Aiotek Servo Flexible Bending Center

(Invention Patent No.: ZL 2020 1 0511516.8)

AT-QS3000

TECHNICAL SPECIFICATION

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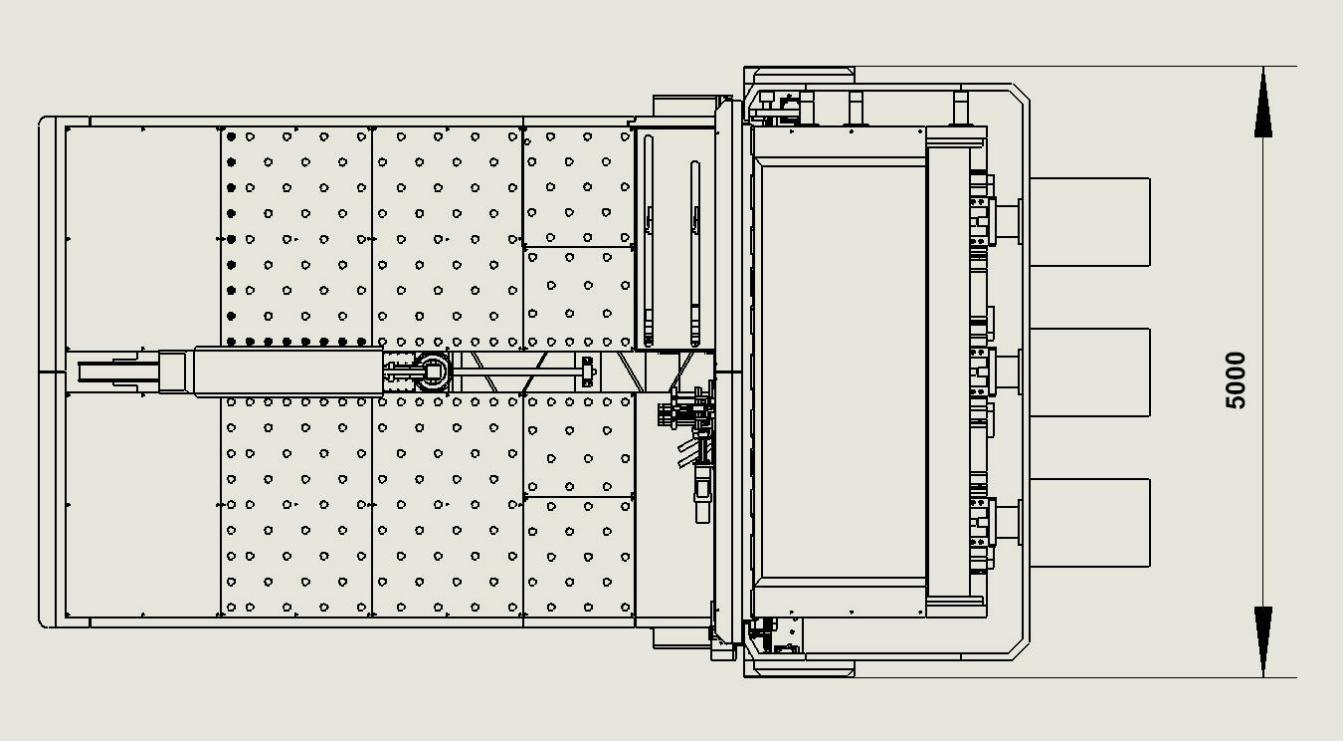
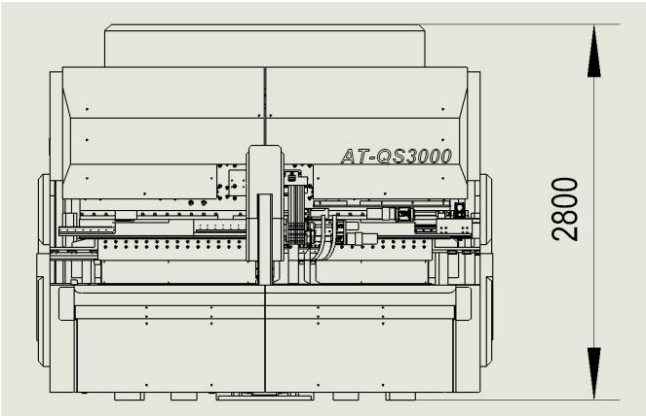
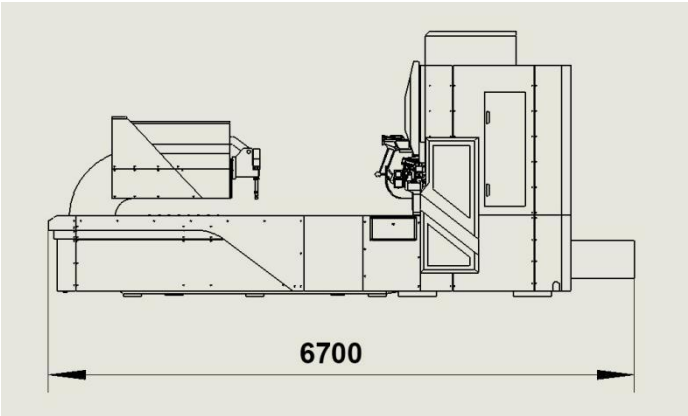
Email：aiotek.wendy@hotmail.com/wendy.aiotek@qdaiotek.com

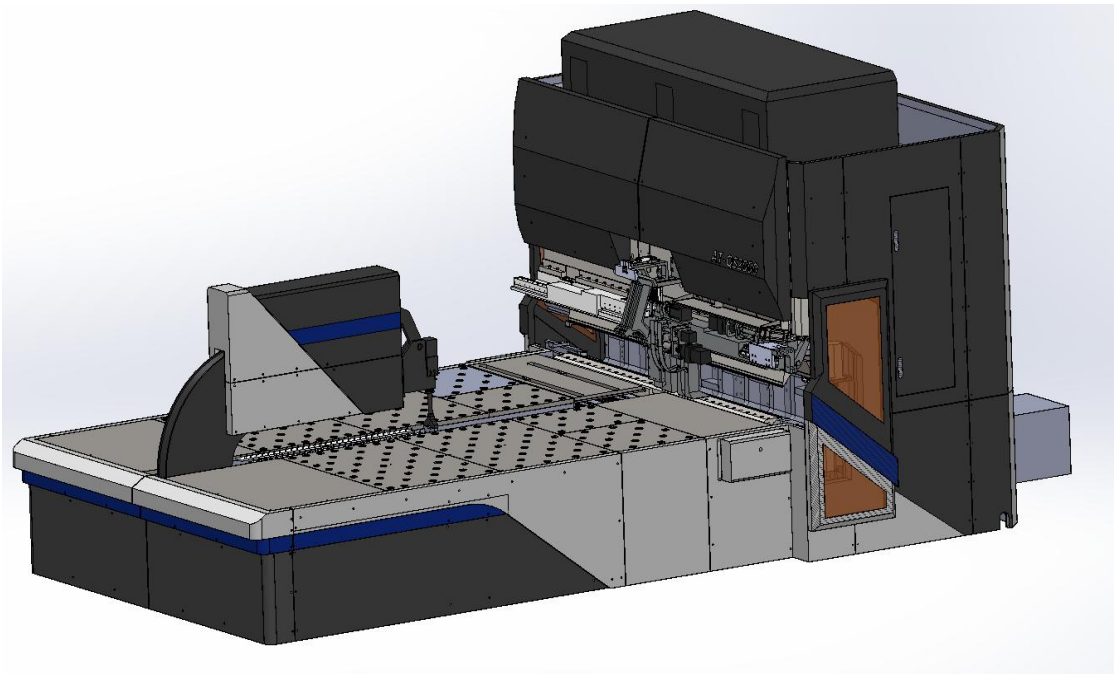
Equipment appearance dimensions







Bending Center Photos



High-strength plate welded body

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1. Product overview

1.1 Product Introduction

Qingdao Aiotek Intelligent Equipment Co., Ltd. has been engaged in the research and development, production and sales of CNC turret punch presses since 2006. In 2016, the technical research and development department focused on the research and development of flexible bending centers and obtained invention patents. It has developed a servo flexible bending center with international advanced level. The bending speed is only 0.2 seconds per knife. The equipment can automatically bend up and down according to the bending process to achieve arc, dead edge, and various angles of combined bending. It can achieve a variety of bending requirements without changing the bending tool, saving a lot of labor and mold costs for the company.

1.2 Functional introduction

◆Aiotek patented system, strong stability

◆Bending speed is only 0.2 seconds per cut

◆One-time forming of workpiece

◆Full servo control, low energy consumption

◆Simple maintenance, low cost

◆Fool-style operation, low personnel requirements

◆Multi-axis linkage control, high degree of automation

◆C-type pressure arm, lead screw multi-link transmission mechanism

◆Electrical integrated design, convenient equipment operation

◆Visualized overload alarm reminder to ensure the service life of the equipment

◆Fully open system port, can be connected with various auxiliary equipment

◆Various loading and unloading methods (manual, joint mechanical arm,

truss, conveying platform, etc.)

◆Simple and clear system interface, easy to learn

◆Wide range of bending materials (carbon steel, 304 stainless steel, 201 stainless steel, aluminum plate, laminated board, etc.)

◆Various precise positioning methods (edge positioning and corner positioning are interchangeable to ensure the bending accuracy of the plate)

1.3 Advantages of Aiotek Intelligent Products

1. The control system is independently developed, and considering the cultural level of domestic employment, a fool-proof operation mode is produced, so there is no need to worry about the emotional and professional operators.

2. The mechanical part reasonably operates the welding process and tempering process on the basis of the CNC turret, which improves the toughness and stability of the main bed and meets international requirements.

3. Rich experience in flexible bending center assembly has improved its own rigor and detail processing, making the equipment more flexible.

4. The third-generation CNC system developed independently is convenient for system upgrades and replacements, is not affected by the international chip market, is not restricted by distance, and the system software can be upgraded remotely for free.

5. The professional R&D team can do paid secondary development according to customer needs, and can provide customers with the connection and extension services of the later sheet metal production line at any time.

6. The press knife structure is stable and has strong bearing capacity. The press knife will not be displaced during the operation of the equipment due to problems with the press knife structure.

7. The folding knife adopts a new heavy-duty folding knife design to ensure that the folding knife strength meets the bending force requirements when the equipment bends stainless steel.

8. The plate feeding/pressing structure adopts the patented structure invented by AiTe. The plate feeding adopts a high-speed ball screw structure, with the fastest feeding speed of 120m/min and the highest acceleration of 1.9G; the upper part of the plate pressing structure adopts a ball screw and connecting rod matching structure, and the maximum pressure value of this mechanism is 785Nm. The lower part of the plate pressing structure adopts a servo motor directly connected to the reducer structure, with high transmission accuracy. The output speed of this structure is 60rpm/min, and this structure is equipped with a pressure bearing. The maximum pressure value of the lower part of the plate pressing structure is 1460Nm.

9. The maximum number of drive axes of the AiTe system is 64 axes; the axis position setting sequence can be defined by the user; the EtherCat refresh cycle is 2ms, and a faster refresh cycle can maximize the system's response speed, and fast data transmission can reduce the error of the entire device; the maximum output pulse frequency of the axis is 500KHz; the maximum input/output IO number is 32, and this value can be arbitrarily configured, enriching the operating space and ensuring that the equipment is fully connected to the fully automatic production line interface.

1.4 Patent Certificate

The company started applying for intellectual property rights in 2019 and obtained a number of flexible bending center intellectual property rights, as well as the first domestic invention patent for the pressure arm bending center and the copyright of the flexible bending control system software. The following are some of the intellectual property rights:


UDEM
CERTIFICATE
ATTESTATION
CERTIFICATE OF MACHINERY DIRECTIVE


ZRX
质量管理体系认证证书
GB/T19001-2016/ISO9001:2015
IAF
CNAS


中华人民共和国国家版权局
计算机软件著作权登记证书


中华人民共和国国家版权局
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实用新型专利证书


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2.Main Technical Parameters

Technical Parameters	Unit	Model
		AT-QS3000
Feeding structure	/	C-Type Arm Press
Workbench structure	mm	Brush and universal ball
Bending Angle	/	0°~ 180°
Fastest bending speed	s	0.2
Maximum feeding speed	m/min	120
Maximum bending size	mm	3000*1500 (L*W)
Maximum bending height	mm	170
Minimum bending height	mm	5 (depending on the thickness of the plate)
Minimum internal molding dimensions of the four sides	mm	310*480
Minimum inner molding size of opposite sides	mm	310
Minimum arc radius	mm	1.2
Number of controlled axes	/	30
Noise	BD	55
Dimensions	mm	6850*6100*2900mm
Average Power	KW	7
Speed adjustment	/	Standard
Advanced Instructions	/	Standard
Arc command	/	Standard
Feeding robot interface	/	Standard
Automatic	/	Standard
Bending plate thickness range	mm	Stainless Steel (SS): 1.5 mm Carbon Steel (MS): 1.5 mm Aluminum (AL): 2.5 mm

3. Main Component Configuration

ITEM	BRAND	ADVANTAGE
System Control Unit	Aiotek independent research and development	Multi-axis linkage system
Servo Unit	Designated research and development	Bus full closed-loop servo system
Linear Guide	HIWIN/Rost	Ultra-heavy load linear guides
Ball Screw	TBI	Heavy load ground screws
Main Electrical Components	Schneider of France	
Pneumatic Components	SMC/Taiwan AirTac	
Bearings	SKF/Great Wall Precision	Heavy-duty high-precision bearings
Reducer	Germany Rost / Modoli	Ultra-precision planetary reducer
Bending Machine Body	Aiotek independent research and development (welding)	High-strength plate welded body
Bending Cutters	Aiotek patented high-end general-purpose tools	Japanese high-speed steel material, overall quenching treatment, surface hardening treatment 42CrMn material, overall quenching and tempering treatment
Lubrication System	Imported	Fully automatic lubrication system
Rack	Taiwan YYC	Precision Helical Rack

4. Functional configuration

AT-QS3000 Functional configuration
◆ High-strength plate welding machine body
◆ Multi-axis linkage control system
◆ Pressure arm P-axis pressure adjustment system
◆ Press tool automatic arrangement and combination system
◆ Advanced instructions
◆ Upper and lower dead-edge pressing instructions
◆ 5-axis full-automatic positioning system
◆ Split-type positioner
◆ Unbalanced load visualization system
◆ C-axis and A-axis synchronization system
◆ Simulated bending visualization system
◆ Servo torque feedback system
◆ Articulated robotic arm docking system
◆ Partial folding tool system
◆ Automatic production line interface
◆ IoT interface
◆ Cloud-based operation and maintenance management interface
◆ Sheet metal thickness detection system

5. Advantages of welding Body

5.1 Good rigidity

As a structural part on a machine tool, it often has to bear a large load. Take the beam of a gantry machining center as an example. The beam has to bear gravity, tension, torsion, etc. at the same time. In order to reduce deformation, the beam is required to have good rigidity.

The material used for welded parts is carbon steel plate, whose elastic modulus and mechanical properties are much better than those used for casting. As we all know, elastic modulus E=α/ε. Now we assume that the stress α is the same, then the larger E is, the smaller the strain ε generated by the material is. In other words, under the same force, we can make the cross section of the beam smaller. Since the span of the beam is large, the weight reduction by reducing the cross section is considerable. With the weight reduction, the droop of the beam is also reduced. Therefore, the use of welded parts ensures the rigidity of the machine tool while also ensuring the static geometric accuracy of the machine tool.

In practical applications, due to the high strength and rigidity of steel plates, the strength of the same structure is 2.5 times that of casting, and the fatigue strength of steel plates is 3 times that of casting.

5.2 Avoid resonance

Since the E value of the material used for welded parts is relatively large, the static stiffness of welded parts is relatively large under the same load. When forced to vibrate, increasing the static stiffness of an object can reduce the amplitude of the object and increase the natural frequency of the object, thereby reducing or avoiding the occurrence of resonance. For self-excited vibration, increasing the static stiffness can increase the limit of self-excited vibration stability.

Since the elastic modulus and mechanical properties of carbon steel materials are greater than those of casting materials, under the premise of the same

rigidity, the weight of welded parts can be much lighter than that of castings. As we all know, the formula for the natural frequency of an object is O = , (ω----natural frequency, K----stiffness, M----mass), so reducing weight means reducing mass M, so that the natural frequency ω can be increased, the probability of resonance is reduced or avoided, and the natural frequency of a well-designed welded part can be 50% higher than that of a casting.

6. Control system introduction

6-1. Aiotek patented system

1) Fully closed-loop multi-axis EtherCAT bus control system, which can be upgraded to up to 64 axes, with seamless system docking, system control accuracy of 0.01mm, and support for linear interpolation, electronic cam, electronic gear, synchronous follow-up, virtual axis setting, etc. It supports multiple tasks running simultaneously, and can be directly simulated and run on the PC.

2) Three-axis synchronous control system, ultra-high precision synchronization of three axes

3) Multi-axis linkage control system, synchronization between axes with 0 error, and industry-leading bending efficiency

4) Automatic positioner to achieve various plate positioning requirements

5) Five-axis positioning system to reduce the bending accuracy deviation caused by manual positioning errors

6) One-time bending system adjustment program, adjust the plate bending parameters at one time, and then directly call the program to bend, without re-adjusting the angle compensation and position compensation

7) If the plate size is too small during the bending process, the system automatically turns on the secondary positioning function

8) Fully automatic lubrication of the whole machine to ensure the overall service life of the equipment

9) Press arm P axis pressure adjustment system, according to different plate requirements, P The axis can adjust the downward force to achieve perfect bending of the plate

10) Visualization system for eccentric loading to avoid eccentric loading caused by employee operation errors, which will affect the service life of the equipment

11) The system has rotation compensation and angle compensation modules for each bending. The user only needs to measure the left and right heights and bending angles of the bending edge that need to be compensated, and input them into the system compensation unit. The system will automatically calculate the data and update the bending system data

12) Graphic programming error detection function, automatic avoidance of the press knife and folding knife, power-off memory of machine tool coordinates, and traceless bending function

13) Production order query function, plate weight adaptive adjustment function, remote diagnosis and upgrade service

14) Customized press edge gap, adaptive torque correction, database cloud sharing

6-2. Aiotek's self-developed system

1) 3D multi-sided bending center operation interface and motion control software

2) Intelligent bending compensation database

3) Sheet metal K parameter database

4) Real-time torque and position error monitoring of digital gantry synchronous axis

5) Three-axis fully automatic positioning system, automatic calculation of loading positioning method

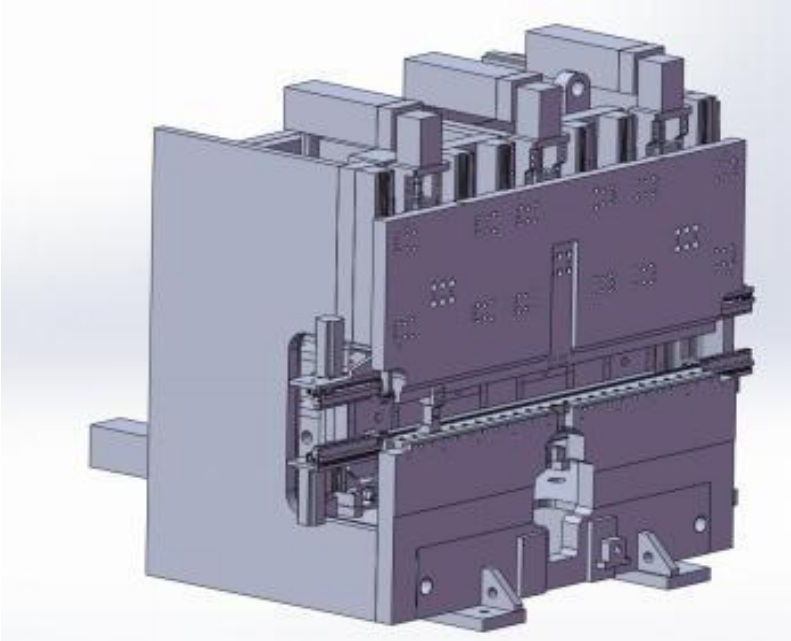
6) Mold interference motion locking

7) Bending dynamic data monitoring

- ✓ The page is simple and touch-friendly.
- ✓ Online updates.
- ✓ One-click data backup.
- ✓ Instant power-off support.
- ✓ Real-time status and alarm monitoring in Chinese.
- ✓ 19-inch large resistive touchscreen.
- ✓ Intuitive and user-friendly interface.
- ✓ Windows operating system.
- ✓ Processor: Intel Core i5.
- ✓ Memory: 8 GB.
- ✓ Hard drive: 64 GB SSD.
- ✓ 3D import support. Flywheel control system added.

7. Bending machine introduction and bending demonstration

7-1. Introduction to bending body



◆The main body of the servo flexible bending center adopts a high-strength welded structure, the main structure is stable and has a long service life.

◆The heat treatment removes internal stress, has strong rigidity and heavy tonnage, ensures the long-term stability of the machine tool accuracy, and improves the bending accuracy, reliability and durability of the machine tool

7-2. Introduction of gasket knife assembly

◆Dual servo motors control the selection of gasket cutters. The system automatically starts the gasket cutter system according to the bending and size

requirements of the plate.

◆The gasket knife is made of Japanese high-speed steel, and uses precision grinding and overall quenching to ensure that each gasket Knife strength and precision

7-3. Introduction to the local folding knife system

◆Two servo motors drive the local folding knives at both ends respectively. The system automatically uses the local folding knives according to the plate bending programming requirements. It makes the single-side partial bending of the plate possible and enriches the bending styles.

◆The local folding knife is made of Japanese high-speed steel, with overall quenching treatment and surface hardening treatment to ensure the service life of the local folding knife. life

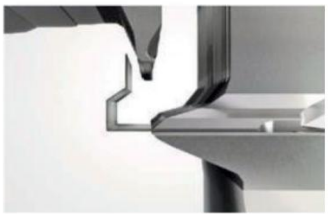
7-4. Introduction of automatic knife pressing system

◆The servo motor drives the press knife to move the guide plate, so that each press knife can move independently. Material size and bending requirements, automatically select and arrange the press tool combination

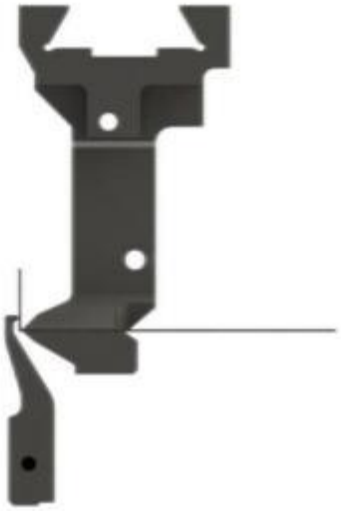
◆The press cutter is made of Japanese high-speed steel, which is fully quenched and hardened to ensure the service life of the cutter.

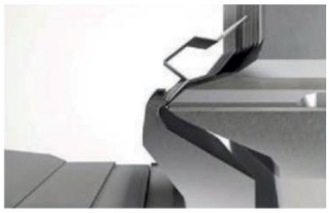
7-5. Bending demonstration

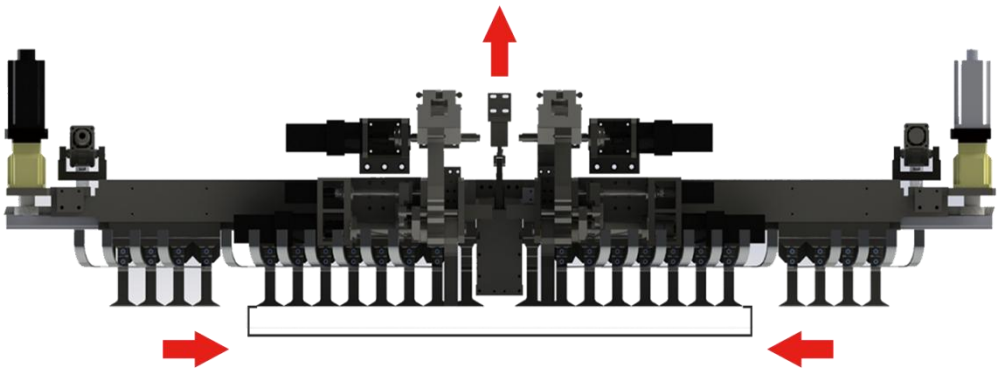
◆Bending demonstration



◆Upper bending demonstration

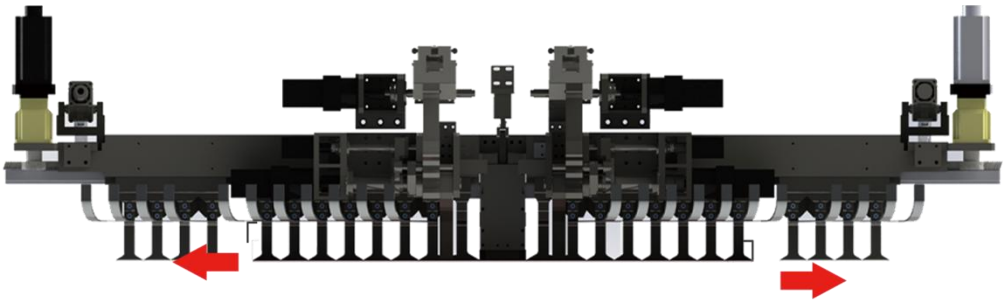




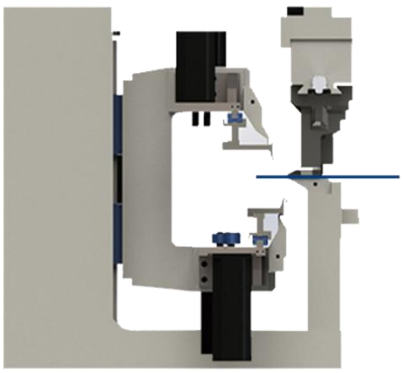


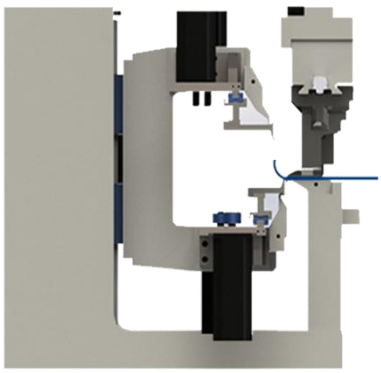
Automatic aggregation

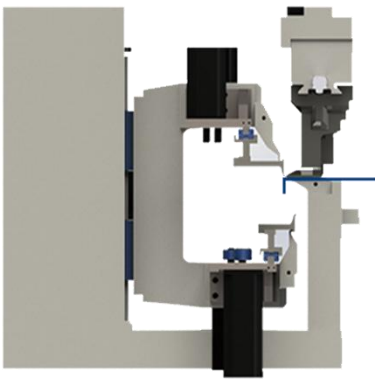
Automatically adjust the tool according to the bending sizeof the workpiece,and ensure that the size of the splicingbending tool is consistent with the size of the workpiece.



Automatic splicing of bending tools



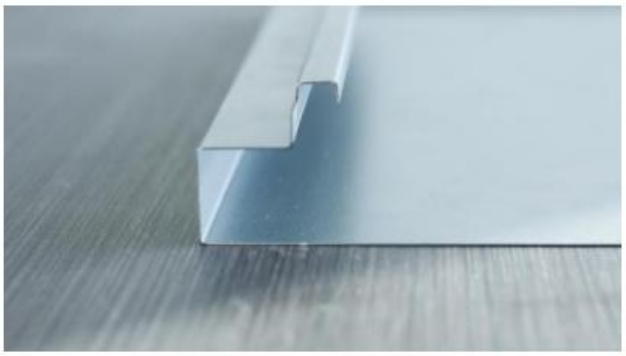




7-3. Bending product display








8. Documents, Tools and Spare Parts

(1) Documents

No.	Item	Qty.	Note
1)	Equipment Packing List	1share	
2)	Certificate of Compliance	1share	
3)	User Manual	1share	
4)	Electrical Schematics	1set	
5)	CNC system information	1set	

(2) Tools and Spare Parts

No.	Item	Regulation	Qty.
1)	Quick-insert air gun		1
2)	Hexagon wrench	S1.5-S10	1
3)	Equipment foot pad		1
4)	Hose	Ø 8	5
5)	TType Tee	Ø 8	2
6)	Nylon cable ties	L200	30
7)	Hexagon socket screw	M10*45 12.9class	6

9. Cooperation that users should provide

1) Power supply: 380V, 50HZ, voltage fluctuation is -5% ~ +10%; when the voltage fluctuates greatly, the user must be equipped with a voltage stabilizer, otherwise it will cause the low-voltage electrical appliances to be in an abnormal working state, the life of electrical components to be reduced or damaged, the processed products to be scrapped, the motor alarm to stop working, the computer hard disk to be damaged and other problems.

2) Air source: output 0.6Mpa or more, dry and clean compressed air, air supply 0.3 cubic meters/minute; if the air is not dry enough, the user should be equipped with a cold dryer, otherwise the pneumatic parts will be flooded,

causing the friction resistance of the piston to increase, and the wear of the sealing ring will cause leakage and other problems, especially in winter, it is easy to freeze, resulting in aggravated damage to the pneumatic parts.

3) Ambient temperature: 0°C ~ +40°C; below 0°C will cause the oil-water separator, gas tank and other parts that may have water to freeze, and the lubricating oil will become too viscous due to the low temperature, affecting the lubrication effect, thus causing damage or failure of the parts.

4) Ambient humidity: relative humidity 20~80%RH (non-condensing).

5) Keep away from strong vibration sources and electromagnetic interference; if the distance is too close, the user must be equipped with a filter, otherwise it will cause the computer screen to flicker, the LED light to flicker, the driver alarm, the encoder abnormality, or interfere with other nearby equipment.

6) An environment with little dust and no harmful and corrosive gases.

7) The foundation is prepared according to the supplier's foundation map.

8) The user should select personnel with a high school education or above, who understand basic computer operations and can work in this position for a long time for training. The acceptance measurement standard is not based on the first bend. The plate cutting size and opening angle size require an accuracy of plus or minus 0.1 mm, and the plate flatness is plus or minus 0.1 mm.

9) It is forbidden to cut off the power when the equipment is working, and keep the voltage stable.

10. After-sales service system

(I) Solemn commitment and strict system (see the regulations on after-sales service in ISO9001 quality assurance system for details)

1. Our company is the first enterprise in the machine tool industry to pass

ISO9001 quality system certification. We implement three guarantees within one year after the equipment is debugged. If the debugging and acceptance work cannot be completed due to the user's reasons within 3 months after the equipment is delivered, it will be deemed that the user has accepted it and the equipment will automatically enter the warranty period. The contract will continue to be executed according to the relevant terms after acceptance.

2. When maintenance service personnel provide services to users, they must provide detailed information on the maintenance tasks completed and the solutions to the problems.

Records are kept, and users provide feedback to the company, so that the quality of service personnel's work can be strictly controlled and assessed.

(II) A full-time service team ensures the operability of the service network

1. The user sends an operator to our company, or our after-sales personnel go to the buyer's factory to operate the operator.

Free training on maintenance and upkeep until you can operate the machine independently