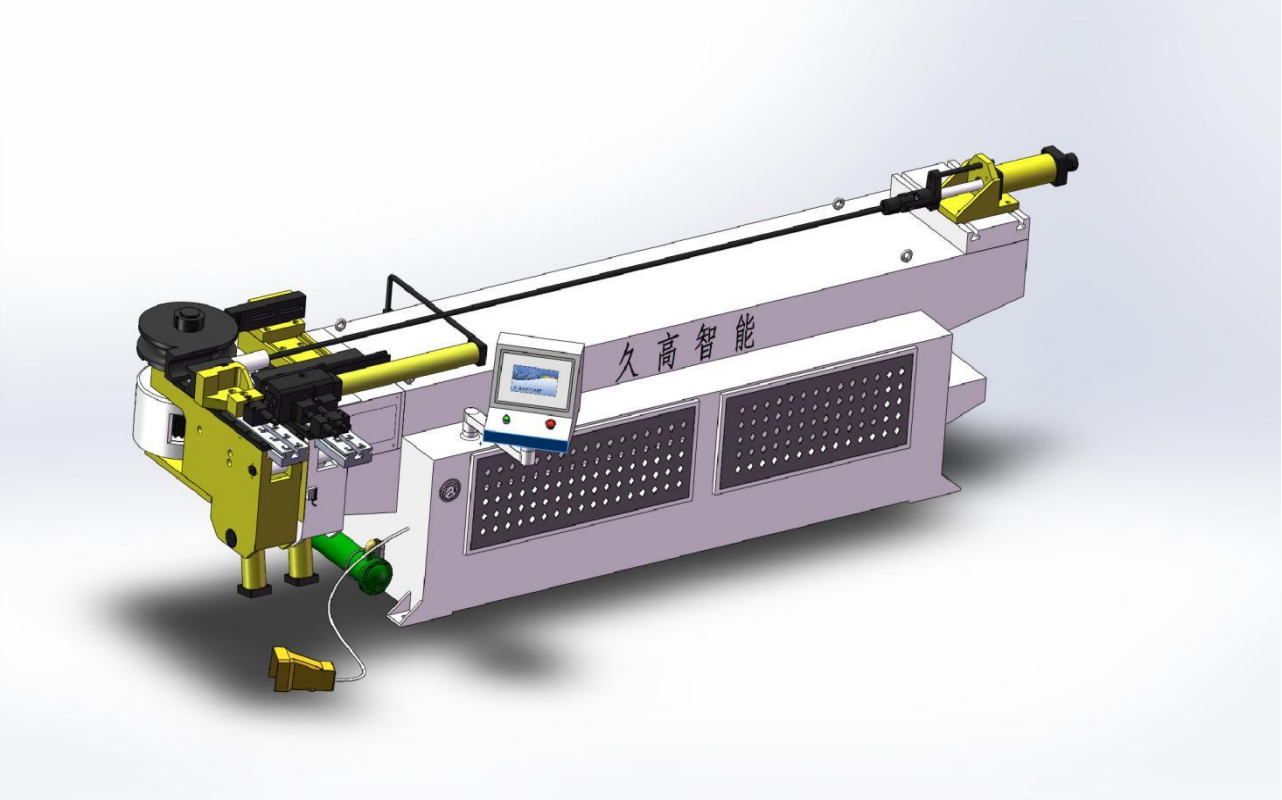
JG89-NC series

User Manual



Instructions for use!

Do not modify any machine's system and its components without authorization and permission from the company.

Unauthorized modification of the machine will result in the cancellation of the machine's warranty and all applicable rights.

Do not modify the safety systems and machine power systems to ensure the safety of operators.

Before operating or installing any components of the machine, please refer to this manual first to avoid damage to the machine and endangering personal safety due to incorrect installation and operation.

·Do not distribute this manual to other individuals, companies, or groups.

Please do not copy in any form.

- The recipient should restrict the distribution of these files within the organization based on basic requirements.

When the machine is received, please check for any parts that may have been damaged or lost during shipping, and you can request compensation for damaged or lost parts directly from the shipping company.

This manual provides instructions for the conveying and installation of the pipe bending machine, safety regulations for operation, operation instructions, mold installation and adjustment, maintenance, troubleshooting, and abnormal processing of workpiece bending.

·Please use the pipe bending machine with a rational and cautious attitude to maintain the safety of personnel and the machine's lifespan.

In terms of machine performance, the manufacturing of bending machines is highly specialized.

· Proper use and planned maintenance contribute to extending the lifespan of the machine; however, human errors and impractical maintenance will cause serious damage to the machine during its operation cycle, accelerate the wear and aging of components, and even seriously endanger personnel safety.

This pipe bending machine is only used for specific performance of pipes and materials with maximum bending resistance as per the specifications. Do not attempt to bend non-metallic pipes or use it for illegal purposes.

If the operator does not comply with the maintenance, safety and performance of the machine, all rights and guarantees in this company will be revoked.

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Part I Bending Machine Conveyance and Installation Regulations

1: Packing and transportation

Before the first machine installation and subsequent migration installation, please read the "Conveyance and Installation Regulations".

"The occurrence of accidents" is mostly caused by human negligence and failure to comply with safety regulations.

Please ensure that the staff strictly follow the rules in this manual to avoid accidents, casualties, and adverse effects on machine functions; in case of a malfunction or the need for maintenance of the pipe bender machine, the machine should be immediately stopped, report to the supervisor, and wait until the machine is repaired.

1.1 Packing Method

The machine has two types of packaging: wooden box packaging and container packaging.

1.2 Transportation Methods

First, it is necessary to determine the weight of the machine, choose a crane or forklift that can handle

the weight of the machine, and place the machine in the cabinet.

Move to the designated installation location.

1.3 Unboxing and positioning

After unpacking the packaging materials, according to local regulations, use steel cables that can withstand the weight of the machine to hook the hoisting ring of the pipe bending machine, and move it to the installation position with a crane; if there is a qualified forklift, the machine can also be moved to the installation position using a forklift.

The operational range diagram of the machine is already displayed in the technical document. Before installing the machine, please read the technical document first, and prepare enough space to ensure the safety of personnel and the machine.

Part I Bending Machine Conveyance and Installation Regulations

Machine installation

The company's machines are transported in fully assembled form. When installing for the first time, please follow the following points:

2.1 Handling of fuselage cleaning

Clean the rust preventive oil or rust on the machine with kerosene or a similar solvent (solvent that does

not corrode the surface paint), and take effective protective measures to avoid damage to the mold and moving parts of the machine.

2.2 Operating environment for machines

The average illuminance in the workplace needs to reach above 300lux, and purchasers need to provide basic work illuminance when installing lighting in the factory to prioritize maintaining work safety.

We recommend that the machine be placed in a factory with good air quality, away from dust; and the room temperature should be between 0°C ~ 38°C (32°F ~ 99°F). Only in this way can the service life of electronic components and control screens be maintained.

Keep a clearance space in front of the machine for pipe loading and unloading operations, and the protective distance should maintain a safe distance of 1-2 meters around the machine. Detailed data is provided in the technical specifications, please refer to the technical documentation.

2.3 Machine Anti-vibration Device

To firmly position the machine on the ground, holes should be drilled on the ground of the machine device for the installation of the machine base. Installing vibration absorption devices purchased from the local market can facilitate the machine installation work.

2.4 Machine Level Calibration and Inspection

Calibrate the machine horizontal level using a machine leveler to ensure the machine is stable and does not shake or swing during the bending process; and use appropriate tools such as adjusting screws or shock-resistant adjusting screws to tighten and fix any loosened components due to vibration or collision during transportation.

2.5 Random Toolbox

Randomly attached tool names, specifications, quantities. Please count all tools before installing the machine.

Part I Bending Machine Conveyance and Installation Regulations

Oil selection

3.1 Hydraulic Oil

3.1.1

Before oiling inspection: Open the machine door lock, open the top cover of the hydraulic oil storage tank, and illuminate the inside of the storage tank with light to confirm that it is clean and free of moisture. The capacity of the hydraulic oil cylinder of this machine is displayed in Table T.1 in the technical document.

3.1.2

It is recommended to use high-quality hydraulic oil (most of which contain anti-wear additives), with a viscosity index of .150SUS at 100°F Fahrenheit temperature (or VGO-46).

Table 3.1 Qualified Oil Products

Brand	Product Code	Pour Point (°C)	Flash Point (°C)
HP	Bartran 42	-33	222
	Bartran 68	-36	208

CALTEX	Rando HD 32	-33	220
	Rando HD 68	-30	226
CALUB	Hydraulic AW Series 46	-18	201
	Hydraulic AW Series 68	-18	204
CPC	46AW	-30	242
	68AW	-30	246
ELF	Visga HP 46	-21	232
	Visga HP 68	-18	242
ESSO	Nuto H 46	-33	241
	Nuto H 68	-30	220
KINGUNION	Hymax 32R	-30	228
	Hymax 68R	-27.5	236
NISSEK	Super Hyrandq 32	-25	236
	Super Hyrandq 68	-25	258
PENNZBELL	FG-AW 46	-12	185
	FG-AW 68	-12	185
SHELL	Hrdro AW 46		240
	Hydro AW 68		240

3.1.3

Fill the oil tank by injecting hydraulic oil through the filter to the top of the oil level gauge. The oil level will drop for the first time the machine is used. After initial operation, replenish the oil to the standard indicated by the oil level gauge.

Part I Bending Machine Conveyance and Installation Regulations

3.1.4 Attention!

When the machine runs for the first time, there is still air trapped in the pipeline, causing hydraulic oil blockage. It is only after running through 20 to 30 cycles of bending pipe actions that the trapped air will be discharged from the hydraulic system.

3.1.5

Check the oil level in the oil sight glass at the bottom front of the machine, ensuring it is not lower than 2/3, and top up with the appropriate hydraulic oil in time.

3.1.6

Keep the hydraulic oil tank clean, away from dirt.

3.1.7

Do not let the hydraulic oil pipe with bent arms rub against the floor.

3.1.8

To maximize the performance of hydraulic oil, choose the appropriate oil based on different temperatures.

Table 3.2 Suitable oil types at different temperatures.

Temperature Range	Oil Type	
Above 25°C	Viscosity ISO 68 China Petroieum AW68, LPS68 BP Energol SHF 68	
10°C ~ 25°C	Viscosity ISO 46 China Petroieum AW46, LPS46 BP Energol SHF 46	
Below 10°C	Viscosity ISO 32 China Petroieum AW32, LPS32 BP Energol SHF 32	

3.2.1

The machine moving parts are equipped with fuel inlet, please refuel according to the table below.

The machine is equipped with a semi-automatic lubricator device with an oil-type lubricator filled with Sliderit #68 in the factory at first.

Please obtain high-grade lubricating oil and pour in the required amount. Please refer to the listed oil product list.

3.2.2

When selecting models equipped with semi-automatic lubricators that require oiling, repeat pulling and releasing the fast feed button until there is a clear sense of filling.

3.2.3

Attention! Every four hours of operation, please pull the handle 2 to 3 times. The tank is equipped with a check valve, so once the oil is sucked out, it cannot flow back. Please fill with lubricant once a week.

Selection of lubricating oil products in Table 3.3

Machine Lubrication Position	Recommended Brands			
	Castrol	Shell	PetroChina	Mobil
Hydraulic Oil Reservoir	Hyspin AWH32.46.68	Tellua T32.46.68	AW32.46.68LPS32.46.68	DTE 15
General Cleaning Oil	Magna BD 68	Tonna TX 68	Way Oil 68	Vactra No.2
General Grease	Spheerol AP 2	Calithia EPT 2	Extreme Pressure Grease EP2	Mobilux EP2
Curved Refined Bar	Strucovice BHD (gear oil)			

Table 3.4 Lubrication Points

Lubrication Point	Lubricant	Lubrication Cycle (Operating hours)	Inspection Cycle (Operating hours)
Head bearing	Grease	100	2,000
Bend arm, head slider	Grease	40	500/1000/2000
Mold guide plate	Lubricating oil	8	100/500/1000
Gear and rack in bending section	Grease	100	500/1000/2000
Clamping linkage mechanism	Lubricating oil	8	100/500/1000

Part I Bending Machine Conveyance and Installation Regulations

Cooling device

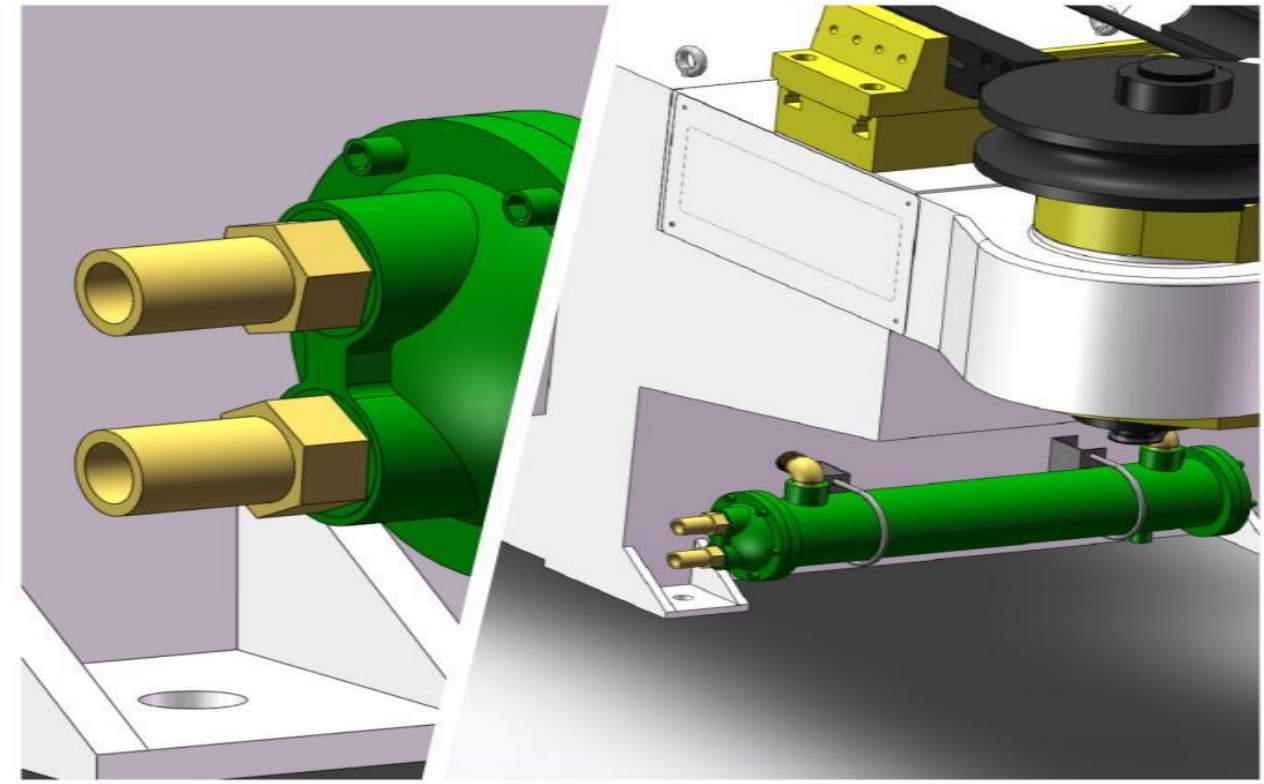
4.1 Connecting Hydraulic System

After a long period of operation, the entire hydraulic oil becomes very hot. Therefore, the oil pressure system must be connected to the cooling system and use cold water to reduce the temperature of the entire system.

This can extend the life of the machine and prevent cylinder oil leakage or other unreasonable dangers.

Ensure that the temperature of the hydraulic oil remains below 55°C. The two water inlet and outlet ports of the water-cooled cooler can be freely determined. Water is input from the inlet

port and output from the outlet port.



Caution! Fresh water only!

4.2 Warning!

Fill the hydraulic tank with ISO-VG68 hydraulic oil containing antifreeze mixture, or refill with ISO-VG46 hydraulic oil containing antifreeze mixture in cold regions. Do not allow the water in the cooling system to freeze, otherwise it will cause the cooling system to crack. If the water in your country freezes in winter, you must release the water in the cooling system when the temperature is below 5°C.

5 Power Connection

5.1 Warning!

Check the voltage at the motor nameplate and the control box input to ensure that both voltages match. Check power supply.

Power on (press the power switch) and verify that the motor rotation matches the direction indicated; otherwise, cut off the power, interchange the positions of the two power lines, and then power on again.

Part I Bending Machine Conveyance and Installation Regulations

5.2 Connection

Located at the end of the control panel, the power supply connected to the machine is marked with three phase sequences as L1, L2, L3. Remember! The machine is equipped with a switch to control the power supply, please ensure that the cables are properly grounded (according to national electrical regulations).

Part II Safety Regulations and Requirements for the Operation of the Pipe Bending Machine

If the bending machines are not used correctly, they will pose potential dangers.

Please be sure to comply with all data and information related to the use, misuse, and harm of

machines.

Before operating the machine, please read: Operating safety regulations and guidelines for the pipe bending machine.

Attention!

"The occurrence of accidents" is mostly caused by human negligence and failure to comply with safety regulations.

Before installing molds, operating machines, and maintaining them, please read this safety regulation section and user guide carefully.

Please ensure that the staff strictly follow the rules in this manual to avoid accidents, casualties, and adverse effects on machine functions; in case of a malfunction or the need for maintenance of the pipe bender machine, the machine should be immediately stopped, report to the supervisor, and wait until the machine is repaired.

In the area where the machine equipment is installed, it is necessary to always and effectively comply with the safety measures set by the factory and the country. Failure to comply with the relevant regulations when operating the pipe bending machine will result in the machine being in an unsafe state, potentially endangering the operator of the machine. In addition, operators should not operate the pipe bending machine according to their own habits, as this can cause immediate or long-term harm to the work environment.

Machine maintenance and repair should be carried out by professional mechanical engineering technicians. If the operators are unable to understand the maintenance procedures, please contact the mechanical service engineers of the agency. Do not attempt to repair the machine on your own.

This pipe bending machine is only used for specific performance of pipe fittings and materials with maximum bending resistance.

Do not attempt to bend non-metallic tubing or use for illegal purposes with this bending machine.

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Part Two: Safety Operating Regulations of Bender Machine

1. Safety warning signs.

The machine is marked with many safety labels, which are used to indicate the relevant hazards existing in each part of the machine; therefore, it is very important to pay attention to and follow the instructions on the labels when using this pipe bender.

All markings and meanings on the bending machine will be detailed in the following chapters.

In addition, the meaning of all symbols remains the same even in different countries.

1.1 Important Note

These signs should be regularly checked to ensure they remain clear and recognizable.

In addition, these signs should not be blocked in any way by anything.

Immediately reporting the abnormal status of the machine, such as the appearance of alarm information, is a duty that an operator should fulfill.

Operators must ensure that the indications and commands of warning signs have been complied with or completed before operating the machine.

During the service life of the machine in operation, the customer shall be responsible for any danger resulting from the unauthorized replacement of warning signs that have become dangerous or unclear in meaning.

If any mechanical accidents occur due to changes in the position of safety labels without authorization, the Company or their designated agents will not assume liability.

1.2 Potential Hazard Identification Area

The majority of potential danger areas in the tube bending machine are distributed as follows:

1.2.1 This range is defined as the total range of motion of the bent arm. The area between the range of

motion of the bent arm and the fixed arm is particularly dangerous.

1.2.2
Range of mold operation.

1.2.3
The space for loading and unloading of pipes in front of the fuselage and the operation space for rotating pipes.

During the installation of pipes, the operator's body must maintain a sideways 45° angle to the direction of the pipes to prevent the servo motor or core rod from pushing the pipes forward suddenly when idle, causing injury or puncture to the operator's body.

Part Two: Safety Operating Regulations of Bender Machine

2 Bending Machine Information

2.1 Introduction

Most accidents are caused by individuals failing to follow basic safety rules or precautions. Failure to adhere to the specifications outlined in this user manual can result in decreased efficiency, accidents, and, in the most severe cases, personnel injuries.

When the operator determines that this pipe bending machine is experiencing a malfunction or requires maintenance, the operator themselves should report to their supervisor and stop the operation of the machine until the necessary repairs have been performed.

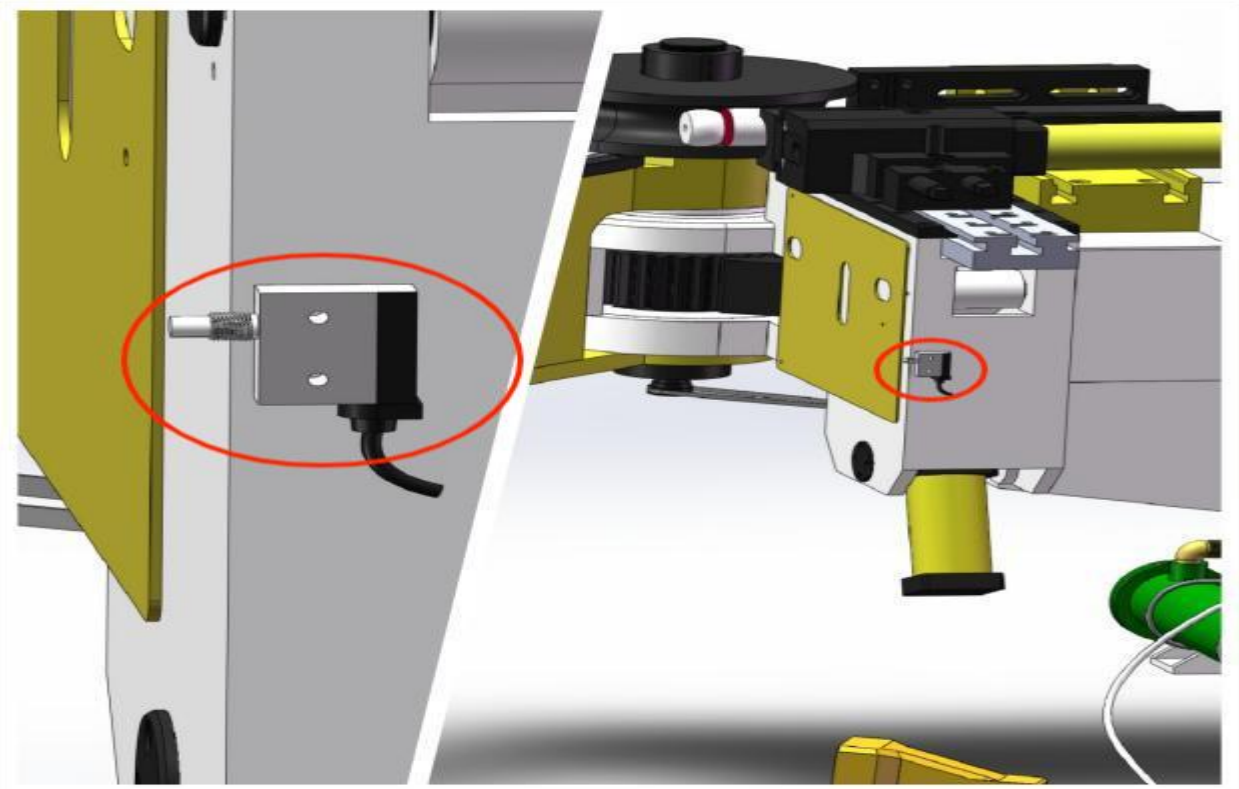
2.2 Use of Bending Machine

2.2.1 Application of bending machine.

Careful and meticulous operation of this pipe bending machine is very important. Proper use and maintenance of the machine will extend its service life. However, incorrect use of the machine can lead to serious safety incidents. Incorrect use of the pipe bending machine may not be intentional; but misuse can accelerate the wear and function degradation of machine components.

2.2.2 Safety guard plate

Next to the machine's bending arm is a safety guard, which, if a worker accidentally enters the range of motion of the bending arm, can be used to press the safety guard switch and cut off the motor power to prevent crushing injuries.



As shown in the figure.

Part Two: Safety Operating Regulations of Bender Machine

2.2.3 Emergency power shutdown device

When the machine is in an emergency state, you can press the emergency stop button to interrupt the motor operation to prevent dangerous events. After the danger is eliminated, you need to restart the motor.

Part Two: Safety Operating Regulations of Bender Machine

2.2.4 Position of the emergency stop button

Pressing this button on the control panel will cut off power supply to all motors and servo motors.

2.3 Avoid Overload

Improper use of machinery may cause overload on machine components. Excessive operating loads may not be intentional, but they often occur easily; this is because the torque required for bending pipes exceeds the torque range originally designed for the machine.

2.3.1 Operational Load

Verify the workload of the machine operation to avoid machine components overload; otherwise, it will affect the machine's service life and endanger the safety of operators.

2.3.2 Understanding the machine's load

Warning! The maximum bending ability is based on the tensile strength coefficient of 40 kg/cm² for bendable general iron pipes. The outer diameter (O.D.) multiplied by the wall thickness (W.T.) of the pipes is listed in the technical documents.

Please adhere to these technical specifications, otherwise it will result in serious damage to the machine and unnecessary maintenance costs.

2.4 Establishing a secure project

A series of safety training and guidance can help you minimize the possibility of injury. Safety training programs must be supervised and guided by leaders and managers. The effectiveness of safety training depends on the quality of management.

Managers must maintain sensitivity to safe operations within all their areas of responsibility.

Managers must create a daily inspection process for the department. Encourage managers to define, report, and correct any safety and hazards.

Moreover, managers must also remind operators to enhance their personal safety and crisis awareness.

Part Two: Safety Operating Regulations of Bender Machine

2.4.1 Concept of Safety Training

To achieve the maximum protective effect, appropriate training is necessary. Employees should be instilled with safety awareness of the work environment and machine operation on a regular basis, and guidance on mold installation, safety devices, and operation.

Part Two: Safety Operating Regulations of Bender Machine

The important rules regarding methods and personal safety are integrated into personal safety awareness and education.

2.4.2 Plan for Safety Training

Establish a safety training program, defining the short-term, medium-term, and long-term goals of this program; this plan must be led and guided by supervisors. Enable supervisors and employees to interact well, truly implement the established safety plan, and lay a solid foundation for effective safety training based on the quality of management.

2.4.3 Feedback

Based on job responsibilities and safety inspection, supervisors should inspect various work areas every day, promptly identify issues arising from the implementation of operational procedures and safety regulations, and timely report the safety status for appropriate disposal.

3 Safety measures for electricity

Warning! Deadly voltage!

1. Do not touch the entrance of the junction of the insulating material circuit! If an external auxiliary power cord plug has been installed, do not approach it. Only qualified personnel are allowed to operate power accessories.

Before using the machine, the voltage at the connection of all transformers must be changed to the voltage supplied by the country.

Before any electrical box is opened, the machine must be fully insulated. The 3-phase power supply of the machine must be turned off.

And clearly marked whether there are staff operating in the area to prevent accidents from happening.

4. The main power switch of the machine must be locked with the appropriate device. This device can only be opened by authorized personnel; only when all the locks and locking devices have been removed, can the main power switch be turned on, which is very important.

Please note that even if the main power switch is turned off, the power supply to the main bus is still

present.

Part Two: Safety Operating Regulations of Bender Machine

Additional signs should be displayed on the machine and control box to warn personnel working on the power system.

Before the main power switch is turned on and the power to the machine is restored, the door of the machine's power control box must be tightly closed.

7. Workers responsible for electrical maintenance and inspection must have received professional training in electrical knowledge; please confirm whether the maintenance personnel have the circuit diagram before the inspection.

Power Supply Voltage Requirement: ±5%.

9. Do not short circuit or bypass the overcurrent protection devices such as limit switches.

10. The installation work must comply with the electricity regulations established by the country and be fully tested.

4 Safety measures for the hydraulic system.

Warning! High-pressure flowing liquid!

In the main oil pressure circuit, a pressure gauge must be installed to monitor the circuit pressure.

Do not remove or install any components of the hydraulic oil pressure system under any circumstances or system pressure. Verify that all hydraulic oil pump motors are in the closed state before conducting inspections.

3. All high-pressure fuel pipes on the machine must be regularly inspected to ensure they remain in good condition. The high-pressure fuel pipes should not have any serious scratches or wear. If any high-pressure fuel pipes are cracked or damaged, they should be replaced immediately and the machine should not be used.

4. All hydraulic components mounted on the machine are designed to meet the maximum operating pressure of the system. Any attempt to increase the pressure arbitrarily will result in potential hazards to the machine's operation and must be avoided.

5. When you purchase oil from any supplier, please ensure that the lubricant and hydraulic oil are non-toxic. And use only specific oils to accomplish a planned work task.

Exposure to organic oils for a long time may remove the skin's natural oils and lead to gradual dryness and local irritation. When handling hydraulic oil, always wear gloves. Under no circumstances should hydraulic oil be swallowed; if accidental ingestion occurs, induce vomiting immediately.

7. For specific safety information regarding oil products, please refer to the data provided by the oil supplier. All suppliers of industrial oils will be happy to provide complete safety data for their products.

If a large amount of oil is ingested, seek medical help immediately.

Part Two: Safety Operating Regulations of Bender Machine

9. When repairing and adding hydraulic oil (piercing lubricant oil), if oil residue occurs on the ground, be sure to clean it up.

10. Used oils that are discarded should be recycled or disposed of according to local regulations.

5 Noise Level

The machine was designed to take into consideration the possible operational noise and reduce it to the lowest level within the acceptable range for this type of machine.

Noise Level	Environment
80dBA	The noise level reading on this machine is measured at the operator's workstation.
70dBA	This reading is identified as the background noise level.

However, it must be emphasized again that machine operators should cultivate good work habits when approaching the machines like the other employees. When the machine is running, appropriate ear protection should be worn.

6 Mold installation safety

6.1 Overview

The installation of molds is a highly important task. The safety of operators depends on the proper execution of this work. Mold installers need to have practical knowledge of bending machines, molds, and materials. In addition, they must understand the importance of proper mold adjustments.

Molds must be of appropriate size for the machine's capability and bending requirements. Attempting to bend pipes beyond the designated bending capacity may overload the machine, leading to mechanical failures and potentially causing harm to personnel operating it.

In addition to being familiar with technical knowledge, mold installation personnel must also cultivate a personal awareness of safety. The installation of molds must be carried out with a safe attitude. All mold installation personnel should be aware of the necessity of safety when performing their work, which is equally important to providing a safe operating environment for others.

Part Two: Safety Operating Regulations of Bender Machine

6.2 Mold Installation Safety

Please follow the following preventive measures to establish a secure mold installation procedure.

Please do not place your hands, fingers or any part of your body in the mold while the hydraulic pump motor is running.

Operating area.

2. Do not install or adjust the mold without reading or understanding the installation instructions in the user manual.

Or move.

Do not install, adjust, move, or maintain the machine while the hydraulic pump motor is running.

When working around or near machinery, do not wear ties, jewelry, or loose clothing.

5. If the mold is too heavy to be lifted by hand, appropriate machinery should be used to move it. In these cases, the mold ...

Equipped with a lifting ring for the operator to hoist and use the equipment.

6. Before installing the mold, please clean it first and remove dust, metal shavings, or other foreign substances. Otherwise, it will lead.

The phenomenon of mismatched mating will cause personal injury or damage to machinery and molds.

When the machine is in operation, the operator must wear personal protective clothing, especially on the hands and feet.

To avoid possible injury to your fingers, please use appropriate tools to operate instead of using any part of your body.

In order to prevent hazards caused by unauthorized use of the machine or accidentally turning on the power, please disconnect the machine power and lock the switch in the off position.

To ensure the mold is securely installed, please pay attention to and confirm the positioning screw's operational status before installing the mold.

Avoid machine vibration to prevent damage and dangerous events caused by mold displacement.

10. Use appropriate molds suitable for the size of the pipe bending machine to avoid overloading the machine. Do not install worn or damaged molds.

11. Before the machine starts running, please complete the necessary adjustments after the mold installation.

Before the machine starts operating, ensure that all individuals have cleaned the machine and the molds.

Before the machine operates, please check in the areas of molds, bending angles, piercing connecting rods, and motors. Confirm that there are no tools, nuts, screws, fixtures, etc., remaining in these areas.

14. Observe the operation of the machine for a long period of time to determine if the machine, mold, and other auxiliary equipment can operate properly.

15. Report any problematic operating procedures, abnormal actions, oil leaks, unsafe conditions, or incorrect maintenance incidents to your supervisor.

Part Two: Safety Operating Regulations of Bender Machine

16. To make different operations, when changing the settings of the pipe bending machine control, please first confirm that the settings are correct. And before carrying out the bending action, please test to ensure smooth operation.

17. The bend lubricant will make the surrounding area slippery, dirtying the mold area. Safely inserting an absorbent material (such as a soft cloth with good oil absorption) into the end of the pipe fitting can prevent the bend lubricant from dripping onto the machine. This will also help keep the floor from becoming slippery, reducing the potential danger to operators.

When the bending machine is unable to operate or unattended, even for a short period of time, before restarting the machine,

Please check all parameter settings.

19. Develop personal safety awareness, follow all safety rules, learn how to deal with emergencies, discuss and develop control methods with the supervisor, and implement them.

Machine Operation

7.1 Safety protection facilities for machines

Due to the different structural properties of pipe fittings and the complexity of some part shapes during bending, it is usually necessary to familiarize oneself with the operational safety measures of each application point.

Designing and manufacturing safety protection facilities for machines will increase the installation cost of the machines. However, because everyone who owns a machine must bear the responsibility for the safety of their employees, the additional cost of appropriate defensive facilities will not be a major consideration affecting the overall cost.

The position of the machine's foot switch and touch screen must be fixed and clearly marked to avoid personnel falling and getting scratched when passing by the machine, or causing line breakage. If it is necessary to remove some protective facilities for machine maintenance, please reinstall the facilities after the maintenance is completed before performing the startup operation.

7.2 Operator safety

Please comply with the following safety regulations to minimize the risk of operator's accidental injuries and effectively improve work efficiency.

Do not use the machine until you have read and understood the operating instructions manual.

2. Do not place hands, fingers, or any part of the body in the mold working area while the oil pressure assistant pump motor is running.

When working near or with machinery, do not wear ties, jewelry, or loose clothing.

Part Two: Safety Operating Regulations of Bender Machine

After each transition between the machine starting up and pausing, operate the machine several times.

Carefully observe whether the machine is functioning properly.

5. When the machine is running, the operator should not talk to anyone. If it is necessary to talk, stop the machine, turn off the motor and stand aside until the conversation is completely finished.

6. Report any malfunctioning procedures, abnormal actions, oil leaks, unsafe conditions, or incorrect maintenance incidents to your supervisor.

7. Do not attempt to pull the mold by hand. If a part is stuck in the mold, stop the machine and seek approval from your supervisor.

8. Keep all safety measures equipment in good condition.

Do not touch around the security protection facilities.

10. Observe whether the machine is operating in overload. Occasional or deliberate attempts to operate the machine beyond its maximum operating load will put the operator in a dangerous working environment and cause excessive wear on the machine and mold.

11. When your work task is completed, please promptly turn off the main power of the machine.

Do not stack zero components around the bending machine's die area.

To prevent hazards caused by unauthorized use of the machine or accidentally turning on the power, it is necessary to turn off the power or hydraulic oil pump when the pipe bending machine is not in use.

14. Before operating the pipe bending machine, make sure to clean the body of the machine and check if there are any tools, nuts, screws, fixtures or other items left in various parts of the machine. In addition, check for any looseness, wear, breakage, or damage in the machine components to prevent any potential hazardous incidents.

15. If there are other personnel moving around the machine during operation, please make sure that each person is in a safe place before starting the machine.

When operating this mandrel bending machine, operators should confirm whether they are in a safe operating position. Also, do not approach the operating range of any machine while it is running to maintain operator safety.

When the machine bends the pipe, if the operator stands in the wrong position, the bending workpiece may impact the operator. Please confirm the direction of the pipe rotation to ensure a safe standing position.

18. Cultivate personal safety awareness, comply with all safety rules, learn to handle emergencies,

discuss and develop control methods with the supervisor, and implement them.

Part Two: Safety Operating Regulations of Bender Machine

7.3 Safe Operating Procedures

Warning! Improper operation will cause serious accidents!

If any safety device fails to operate or is ineffective, the machine should not be operated. The machine should also not be operated if safety equipment or safeguards are damaged.

If a malfunction occurs during the manufacturing process, do not operate the machine anymore; it will make the machine unsafe.

If there are the following malfunctions when bending pipes, please take protective measures immediately.

After the bend, the pipe fittings cannot be removed or get stuck between the dies.

During the bending process, the construction fittings are in a dangerous state.

c. The machine's tube bending cycle is interrupted or terminated in any way before completing a special tube bend or tube bend cycle. This will cause the pipe to get stuck inside the machine.

4. If a malfunction occurs, stop the machine urgently as quickly as possible! Report the malfunction directly to the supervisor and make sure all nearby personnel are aware that the machine has malfunctioned.

5. If the power supply can be safely restored, switch to manual mode; manipulate each component of the mold to remove the faulty pipes from the machine. During this operation, no one is allowed to approach the machine.

6. Do not hold the pipe fittings by hand or ask anyone else to hold the pipe fittings or any mold items. Do not attempt to forcibly remove the pipe fittings from the machine with any part of your body while operating the control machine.

If zero components cannot be removed from the machine manually, as with the statement in the electrical safety measures, carefully remove all components from the molds to remove the piping after all power facilities on the machine have been disconnected.

After all the pipes have been removed, please inspect the machine thoroughly and write a report on any damages.

Investigate and research the causes of the malfunction, and do not operate the machine again until the fault has been resolved. If necessary, isolate the machine completely and request assistance from Qiaosheng Machinery Co., Ltd.

9. After the occurrence of the fault, please conduct a detailed inspection of the safety protection facilities. In addition, perform the startup.

The program checks whether the machine, mold installation, and bending program are normal.

When installing pipe fittings, the operator's body must be kept at a 45° angle to the feed seat to avoid the servo motor suddenly moving forward when idle, injuring or piercing the operator's body.

Part Two: Safety Operating Regulations of Bender Machine

7.4 Safety precautions during the bending process

When the machine is still running, do not attempt to retrieve the components under any circumstances. Even if the machine is interrupted while running and the components are trapped in the mold, do not attempt to retrieve them. Do not perform any work in any work area when the main power is on.

Operators must communicate with each other. When transferring the machine to a new shift operator, the appropriate handover procedure must be followed. Each time, the machine's structural configuration should be checked and valid machine options and features recorded. Ensuring that sequential options and sequential teaching equipment operate effectively is very important.

3. Do not anticipate events in the order of bending pipes. If necessary, choose manual mode and let the machine run a full cycle before loading the fittings.

4. Often use the single-step execution mode to test the operating status of the pipe bending machine during the new pipe bending product process.

The test must be conducted at the slowest speed.

5. Choose a manageable speed to ensure safety during production. Before carrying out the bending action, carefully consider the diameter, length, and protruding part of the pipe being machined. Start slowly and then gradually increase the speed.

6. When each bend pipe software changes, all operators should be notified. Give operators sufficient training to ensure that all operators are familiar with machine operation procedures.

8 Maintenance and Repair

8.1 The lifespan of the machine

To maintain the performance and establish the safety of the machine, an efficient plan for machine inspection and maintenance must be carried out according to regulations.

Details about this plan are listed in the maintenance section of the user manual. In fact, establishing the service life figures for relays, solenoid valves, or other electromechanical component is very difficult.

The actual service life should be determined by the type of usage, environmental conditions, and a comprehensive preventive maintenance plan. It is important to understand that the possibility of a part

failing at any time due to wear and improper maintenance. However, frequent inspections and a good preventive maintenance plan can reduce the likelihood of failure. Worn-out or improperly maintained components should be replaced immediately.

Part Two: Safety Operating Regulations of Bender Machine

8.2 Cleaning of the machine

Keeping the machine clean will make any inspection and maintenance easier to implement. On a clean machine, problematic areas can be found more quickly. Applying a thin layer of oil to the unpainted parts of the bending machine can prevent dust and facilitate equipment maintenance.

In addition, it is also important to keep the floor around the machine clean and free from obstacles.

8.3 Improvement of Machines

When the machine can no longer be repaired, please purchase a new machine to replace it. A worn-out machine, if it continues to operate, is not only unsafe and inefficient, but also a major factor in shortening the life of the mold and producing unsatisfactory products.

If the bending machine is already old but still in good condition, it can be updated and upgraded so that it can be more efficient through applying the latest projects, such as the newest hydraulic conversion units and new electronic controllers.

Develop a comprehensive, detailed, and objective system to evaluate all in-use mandrel bending machines. Based on the results of these evaluations, update, repair, or replace the necessary equipment.

8.4 Safety Regulations for Maintenance and Repair.

The following maintenance precautions can minimize the chance of operators getting injured during the maintenance process. When conducting maintenance on the pipe bending machine, please read and follow these steps carefully.

Before repairing the bending machine, please read the maintenance manual.

Do not place your hands, fingers or any part of your body in the potential bend machine oil pressure area while the hydraulic motor is running.

When working near or with machinery, do not wear ties, jewelry, or loose clothing.

4. Tools at hand should be placed in a toolbox or tool belt. Do not place them in pockets or trousers; after maintenance, do not leave tools near the machine.

Before maintenance, please cut off the power supply and lock the switch to ensure that it cannot be turned on without permission.

6. Before starting the motor, please confirm that all hydraulic components, electrical components, and oil pressure parts have been positioned and assembled. Only after confirming the power supply voltage value can the machine be turned on.

7. Please use standard specifications for molds, perform tuning tests and mold trials.

Part Two: Safety Operating Regulations of Bender Machine

After completing the machine maintenance, please adjust and confirm the relevant parameters, tidy up all tools, and start the pipe bending machine.

Ensure smooth operation.

9. Do not let the machine under maintenance to be used for production manufacturing unless you can ensure that the machine is functioning correctly.

Carry out the operation.

Do not leave the machine while the hydraulic pump is running.

11. Clean all grease and oil stains, keep the area near the machine tidy.

When painting, do not cover the safety signs on the machine parts, and regularly check to ensure that the safety markings remain clear.

Identify, if ambiguous and difficult to identify, then update.

If the machine fails to operate normally, please shut down the power directly.

14. Keep the area around the machine clean, especially the floor.

Before running the automatic program, please make sure all the data is correct.

16. Please do not use any sharp tools to poke or scratch the touch screen to prevent damage.

Do not allow the system pressure to exceed the required maximum value.

Operation of the bending machine in Part Three.

Operation of the third part of the bending machine.

Before operating the machine, please read the "Operating Instructions".

Attention!

"The occurrence of accidents" is mostly caused by human negligence and failure to comply with safety regulations.

Please ensure that the staff strictly follow the rules in this manual to avoid accidents, casualties, and adverse effects on machine functions; in case of a malfunction or the need for maintenance of the pipe bender machine, the machine should be immediately stopped, report to the supervisor, and wait until the machine is repaired.

The operation of the elbow bending machine.

Table of Contents 3

1. Bending tube principle

2. Description of mold installation operation

3. Operating System User Guide

4. Operating System Failure Description

1. Bending tube principle.

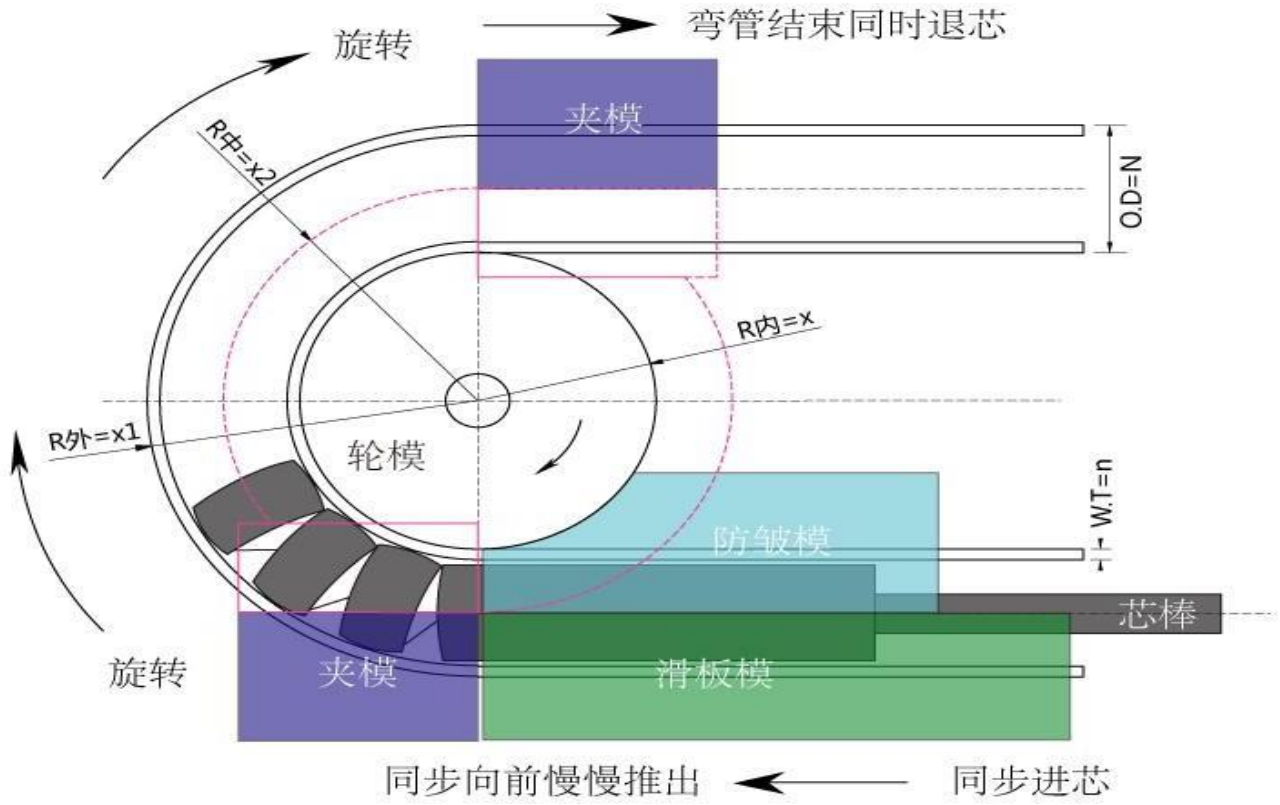
1.1 Technical Specifications

Before operating the machine, the operator must understand the performance and technical specifications of the machine to prevent overloading the machine and causing potential harm to the user and the machine.

Some machine-related performance and technical specification documents, including detailed machine

specifications and data.
The information is all included in the technical documents. If the operator needs to refer to the machine's specifications, please refer to the technical documents.

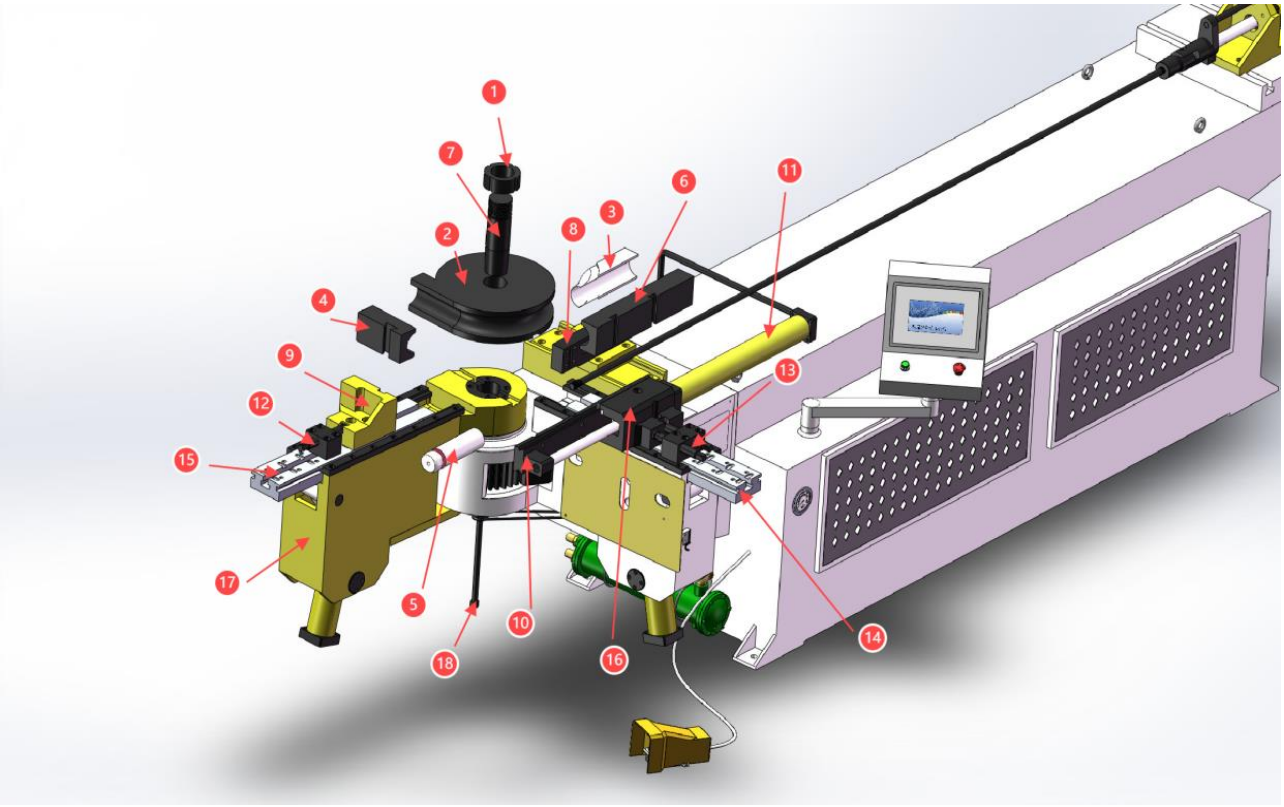
1.2.1 Bending tube principle:



Part III Operation of the bending machine.

2.1 Mould Installation Instructions

Text 1: No translation required as the original text is already in English.



The meaning of numbers:

1: Mold core axis nut 2: Round mold 3: Anti-wrinkle mold

4: Main fixture 5: Core rod 6: Auxiliary fixture

7: Mold Core Axis 8: Anti-wrinkle Mold Base 9: Main Fixture Seat

10: Auxiliary push skateboard 11: Auxiliary push hydraulic cylinder 12: Primary fixture adjusting screw

13: Auxiliary fixture adjusting screw 14: Auxiliary fixture slider 15: Main fixture slider

16: Auxiliary Push Rod 17: Bent Arm 18: Core Axial Pull Rod

Mold installation steps:

1: Operate the computer manually, click the bend pipe button, and bend the bending arm (17) more than 90°. As shown in Figure 1.

Operating the computer manual screen, clicking the assist push forward button, extends the assist push skid (10). As shown in Figure 1.

3: Operate the computer manual screen, click on the main fixture and auxiliary fixture clamping button, and clamp the main fixture slider (15) and the auxiliary fixture slider (14) forward to the appropriate position.

Operation of the bending machine in Part Three.

Rotary module installation:

Insert the round mold (2) into the mold core shaft (7), while locking the mold core shaft (1) and the core rod (18) simultaneously.

Workpiece Clamping: ## English

5: Install the main fixture (4) onto the main fixture seat (9) and tighten it to ensure that the main fixture

(4) is concentric with the round die (2).

Installation of auxiliary fixtures:

6: Install the auxiliary fixture (6) onto the auxiliary support (16) and lock it to ensure that the main fixture (6) is concentric with the circular die (2).

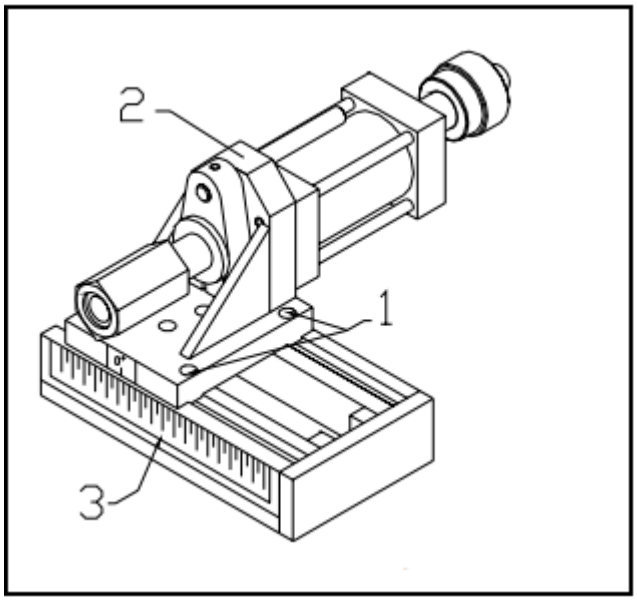
Adjust the main fixture adjusting screw (12) and the auxiliary fixture adjusting screw (13) to align the main fixture (4) and the auxiliary fixture (6) with the circular die (2).

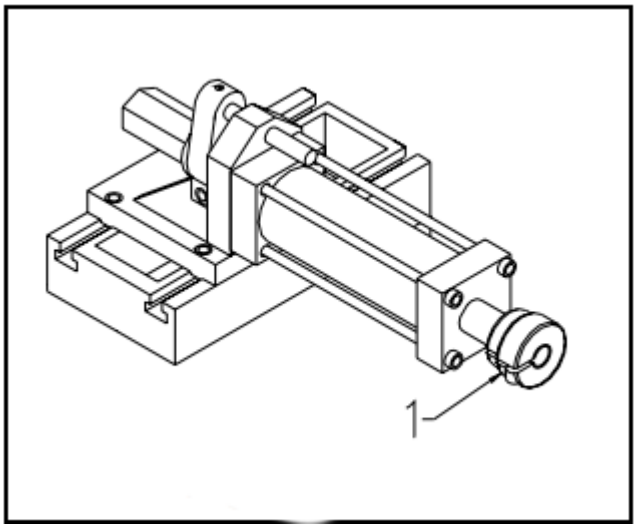
Manually operate the computer screen, click the main fixture retreat and the auxiliary fixture retreat button respectively, make the main fixture and auxiliary fixture retreat a certain distance, then adjust the main fixture adjusting screw (12) and the auxiliary fixture adjusting screw (13), rotate clockwise 1/4-1/2 turn.

Operating the computer manual screen, sequentially click on the following buttons: main fixture retreat, auxiliary fixture retreat, auxiliary push retreat, and bend tube return button.

9: Pre-fix the anti-wrinkle mold (3) on the anti-wrinkle mold base (8), adjust the position of the anti-wrinkle mold base (8) front and back, ensuring that the front end of the anti-wrinkle mold is ±1-3mm from the center of the round die (2). The anti-wrinkle mold (3) must fit the arc of the round die (2).

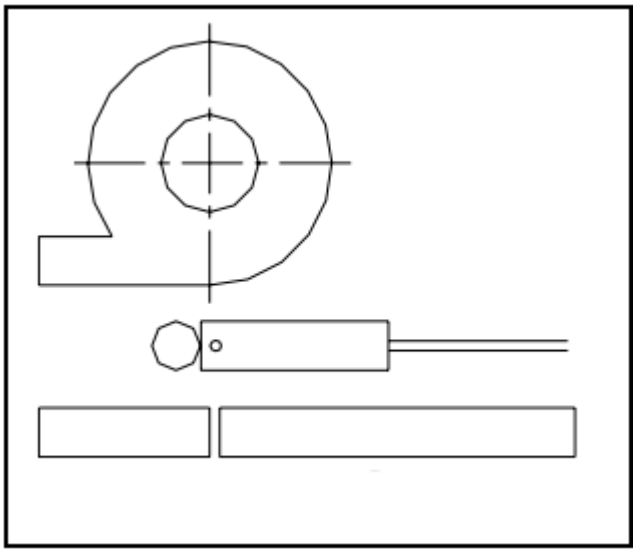
Installation and Adjustment of Core Rods:





Manually operate the computer screen, click on the core rod forward button, and move the core pulling cylinder forward. Connect the core rod (5) with the core pulling rod, and adjust the core pulling adjustment nut.

Operation of the bending machine in Part Three.

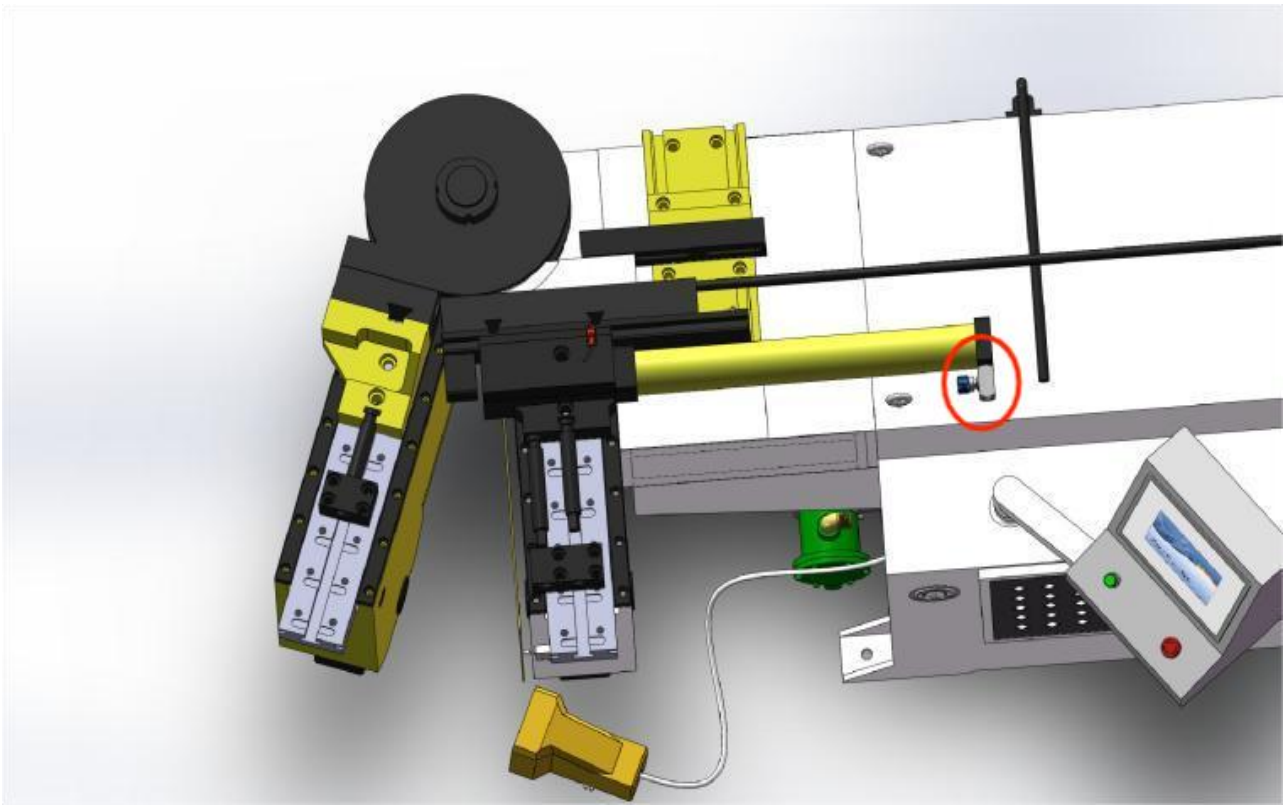


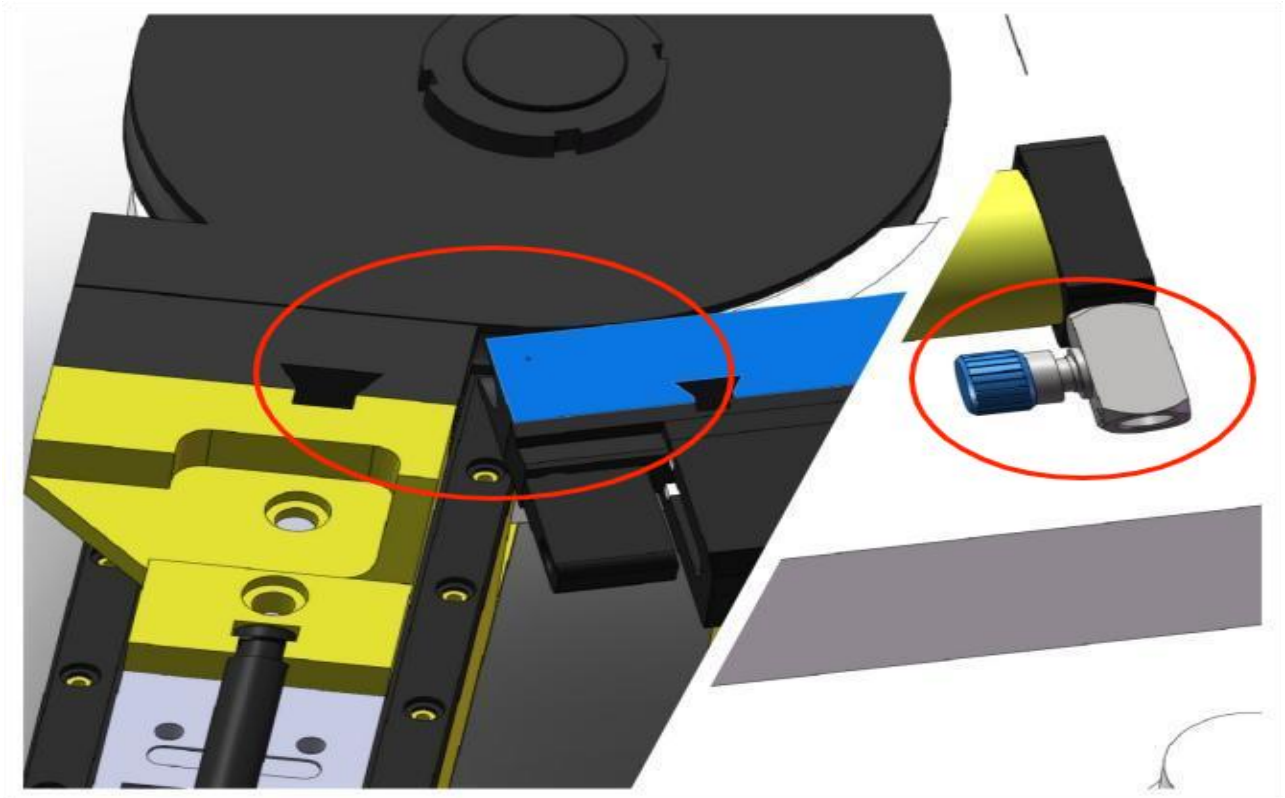
The position ensures that the core rod (5) is located 1-3mm in front of the center of the round die (2), and the distance between the core rod (5) and the center of the round die (2) can be adjusted forwards and backwards according to the bending situation.

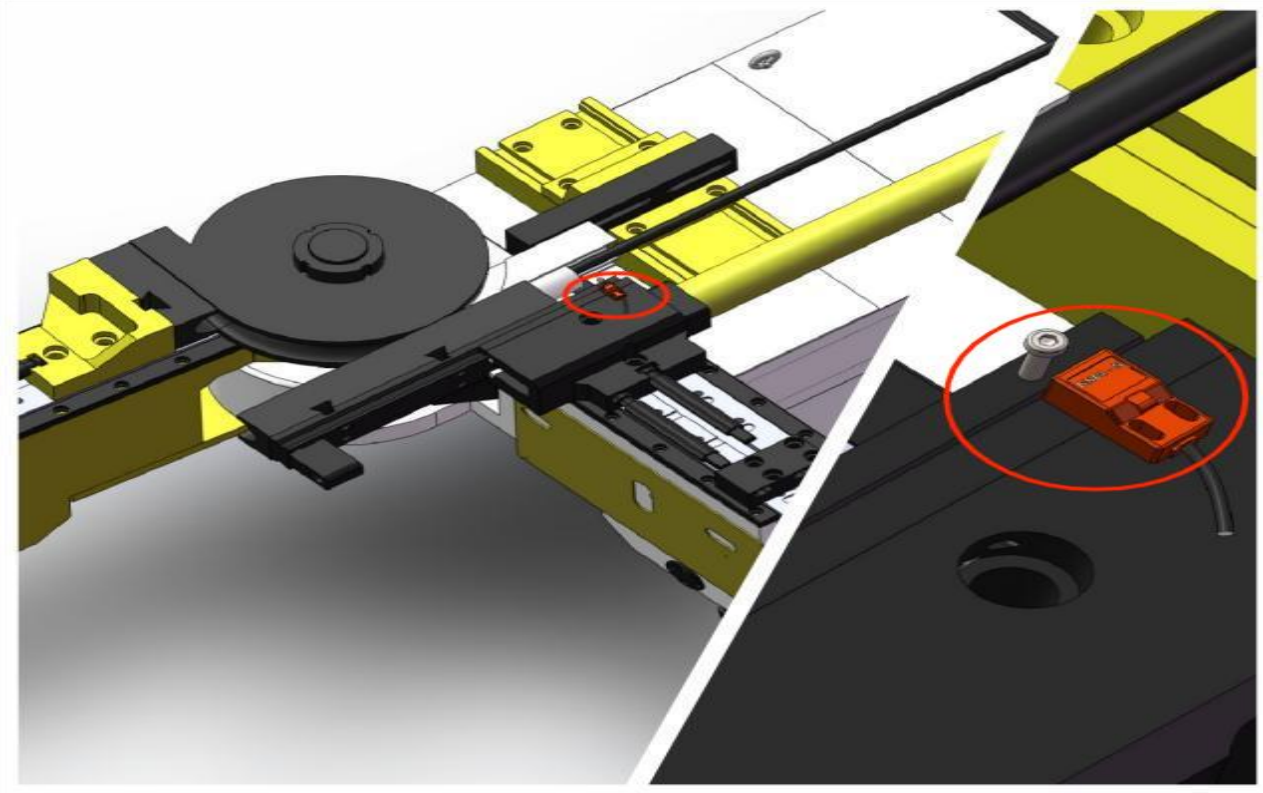
2.2 Machine Operation Instructions

2.2.1 Speed regulation of auxiliary clamp engagement

By adjusting the flow control valve, the speed of advancing the mandrel can be regulated. When the diameters of the round dies are different, the auxiliary push speed needs to be adjusted to prevent collision between the mandrel and the main clamp die.





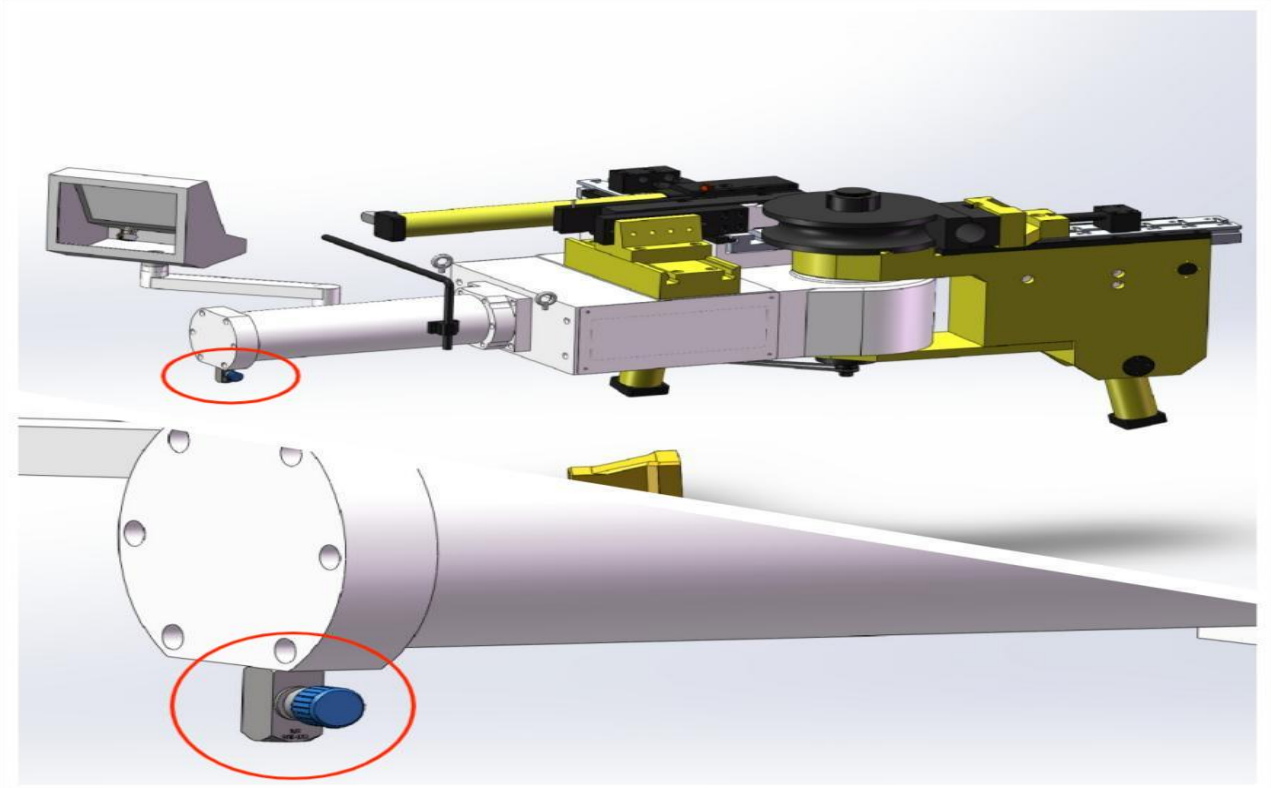


2.2.2 Repetitive auxiliary push-to-use method

When the diameter of the circular die is large enough and the bending angle is relatively large, the length of the auxiliary clamp around the circumference of the circular die is not enough, so the repeat auxiliary propulsion function is needed.

By adjusting the position of the sensor screw, during the bending process, when the screw moves close to the switch, the auxiliary clamp will perform a backward motion. When the auxiliary clamp re-clamps, the bending process will continue.

Operation of the bending machine in Part Three.



2.2.3 Bending Speed Setting:

When the pipe fittings have different bending sizes and different wall thicknesses, the bending speed needs to be adjusted. In general, the principle followed by bending speed is: the larger the diameter, the slower the speed, and the thicker the wall, the slower the speed.

Clockwise slow down, counterclockwise speed up.

Operation of the bending machine in Part Three.

3.1 Operating System User Guide

Operation Instructions (English Version)

1.1 Boot Interface

After the controller is powered on, it enters the boot interface as shown in the diagram. Click on any area to enter the manual operation interface.

Operation of the bending machine in Part Three.

1.2 Manual Interface

Under manual mode, it is effective (Settings -> Advanced Options -> Device Parameters -> Manual bend multiple angles -> Allow, otherwise only the 1st angle can be bent)

Click the corresponding touch button, and if the relevant conditions are met, there will be output.
Press "clamp": Clamp electromagnetic valve Y1 and relief valve Y9 work (limitation: auxiliary propulsion must return to its original position)
Engage "Retract Solenoid Valve": Retract solenoid valve Y2 works with relief valve Y9 (Limitation: None)
Press "Auxiliary Thrust": Auxiliary thrust solenoid valve Y3 and relief valve Y9 work (constraint: actual current angle must be greater than 90 degrees/optional)
Press "Auxiliary Pushback": The electromagnetic valve Y4 and the relief valve Y9 work (restriction: auxiliary pushback stops when in place)
Press "Enter Core": Enter core electromagnetic valve Y5 and relief valve Y9 work (Constraint: none)
Pressing "RET SPOOL": Both the spool solenoid valve Y5 and the relief valve Y9 work (no restrictions).
Pressing "Bend Tube": Bend tube solenoid valve Y7, auxiliary solenoid valve Y3 and relief valve Y9 work (constraint: angle less than the set angle)
Press "Ret Bend": Ret bend solenoid valve Y8 and relief valve Y9 work (condition: the secondary propulsion must be in the original position)
1.3 Semi-automatic mode

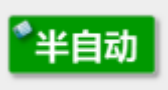
Click the semi-automatic button to enter semi-automatic mode.
The statistical time for processing a pipe.

Stem stick, auxiliary propulsion: Green squares indicate the use of this function, while gray squares indicate not using this function.
Click "Run" button to enter semi-automatic control mode, during the running process, click "Stop" touch button, the system enters stop status.

Note: The system must be in a stopped state before modifying other system functionality options and parameters!

Operation of the bending machine in Part Three.

Semi-automatic workflow:



Enter full automatic mode.

2) Press the run key to enter the automatic running state.

3) Check if all signals are normal, and if the device mechanism is in the initial state.

4) The device displays on the status bar, "Start by stepping on the foot pedal."

5) Automatic bending process begins

Part Three: Operation of the bending machine

Clamping - gripping - bending tube - reaching set angle - retracting core - releasing grip - auxiliary pushing back - taking the tube - stepping on the pedal again - retracting bend - entering core

1.4 Fully automatic mode

Automated workflow:

Click to enter full automatic mode

2) Press the run button to enter the automatic running mode.

3) Check if all signals are normal, and if the equipment mechanism is in the initial state.

4) The device's normal status display prompts, "Start with foot pedal"

5) Automatic bending process begins

Clamp - Clamp tight - Bend the tube - Reach the set angle - Retract the core - Release the clamp - Auxiliary push back - Take the tube - Bending back - Insert the core

The difference between fully automatic mode and semi-automatic mode is that in a bend tube process, semi-automatic mode requires two foot pedals, while fully automatic mode only requires one.

For safety reasons, it is recommended to use semi-automatic mode during production.

1.5 Trial Mode

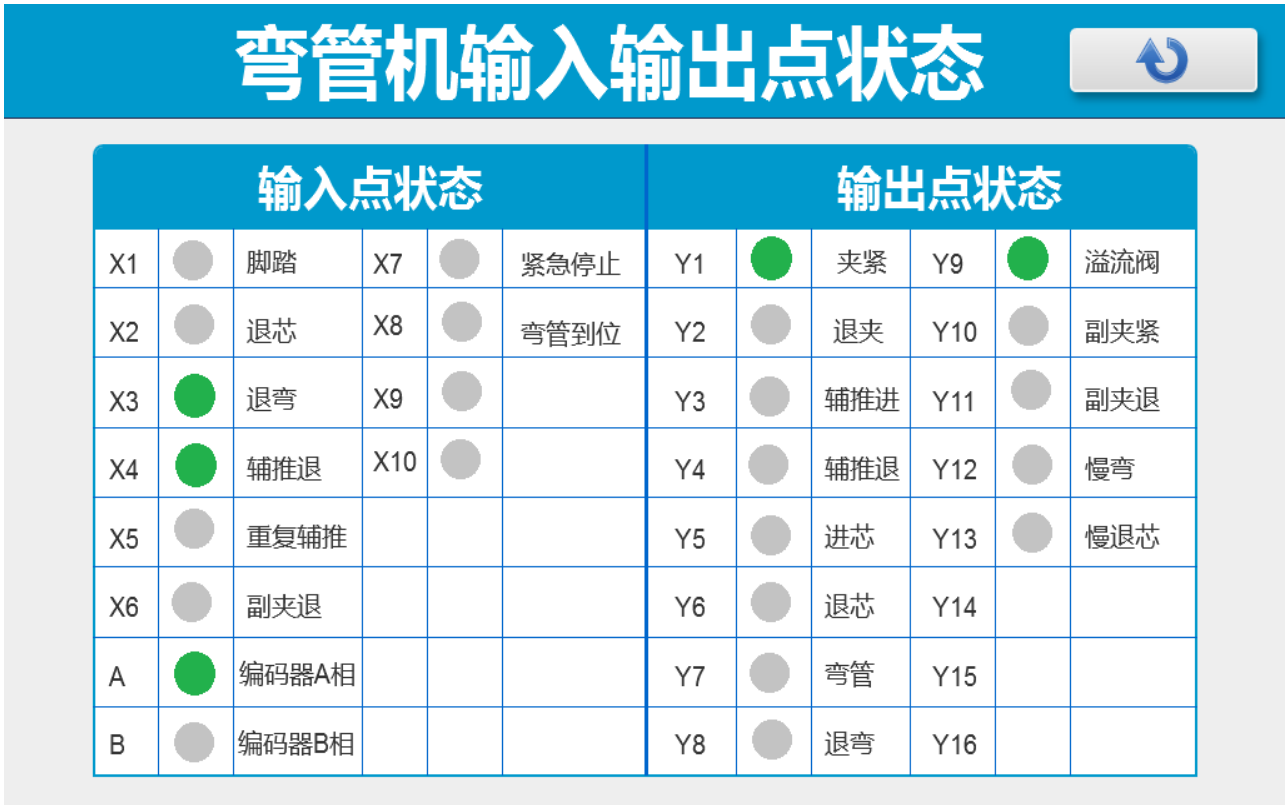
The trial mode is used by device manufacturers to test and inspect the performance of the equipment before it leaves the factory, and it is strictly prohibited for use in production processes.

To enter the test mode, you need to enter the password "123".

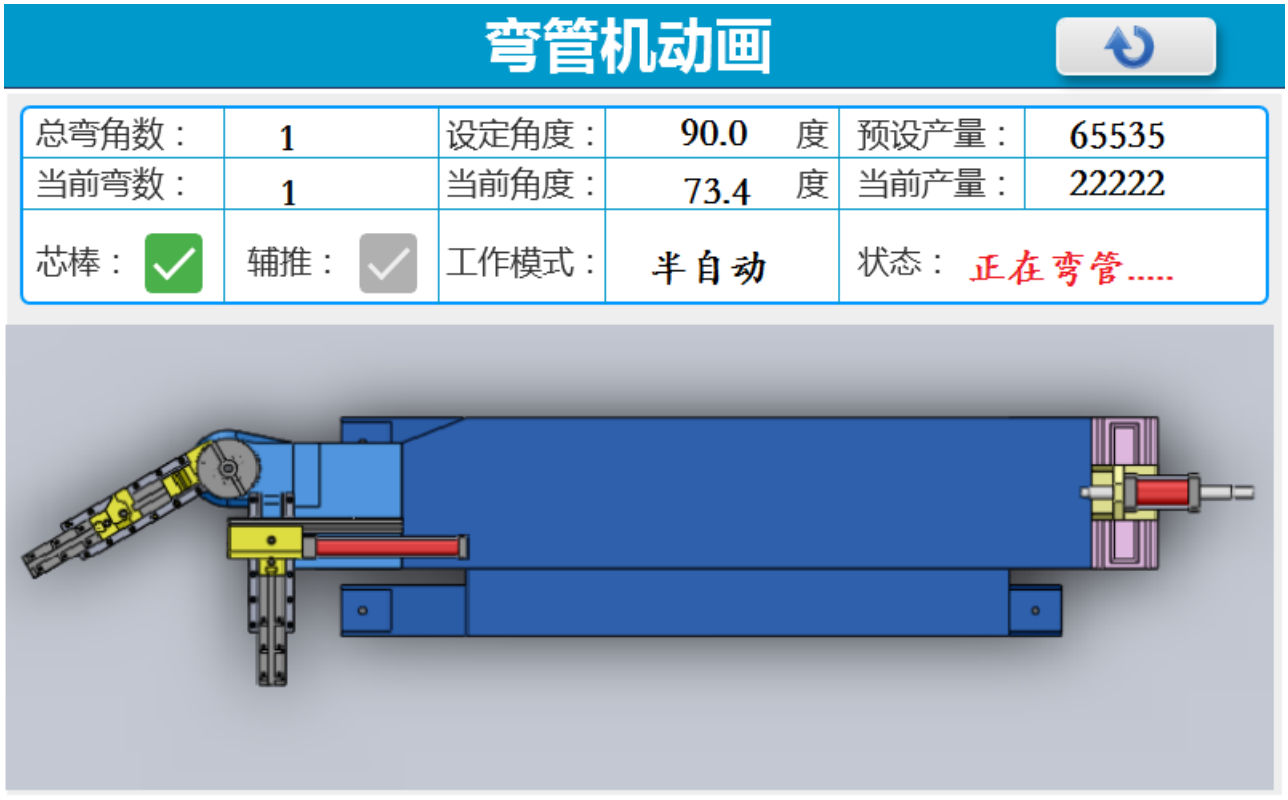
1.6 Query Interface

Click the "Search" touch button to enter the query interface, as shown in the figure below.

Operation of the bending machine in Part Three.



When the corresponding input point is connected or there is output at the output point, the corresponding input point status will be indicated by a green light, otherwise, it will be indicated by a gray light.



In the stopped state, there is no output. The animation interface displays some running status of the bent

pipe.

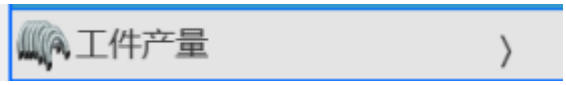
1.7 Setting up the directory interface

Click directly on the desired item to enter the corresponding setting interface.

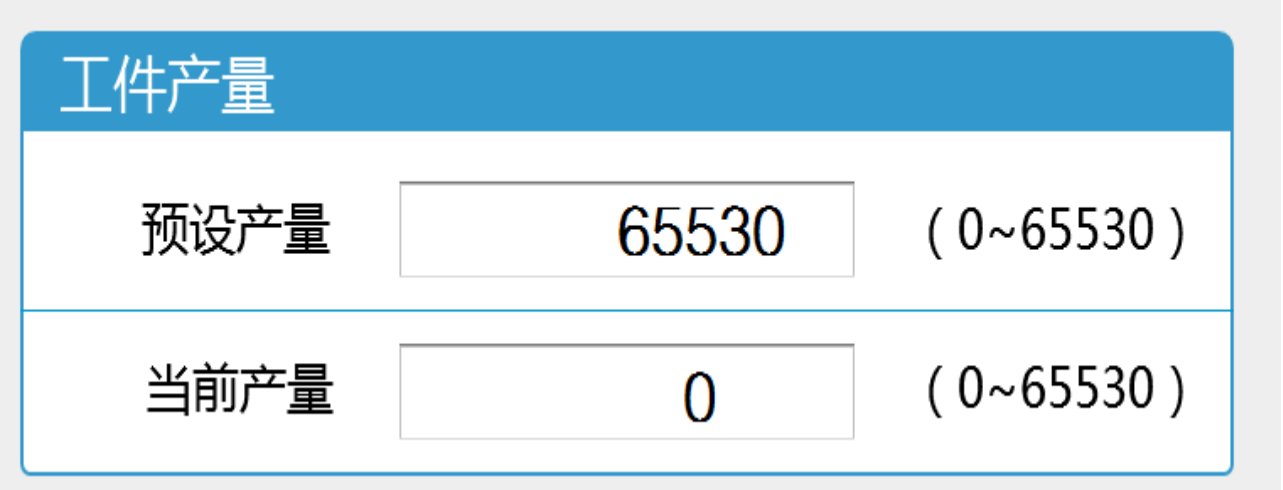
Part Number

The part number is the workpiece number, ranging from 1 to 20, and can store 20 sets of recipe data internally, which is directly called.

2) Workpiece production volume



Click "" to enter the following interface.



If the current output reaches the preset output level, the machine will automatically enter a stop state.

At this time, the current output needs to be cleared to zero.

3) Language Selection: # Language required: English

Click the flag directly to switch languages between Chinese and English.

Operation of the bending machine in Part Three.

4) Function Selection

Click to enter the following interface

Please set according to the actual configuration of the processing technology and machines. Green indicates selection.

Core selection: Whether to use a core bar.

Feature selection: whether to use feature selection

Emergency stop: Sequence of emergency stop action under automatic mode.

Single action: Retreat the clamp after completion and then retract the auxiliary push.

Linked action: Retreat the clamp first, then retract the auxiliary push simultaneously after 0.5 seconds.

Clamp the bent tube: Check with the equipment supplier for the continuity of the clamping valve during the bending process.

Manually bend multiple angles: Select whether to allow bending multiple angles in manual mode.

The sequence of clamping before bending: When the primary and secondary clamps are separated, the primary clamp moves first, and the secondary clamp moves later.

Manually assisted propulsion: Does the operation of the manual mode in the assistance of propulsion actions have angle restrictions?

Backlight time

Adjust the backlight brightness off time (no need to set)

Advanced Options

Device manufacturer exclusive (do not set arbitrarily)

Restore factory settings

Restore all parameters to the factory default settings (do not arbitrarily adjust).

8) About the product

Display product-related information.

Help

Display startup interface.

Operation of the bending machine in Part Three.

10) Action Time

Click to enter the following interface.

The time units are all in 0.1 seconds.

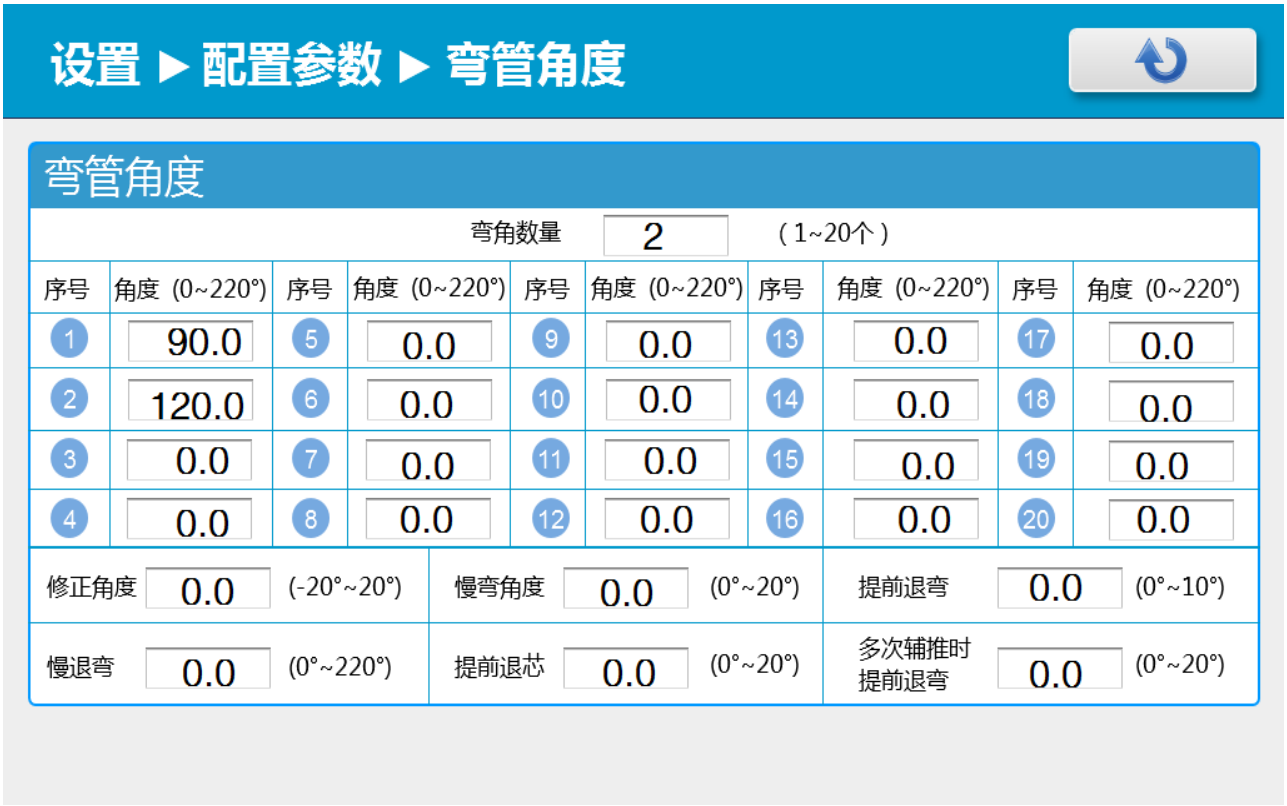
If the "core rod retraction" time is set to 0, it means that the retraction of the core rod to the position is controlled by the sensor. This parameter should be set according to the processing technology and the actual configuration of the machine.

The parameter in the red area is generally set to 0. Please consult the device manufacturer for any special requirements.

11) Bend Angle

Click to enter the following interface, the number of bends is the total number of bends on a pipe.

Operation of the bending machine in Part Three.



The number of bend angles determines the effectiveness of the current angles. If the number of bend angles is 1, angle 1 is effective, and the rest of the angles are invalid (even if the relevant angles have been set); if the number of bend angles is 5, angles 1 to 5 are all effective, and the rest of the angles are invalid.

Correction Angle: the actual angle of the elbow pipe = set angle - correction angle. The set angle is the angle set in "elbow pipe angle -1" ranging from angle 1 to angle 20.

Slow bending angle: In the bending process, the starting angle of the slow bending action = set angle - slow bending angle.

In-process bend withdrawal: After the core has been withdrawn, if the withdrawal angle is not 0, the process enters the in-process bend withdrawal state (first send auxiliary grip until the time is up and the auxiliary push is retracted into position, entering the bend withdrawal state). During bend withdrawal, when the actual angle reaches the bend withdrawal end angle (equal to the actual angle minus the in-process bend withdrawal angle), the bend withdrawal is stopped and enters the grip withdrawal state.

Slow retraction curve: During the retraction process, when the actual angle reaches the slow retraction angle, the machine enters the slow retraction curve state (i.e. the retraction has simultaneous outputs from Y8 and Y13).

Retreat in advance: During the bending process, if the actual angle reaches the starting angle of retreat in advance (equal to the set angle - retreat in advance), the machine retreats while bending the tube.

When pushing multiple times, make an early withdrawal before each push: During multiple pushing processes, after completing the early withdrawal action (when the early withdrawal is not 0), then enter the repeated pushing state.

Operation of the bending machine in Part Three.

Operating System Failure Description

System Fault Alarm Handling		
Number	Fault Phenomenon	Handling Method
1	Encoder measurement over limit	1. Swap the wiring of encoder AB phase 2. Check if the bending sensor is normal 3. Replace the encoder 4. Contact the manufacturer.....
2	No angle display, or always display angle as zero	1. Check if the encoder wiring is correct 2. Rotate the encoder and observe if the AB phase on the touch screen flashes (should alternate between AB phases in normal conditions) 3. Replace a new encoder 4. Contact the manufacturer....
3	Check bending sensor	1. Check if the bending sensor has any abnormalities 2. Manually operate to make the machine head return to the origin, observe if there is contact with the bending sensor 3. Replace the bending sensor 4. Contact the manufacturer....
4	Check auxiliary retraction sensor	1. Manually operate the auxiliary retraction button to make it retract to the origin 2. Observe if the indicator light of the auxiliary retraction sensor stays on when in contact with metal 3. Check the sensor wiring, replace the sensor 4. Contact the manufacturer....
5	No display after power on	1. Observe if the power indicator light in the electrical box is constantly on 2. Measure if there is a DC 24V voltage between terminal "24V" and "0V" 3. Check the wiring 4. Measure if the power switch has AC 220V input and DC 24V power output 5. Replace the power switch
6	No action of the equipment, no output from solenoid valve	1. Check if the wiring is normal 2. Measure if there is a DC 24V output between terminals "24V" and "Y9" (need to hold the "bending" button and measure while the screen prompts that it is bending), if there is, please check if the hydraulic solenoid valve is abnormal
7	Solenoid valve all on	1. Check the wiring
8	Angle abnormal	Replace the encoder

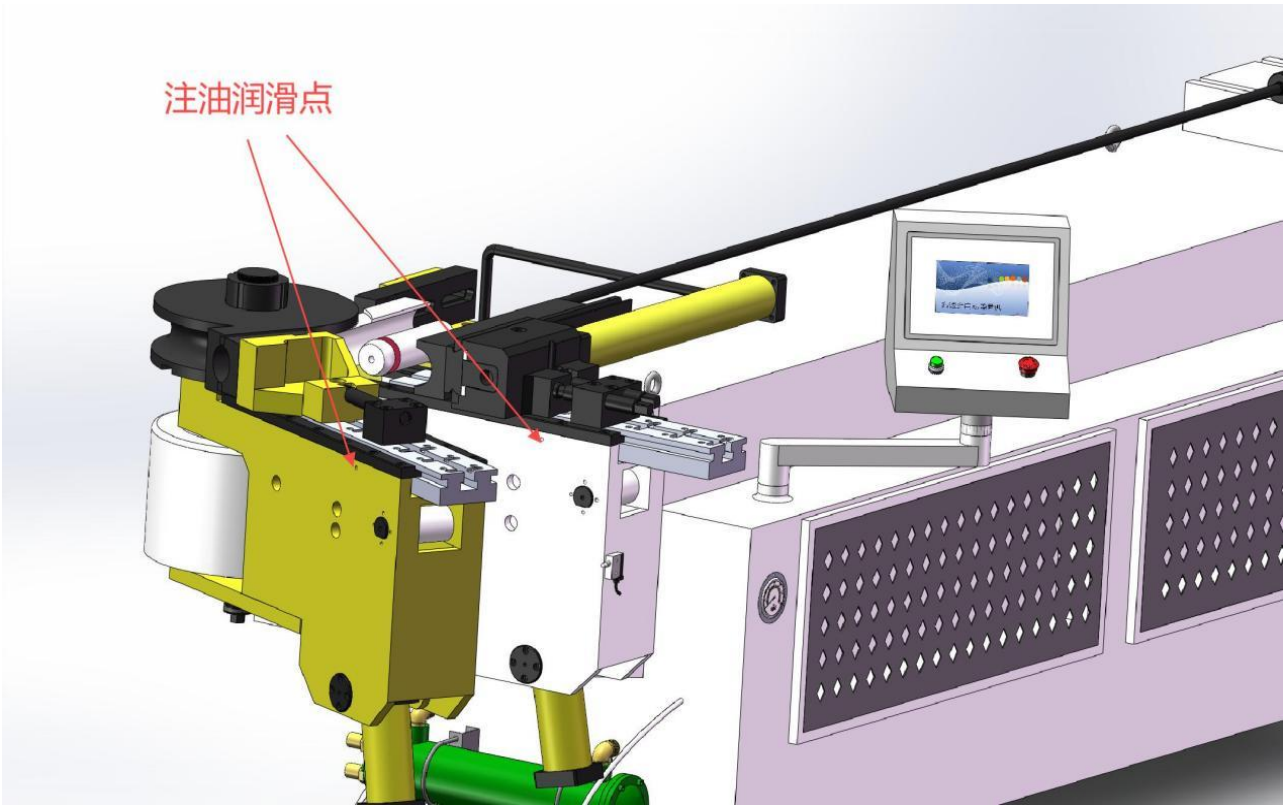
Maintenance instructions for Section Four of the pipe bending machine.

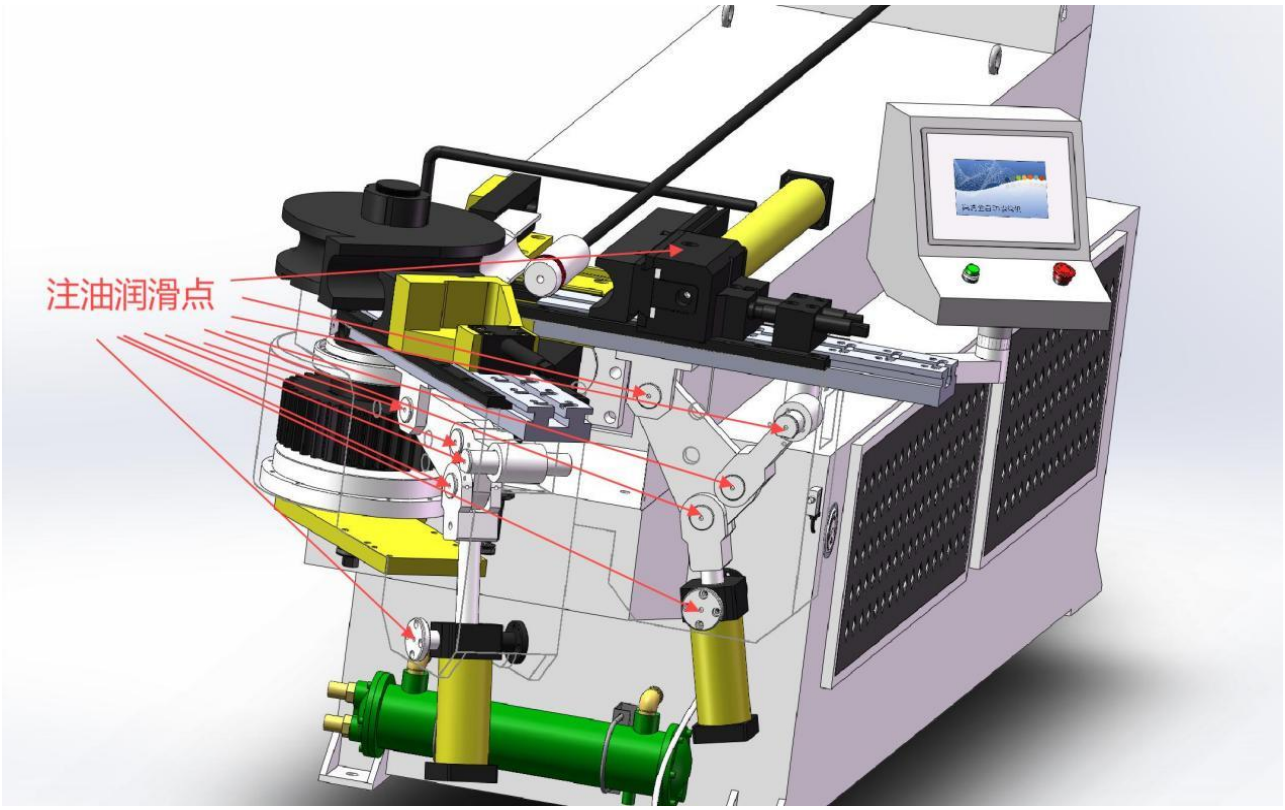
Maintenance instructions for the fourth part of the bending machine.

Before operating the machine, please read the "Maintenance Instructions".

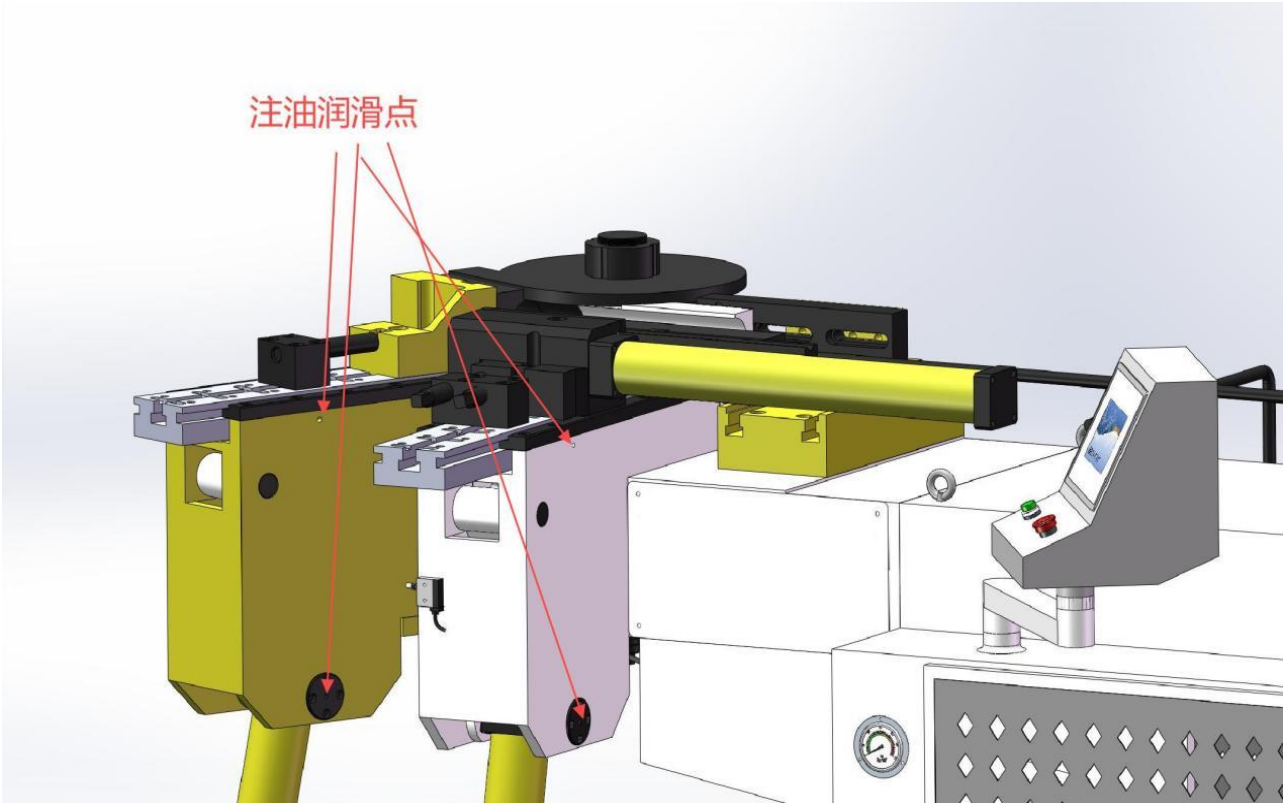
"The occurrence of accidents" is mostly caused by human negligence and failure to comply with safety regulations.

4.1 Position for oiling and maintenance of the bending machine





Part 4 Bending Machine Maintenance Instructions



Part V Troubleshooting Methods for Tube Bending Machine

Part Five Troubleshooting

When the bending machine is ready

During the installation and adjustment of equipment, operators can start operating the pipe bending machine.

Before operating the machinery, please read the "Troubleshooting".

"The occurrence of accidents" is mostly caused by human negligence and failure to comply with safety regulations.

Chapter 5

Troubleshooting method for the bending machine.

1.1 Troubleshooting of Start-up Test Failure

1.2 Troubleshooting of Hydraulic Pump Failure

1.3 Troubleshooting Methods for Curved Arm Mechanical State Failures

1.4 troubleshooting methods for mechanical faults in core-wearing machines

Troubleshooting methods for the mechanical status faults of the clamping module and guiding module.

2. Abnormal handling of pipe bending.

The location where the pipe fittings produce indentations is within the range of the clamping die action.

2.2 Scratches occur within the range of the rear die movement.

The position where the pipe fittings produce clamping marks is within the range of the die closing action.

2.4 Wrinkles occur in the range of pipe bending.

2.5 Pipe flattening occurs during bending.

2.6 Pipe diameter rupture or breakage occurs when the pipe bends.

Part V Troubleshooting Methods for Tube Bending Machine

Troubleshooting methods of bending machine failure.

1.1 Troubleshooting Methods for Start-Up Test Failure

Abnormal situation	Cause of occurrence	Exclusion method
---	---	---
	1 The power is cut off or the power supply voltage is suddenly cut off.	1 Recheck the power and make sure there is no issue, then press the "Start" button.
	2 The motor is overloaded, and the overload protection switch trips.	2 Check the overload tripping protector, wait for about 3 minutes before restarting; if the overload circuit trips again, it indicates a fault in the wiring configuration or electronic components, which should be identified and eliminated before restarting.
	3 The electromagnetic contactor is overloaded, and the coil trips.	3 Replace the coil or electromagnetic contactor.
	4 The control circuit fuse is blown.	4 Identify the correct fault point, repair and replace the fuse before restarting.
	5 The safety switch is malfunctioning or tripped.	5 A Replace the protective switch. B Check the safety switch circuit or terminal contacts.
	6 The transformer trips or burns out.	6 Replace the transformer.
	7 Momentary voltage instability (voltage drop or rise exceeds 10%).	7 Improve the power supply or stabilize the voltage supply.
With the pump and motor drive, the machine still cannot operate.	The solenoid valve is faulty.	1 Disassemble and clean any dirt, do not obstruct the operation, if there is leakage, replace it. 2 Test the circuit, ensure the input DC voltage (24V), if the coil is burnt, replace the coil or the entire set. 3 Disassemble the solenoid valve to check if the various oil rings and springs are damaged, if damaged, replace them, and send the faulty item for repair. 4 Check the indicator lights on the solenoid valve, if there is still a fault, check the circuit board, repair or replace it.
	1 Check the oil level gauge.	1 If the oil storage is insufficient, add hydraulic oil.
	2 Check if the oil filter is clogged.	2 Clean or replace the oil filter, drain the clean oil from the tank, clean the tank, add new oil and install the oil filter.
	3 Hydraulic pump failure.	3 Refer to the pump failure exclusion method.
	4 Check if the oil pressure is rising.	4 Adjust the pressure control rod to the normal value.

Part V Troubleshooting Methods for Tube Bending Machine

1.2 Troubleshooting methods for hydraulic pump failures.

Abnormal Situation	Cause	Exclusion Method
The pump cannot output full flow pressure.	1 The oil level in the tank is too low.	1 Add hydraulic oil.
	2 Oil filter clogged.	2 Clean or replace the oil filter. After draining the clean oil from the tank, clean the tank, add new oil, and install the oil filter.
	3 The viscosity of the hydraulic oil is too high, and the pump cannot extract output.	3 Select the appropriate oil for replacement according to the working environment temperature (refer to the maintenance section).
The pump makes abnormal noises or insufficient oil pressure.	1 The oil seal of the pump is ruptured or air leaks into the suction port (air enters when oil is being drawn).	1 Replace the oil seal of the pump spindle. 2 Check if the suction pipe is damaged.
	2 Oil leakage in the pump outlet pipe.	Secure and update the parts that produce leakage.

Part V Troubleshooting Methods for Tube Bending Machine

1.3 Troubleshooting methods for the failure of the articulated arm robot.

Abnormal situation	Causes	Troubleshooting methods
The clamping die and bending die are in a locked state, and the bending arm does not perform bending actions.	The throttle valve controlling the speed of the bending die is in a locked state. The solenoid valve is blocked.	Release and adjust the throttle control valve. Disassemble the solenoid valve for cleaning.
The bending angle of the bending arm is imprecise.	The encoder gear is loose due to oil temperature changes.	1. The bending angle is affected by oil temperature. 2. Check if the encoder and main shaft synchronization gear locking screw is loose.
There is an impact sound when the bending arm retreats to the bottom.	The buffer screw of the bending cylinder is loose.	Open the machine box lock, adjust the buffer screw on the back end cover of the bending cylinder clockwise by a certain number of turns.

1.4 Troubleshooting methods for piercing mechanical state faults

Abnormality	Cause	Solution
No retraction after passing through the heart.	1 The electromagnetic valve is faulty and cannot fully displace.	A Disassemble and inspect to remove dirt, ensure no blockage affecting operation, replace if leakage is found. B Check the circuit to ensure input DC voltage (24V), replace the coil or the whole set if burnt. C Disassemble the electromagnetic valve to inspect if the oil rings and springs are damaged, replace if necessary, send faulty parts for repair. D Check the indicator lights on the electromagnetic valve, if the fault persists, diagnose the circuit board for repair or replacement.
	2 Leakage inside the heart-piercing cylinder.	Disassemble the cylinder, replace the oil seal, piston ring, etc.
The bending tube	1 A. Sensor of the heart-piercing	A Clean dirt affecting sensor detection. B

retracts after completion, but the clamp and die do not retract.	cylinder is unable to detect. B. Front positioning sensor of the clamping cylinder is damaged. C. Proximity sensor of the heart-piercing is damaged.	Adjust the sensor position (about 2-3mm away from the detecting object). C Test the proximity switch and its wiring, replace if damaged. (Test with iron blocks or similar objects to check the sensor.)
	2 The electromagnetic valve for retracting the clamp is faulty.	A Disassemble and inspect to remove dirt, ensure no blockage affecting operation, replace if leakage is found. B Check the circuit to ensure input DC voltage (24V), replace the coil or the whole set if burnt. C Disassemble the electromagnetic valve to inspect if the oil rings and springs are damaged, replace if necessary, send faulty parts for repair. D Check the indicator lights on the electromagnetic valve, if the fault persists, diagnose the circuit board for repair or replacement.

Troubleshooting Methods for Clamping Unit and Injection Unit Mechanical Failure

Abnormal situation	Causes	Elimination methods
---	---	---
	1. The screw of the slider pressure plate is too tight. 2. There are foreign objects in the slider groove, causing scratches on the surface of the slider.	1. Adjust the tightness of the slider pressure plate screw. 2. Clean foreign objects, polish the surface of the slider.
	1. The UN ring inside the oil cylinder is leaking or failed. 2. The unclamping time is set too short.	1. Replace the internal sealing ring of the oil cylinder. 2. Extend the unclamping action time.

Part V Troubleshooting Methods for Tube Bending Machine

2. Handling Instructions for Abnormal Pipe Bending

The position where the pipe fittings produce trims is within the clamping range of the clamping die action.

2.1.1 Wrinkles occur in the bending area and scratches are present in the clamping region.

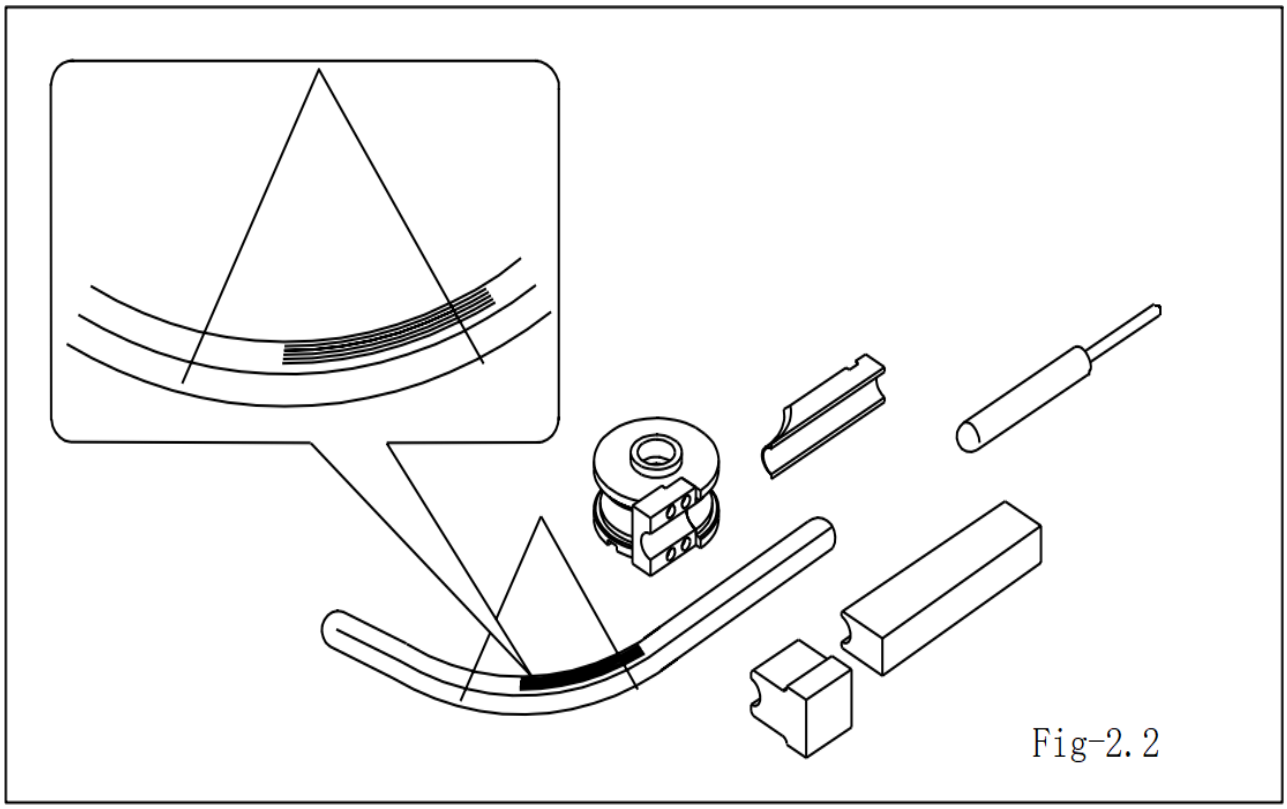
2.1.2 Explanation

Abnormal situation	Causes	Exclusion method
---	---	---
Wrinkles, scratches, and pinch marks occur when the pipe is bent in the clamp position.	Foreign substances such as dirt, iron chips, etc., are attached to the clamping groove position or the wheel mold.	Clean the oil stains and remove residue before bending the pipe.
Scratches occur when the pipe is bent in the clamp seat position.	The clamping pressure of the clamp is too high.	Adjust the pressure of the clamp cylinder, and if slipping occurs when bending the pipe, adjust the clamping pressure slightly.
Bright pressure marks occur on the outer diameter pipe wall of the pipe when bent in the clamp position.	The piercing position is too forward, and the bending force inside the piercing and the clamping force of the clamp act on it, causing the pipe to have bright pressure marks.	Adjust the piercing position to move back.

	1. The pipe diameter is too large, causing groove marks at the clamping position; the mold size is too small, causing the pipe to have pinch marks.	1. The pipe diameter should match the size of the clamp; in addition, the tensile properties of the pipe material should be considered in the mold design.

2.2 Scratches occur within the range of the rear die motion.

2.2.1 Scratches occur in the range of rear die motion (as shown in the figure)



2.2.2 Explanation

Issue	Causes	Solutions
Scratches appear on the inner surface of the pipe when the rear guide die bends.	1. The rear guide die is worn out.	1. Repair the rear guide die.
	2. Incorrect positioning of the rear guide die.	2. Adjust the rear guide die so that the end does not touch the pipe, leaving a gap of about 2mm.
	3. Inappropriate material of the rear guide die.	3. Replace the rear guide die with a new one.
	4. Inadequate lubrication of the rear guide die.	4. Use a high-quality lubricant. Clean the pipe and die groove before bending and lubricate the rear guide die.

The position where the groove is formed on the pipe fittings is within the range of the die movement.

The traces of the mold are in the curved centerline.

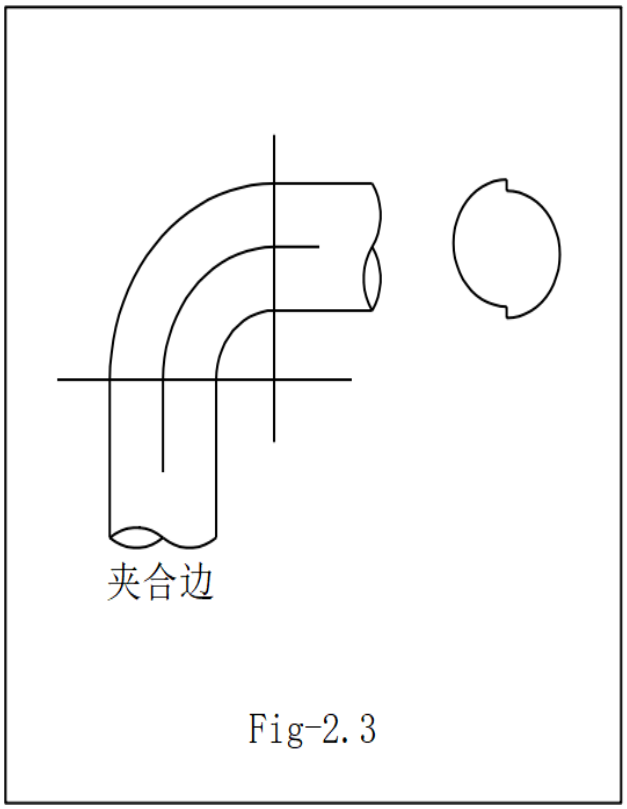


Fig-2.3

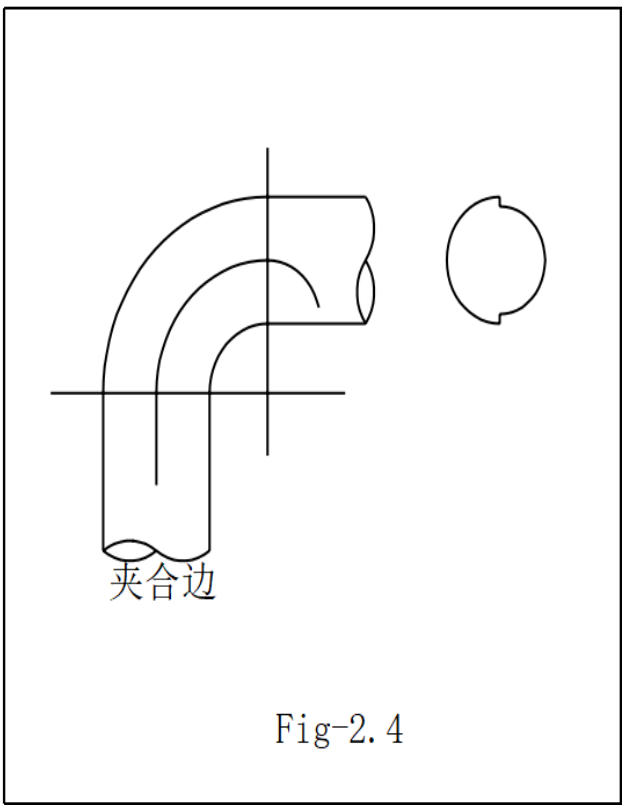


Fig-2.4

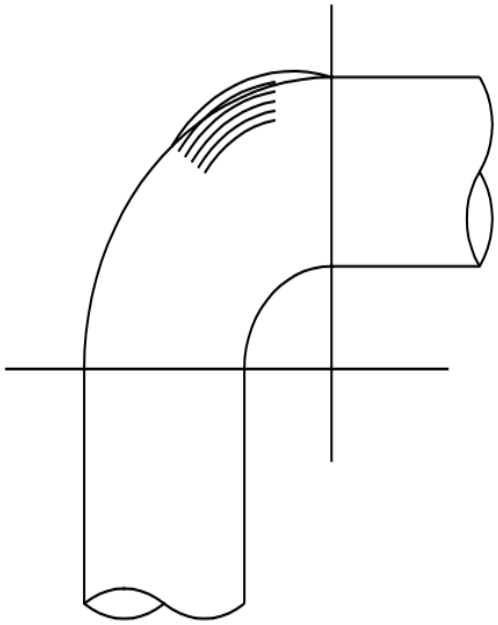
2.3.2 Description

Abnormal situation	Cause	Exclusion method
When the pipe is bent at the position of the guide mold, there are pinches or scratches at the top or bottom of the pipe.	1 The center height of the guide mold and wheel mold does not match. (The groove of the mold is too large or too small.)	1 Adjust the center of the guide mold to match the wheel mold.
	2 The size of the pipe diameter does not match (does not match the size of the pipe to be processed).	2 Please select a pipe that fits this mold.
When the pipe is bent at the guide mold position, there are scratches and unevenness on the outer diameter of the bend.	Foreign objects, such as dirt and iron chips, are attached to the guide mold.	Clean the attachments on the surface of the guide mold and wheel mold.

Part V Troubleshooting Methods for Tube Bending Machine

2.4 Wrinkles occur within the range of pipe bending.

2.4.1 The end of the pipe bend is raised.



夹合边　　Fig-2.5

Abnormal Situation	Cause	Solution
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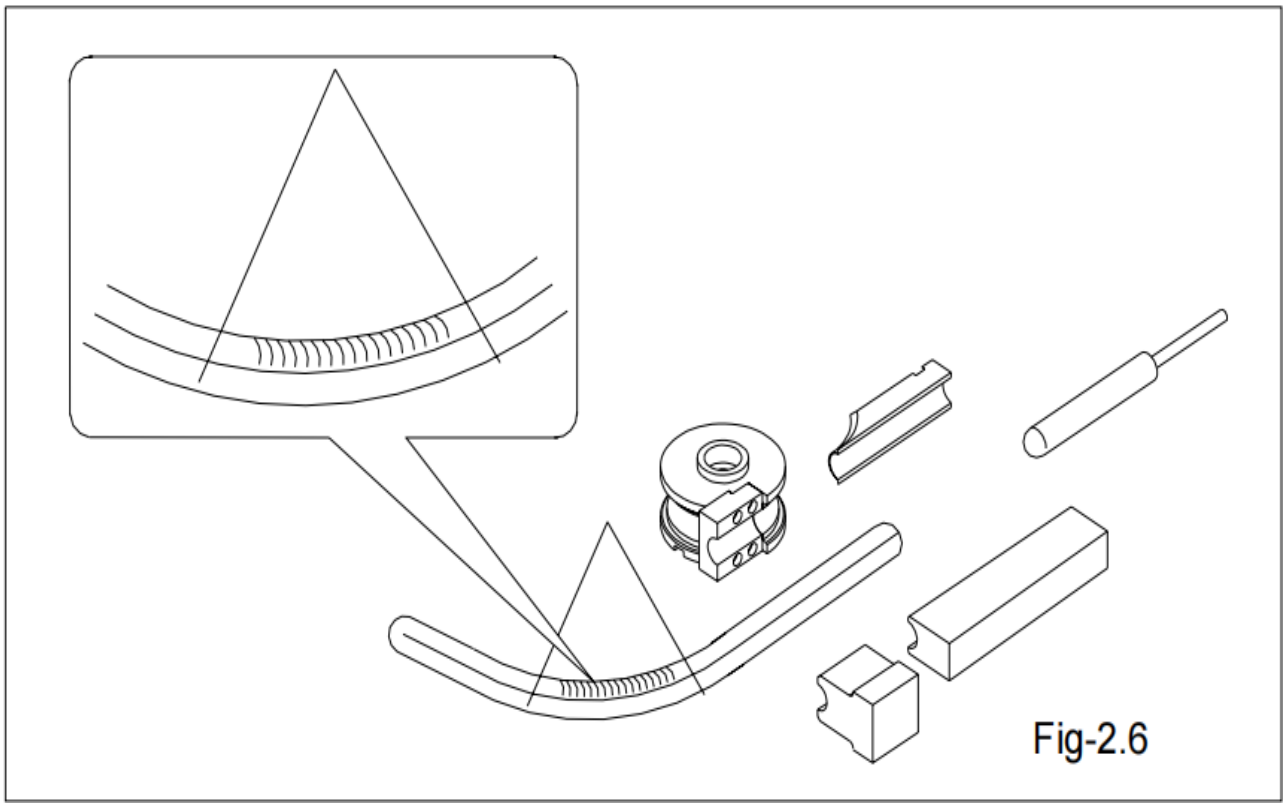
	1. Improper piercing position or failure to use slow retreat core function.	1. Adjust the piercing position to the appropriate location. Add or activate the slow retreat core function.
	2. The position of the back guide is too far back.	2. Adjust the position of the back guide forward.



2.4.2 Wrinkles throughout the curved area

Abnormal situation	Cause	Elimination method
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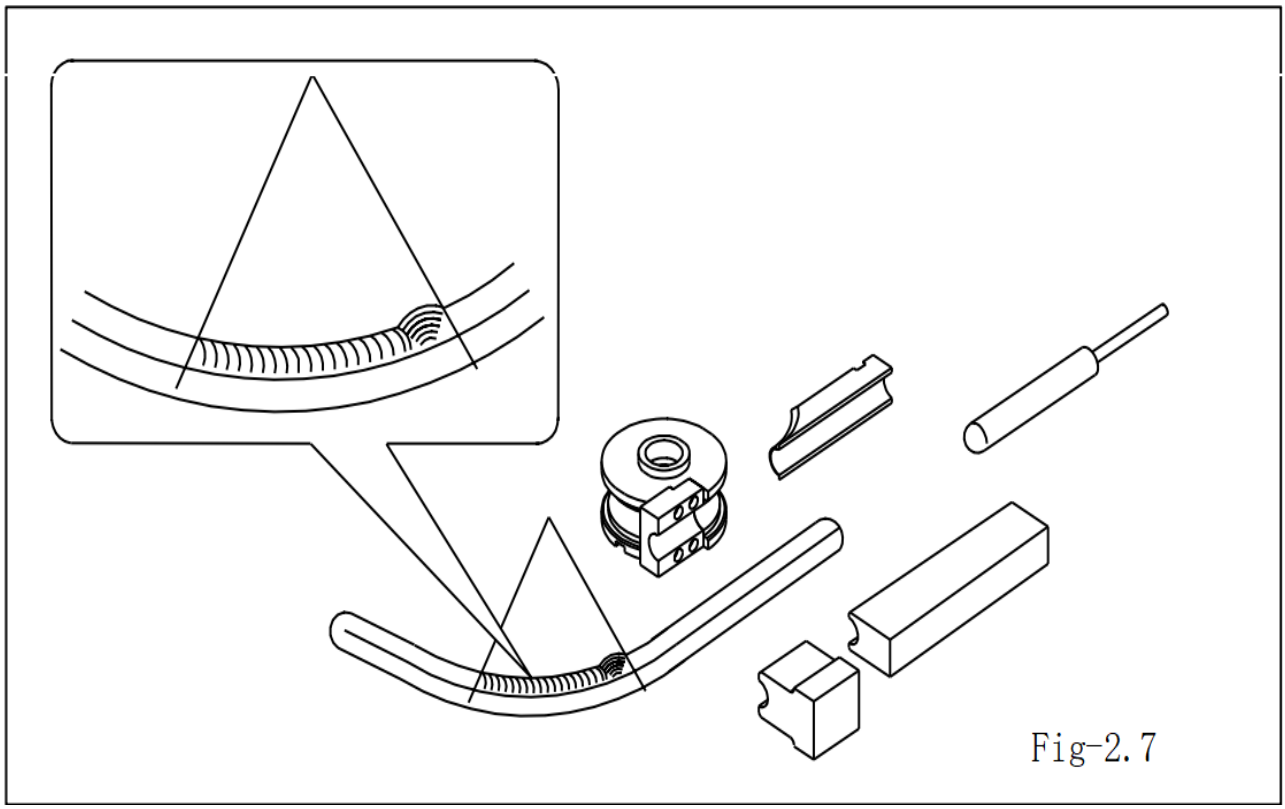
	1. Insufficient clamping force or too short clamping length of the pipes, causing slipping. Insufficient die clamping force.	1. Adjust the clamping pressure and lengthen the clamping length. After checking that the die assembly and core positioning are correct, increase the die pressure or tighten the die position.

Part V Troubleshooting Methods for Tube Bending Machine

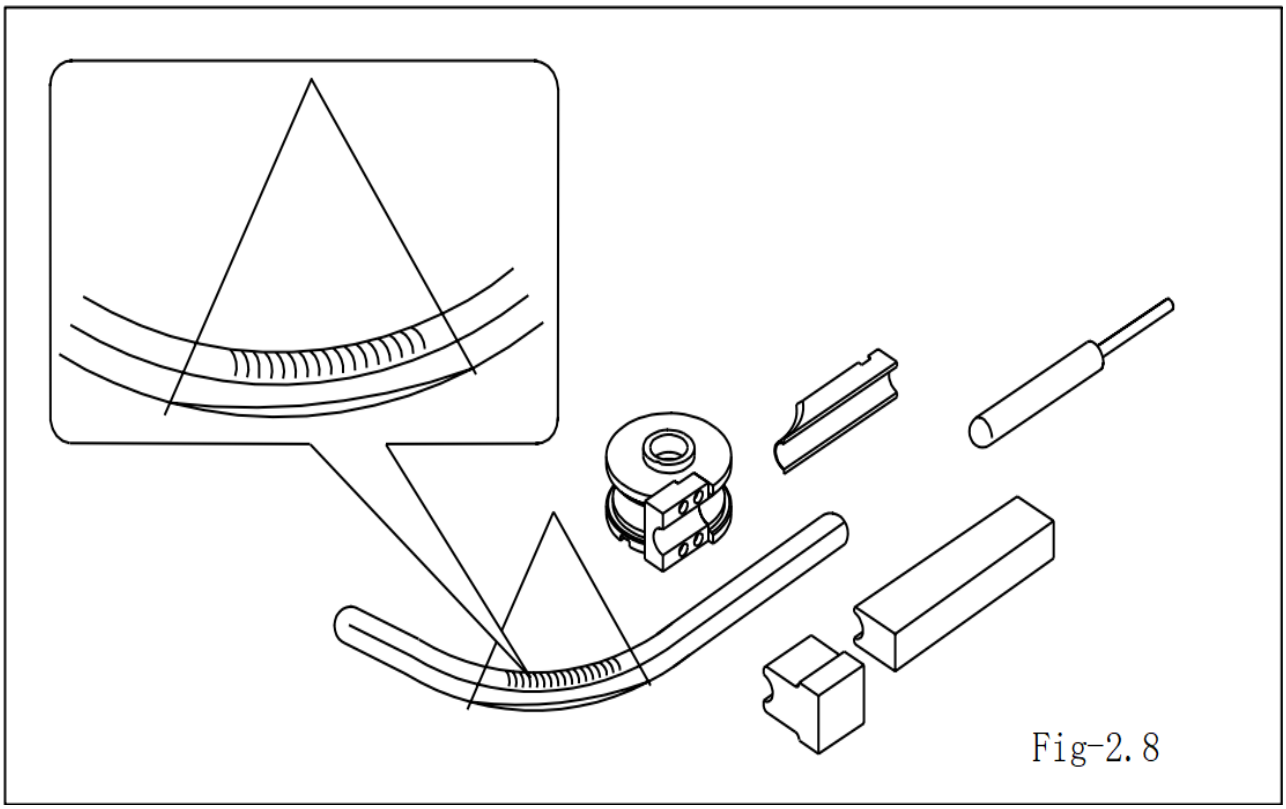
Wrinkles spread across curved areas and even extend to the posterior region.



Abnormal situation	Causes	Solutions
Wrinkles occur at the bend of the pipe when the pipe is bent.	1 The positioning of the mandrel inside the pipe fitting does not reach the support point.	1 Adjust the mandrel to the appropriate position.
	2 Wear of the anti-wrinkle mold. The position of the anti-wrinkle mold with respect to the mandrel is incorrect, deviating from the tangential direction or the anti-wrinkle mold is worn out, resulting in mismatching of the assembly due to insufficient length.	2 Overhaul or update the anti-wrinkle mold. Advance the anti-wrinkle mold closer to the tangential direction. Reduce the inclination angle of the anti-wrinkle mold and get it as close to the pipe fitting as possible. Repair the groove of the anti-wrinkle mold.

Part V Troubleshooting Methods for Tube Bending Machine

2.5 Flatness of pipe fittings during bending.



Abnormal situation	Causes	Elimination methods
The cut surface of the pipe bend is excessively flat.	1. When there is no core penetration, the clamping force of the guide die is insufficient or improperly positioned.	1. Adjust the clamping force and position of the guide die.
	2. When there is core penetration, the core positioning is improper. The number of core balls is insufficient.	2. Adjust the core positioning to the tangent point position. If the core ball diameter is insufficient, increase the outer diameter of the core ball to meet the required internal support of the pipe bend or increase the number of core balls.

Part V Troubleshooting Methods for Tube Bending Machine

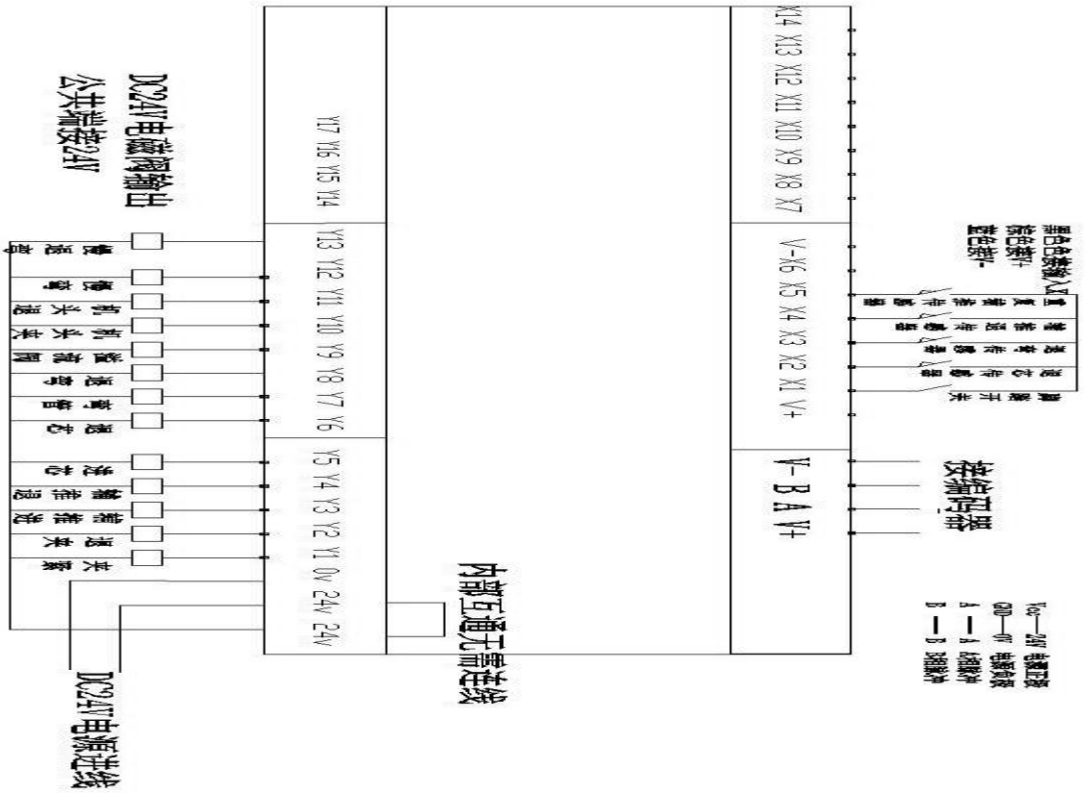
2.6 Pipe failure in bending due to pipe diameter rupture or fracture

Issue	Cause	Solution
Damage or breakage occurs when the pipe is bent.	1 Insufficient lubrication during core penetration increases the friction of the inner wall of the pipe.	1 Select suitable lubricant and lubricate the core, mandrel, and inner wall of the pipe.
	2 The speed of the auxiliary push is too slow.	2 Adjust the speed of the auxiliary push.
	3 Incorrect core penetration position.	3 Adjust the core penetration position to the correct location.
	4 Insufficient ductility of the pipe.	4 Choose the material of the pipe for bending carefully.
	5 Slip occurs when the pipe is bent.	5 Confirm the center positions of the mandrel and wheel formers.
	6 Excessive pressure on the mandrel.	6 Reduce the pressure on the mandrel (relax the mandrel).

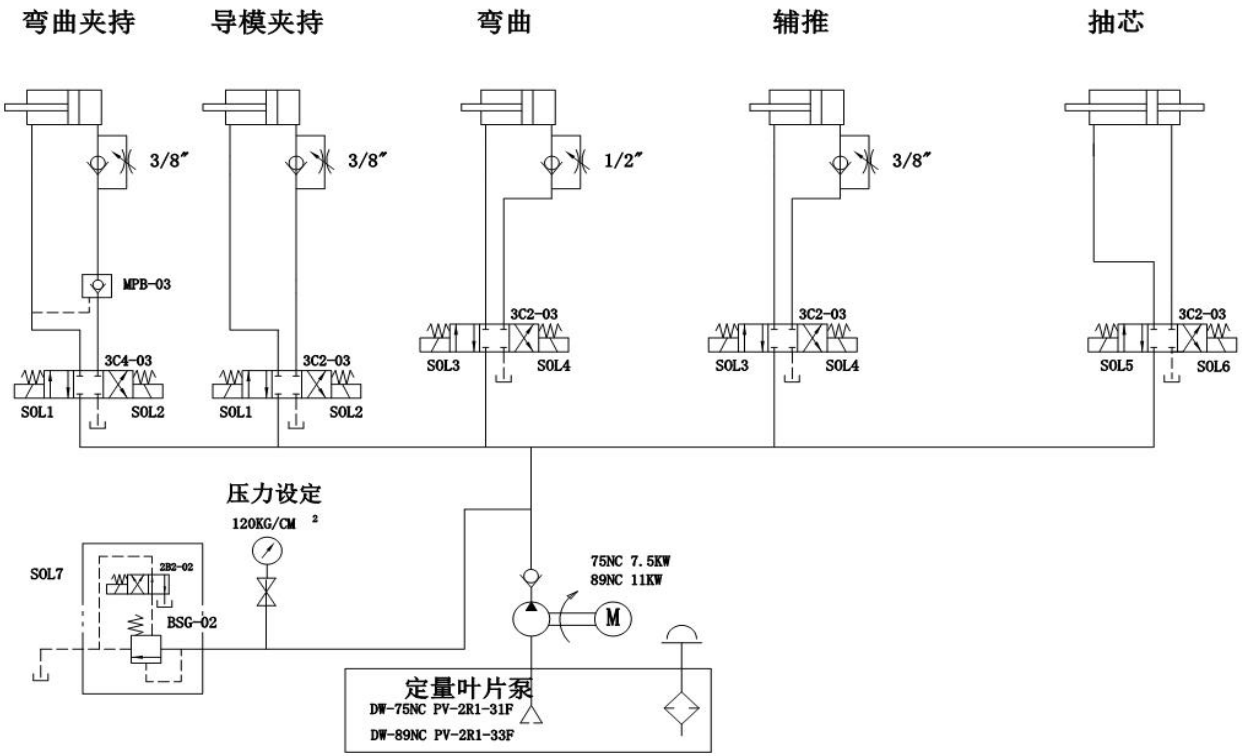
	7 The bending radius of the core ball is greater than the radius of the wheel former. Scratches on the surface of the core increase the bending resistance of the pipe.	7 Use a core ball with a smaller radius. Replace the core.

The sixth part: circuit diagram and hydraulic schematic diagram.

6.1 Circuit Diagram



6.2 Hydraulic Schematic Diagram



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油压原理图

DW-75/89NC

DW-75/89NC弯管机

图　样　标　记	数量	重量	比例
共　　张	第　　张		

Part Seven: Technical Parameters Appendix

DW-89NC semi-automatic pipe bending machine parameters:

	Main Specifications	Unit	DW-89NC	Remarks
	Max bending tube diameter × wall thickness	mm	Φ 89×5 carbon steel tube	Minimum bending radius shall not be less than 1.3D of the tube diameter; maximum bending radius and maximum effective core penetration length can be customized according to customer requirements.
	Max bending radius	mm	R450	
	Min bending radius	mm	Depends on the tube material and wall thickness	
	Max bending angle		190°	
	Standard core length	mm	3800	
	Control system	Microcomputer control		
	Maximum allowable number of bends for fittings	pcs	16	
	Number of parts that can be stored	pcs	16×16	
	Hydraulic motor power	kw	11	
	Maximum system pressure	mpa	14	
	Hydraulic system control	Solenoid valve		
	Oil tank capacity	L	320	
	Machine size	mm	4800×1150×1400	
	Machine weight	kg	3000	