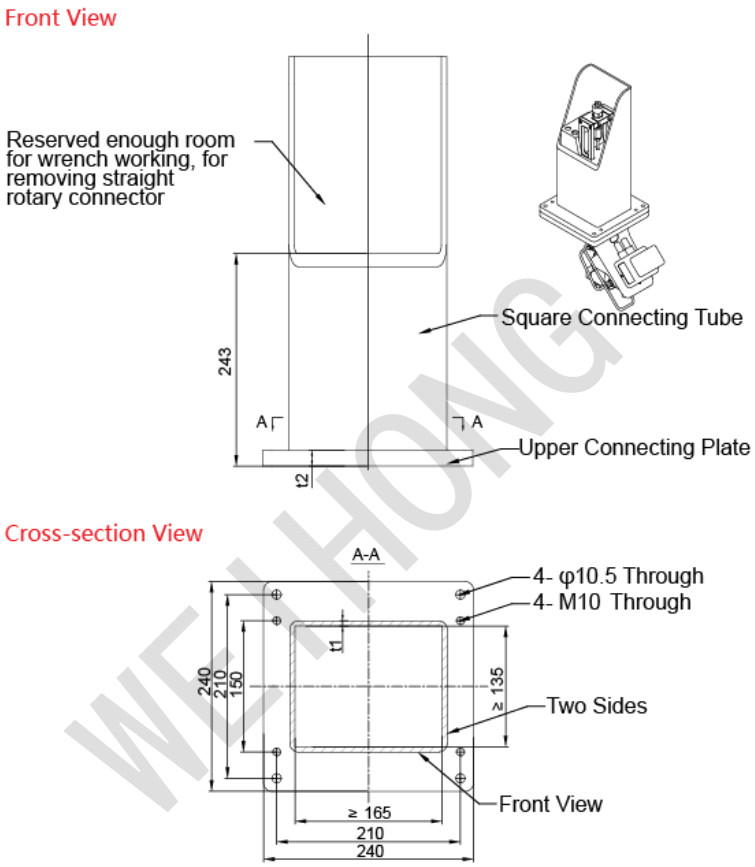
Encoder connector of C-axis motor

7-pin aviation plug (Hole)

1	PG5V
2	PG0V
3	BAT（+）
4	BAT（-）
5	PS
6	/PS
7	FG



3. Refer to the following figure, to dock with the machine tool:



The following technical requirements for docking should be met:

– As shown in front view, enough room should be reserved on the front or side for wrench working, in order to remove through-type high pressure rotary connector.

– Front view shows the recommended connecting method. The dimension of upper connecting plate in front view must be in line with that offered in cross-section view, while net size of the

square connecting tube should be larger than the size of rectangle (165mm*135mm) in cross-section view (*t1=6mm, t2=18mm* is recommended).

– 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.

– 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.

– 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 Adjust Perpendicularity.

Should you change the connecting method, please inform us in advance.

3. Commissioning

Commissioning of WJAC-70-xxxx-03 is divided into two parts:

1. Adjust perpendicularity
2. Adjust reference point

Commissioning MUST be completed by qualified operators.

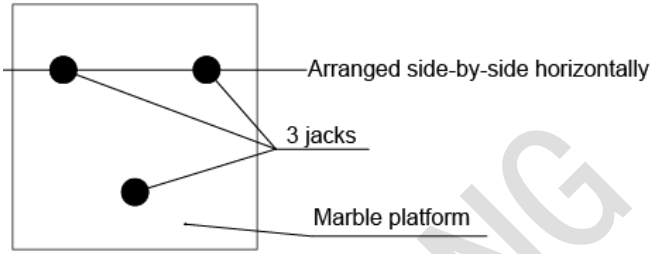
Before commissioning, prepare the following tools:

- 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≤0.002mm).

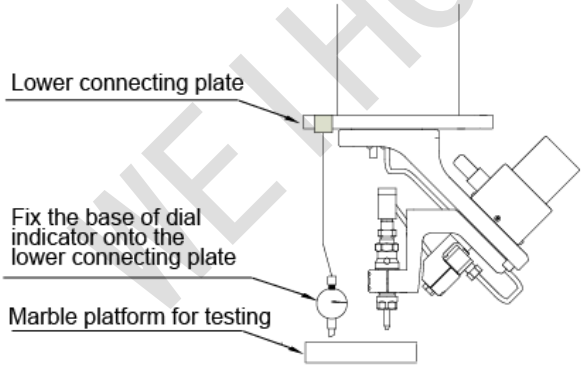
3.1. Adjust Perpendicularity

To adjust perpendicularity of C-axis relative to XY-plane of the machine, do the following:

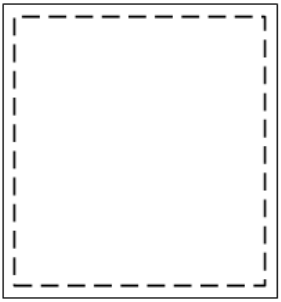
1. Place marble platform on three jacks, with test surface up:



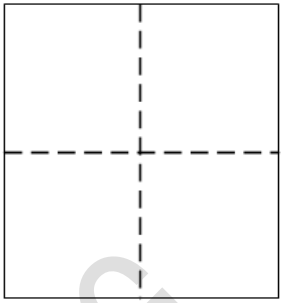
2. Fix round dial indicator on the lower connecting plate.



3. Move the dial indicator as rectangle-shaped or cross-shaped testing route to test parallelism of marble platform to XY-plane of the machine:



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

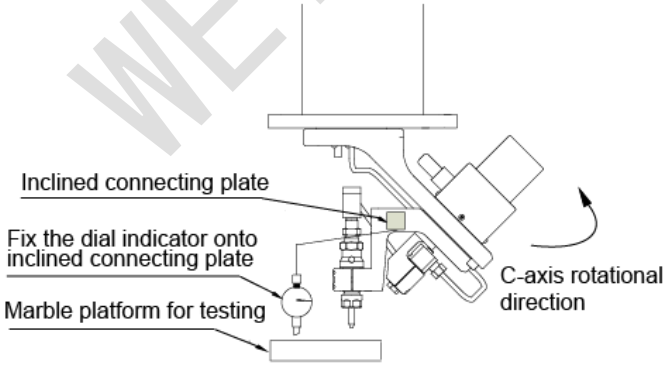


Cross-shaped (like Chinese character ten "十").

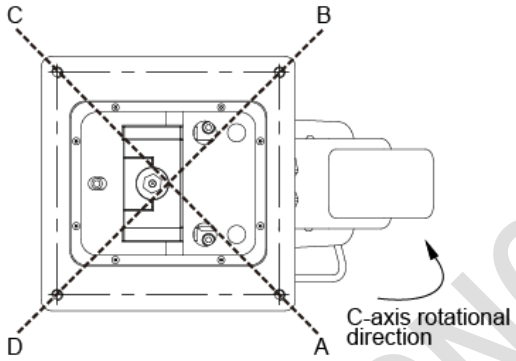
Note: Dotted line refers to actual testing route of the dial indicator.

4. 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≤0.02mm.

5. Remove the round dial indicator and fix it to the inclined connecting plate of cutting head, making the indicator touch the marble platform:



6. Rotate C-axis by 90 degrees each time, as rotating route A-D in the following figure and observe the moving direction and value of the pointer:



AC is perpendicular to BD, passing through four screws.

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.

3.2. Adjust the Reference Point

The operation includes adjusting the reference point of A-axis and C-axis.

The reference point of A-axis has been well defined before leaving factory, to put it in other words, you only needs to adjust and set the reference point of C-axis.

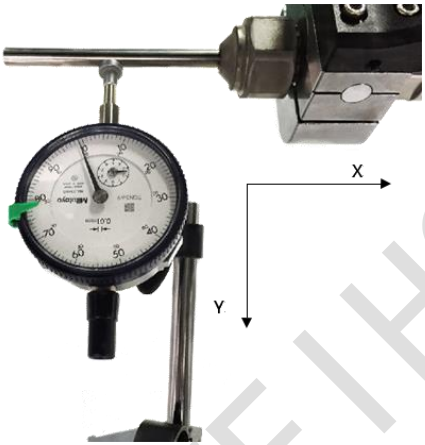
To prevent the A-axis reference point from disappearing or mislocating, we have saved and backup the data in the system, for your convenience.

After successful adjustment of perpendicularity of C-axis to machine XY-plane, to correct the reference point of C-axis, do the following:

1. Remove HP water pipe of C-axis.
2. Replace mixing tube of the cutting head with mount detection lever.
3. Change the soft limit setting of A-axis rotational angle.

4. Rotate A-axis by 180 degrees, and adjust C-axis to proper position, leaving detection lever parallel to X-axis.
5. Mount a flat dial indicator onto the external surface of detection lever.
6. Move X-axis and record readout of dial indicator.
7. Adjust C-axis for several times, making pointer of the indicator jump within range of 0.02mm.
8. Define the current C-axis position as the reference point.

Adjusting example is as follows:



After setting of the C-axis reference point, set A-axis soft limit to default value.

4. Maintenance and Service

To maximize the life of **WJAC-70**, you need to know knowledge about precautions and maintenance of wearing parts.

4.1. Precautions

The part includes precautions before running, in running and after running:

1. Before running, do the following:
   - 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 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.
   - Check all parameters related with machining.
2. In running, do the following:
   - 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, 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.
3. After running, do the following:
   - 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.
   - Check if there is any damage to HP water pipe, abrasive inlet hose and wires.

4.2. Maintenance of Easily Won-out Parts

In order to secure the best performance of **WJAC-70**, following easily won-out parts need to be replaced timely, whose replacement cycle varies depending on the actual operating conditions, e.g. water pressure of intensifier pump:

- 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)

Defective parts should be replaced or repaired when any error have occurred.

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.

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

5. General Troubleshooting

The following are the general failures that might occur during use, their corresponding causes and countermeasures. Any other type of error occurs, please contact with our sale engineer.

- Cutting result is not good enough because of badly split stream.

Cause	Solution
Jewel orifice has worn out badly.	Replace the jewel orifice.
Mixing tube has worn out badly.	Replace the mixing tube.

- Abrasive does not flow out.

Cause	Solution
Abrasive inlet hose or abrasive ring has been blocked.	Clear with air, and dry the abrasive inlet hose and abrasive ring.
Abrasive inlet hose has worn out badly.	Replace the abrasive inlet hose.

- Water leakage occurs.

Cause	Solution
Water leaks at the rotary connector.	Check the sealing condition and replace seal assembly.
High pressure water pipe is broken.	Replace the high pressure water pipe.

- There is obvious dislocation or deviation of the A/C-axis reference points.

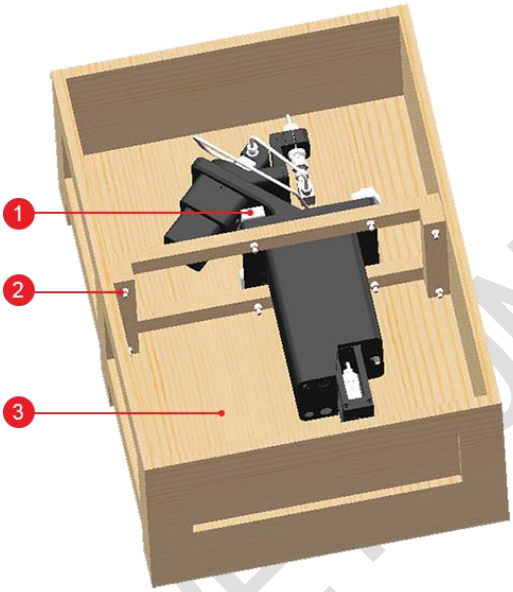
Cause	Solution
The reference point of A-axis disappears.	Find back the reference point of A-axis with the help of backup file.
The reference point of C-axis disappears.	Reset and define the reference point of C-axis again.

- Cutting precision of WJAC-70 is found decreased after detection

Cause	Solution
The device requires maintenance	Contact with your supplier to make timely adjustment (Do not remove or dismantle the device by yourself without permission).

Appendix Packing

If the device needs repairing or dismantling, please refer to the following figure to pack it:



1. Wood block. All together 4 wood blocks.
2. M80*80 screw and nut. All together 8 screws and 8 nuts.
3. Fill flexible material in other places.