

Control System of TP10S CNC Bending Machine

Explanation



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Preface

Content validity

This manual mainly introduces the installation, technical specifications and application examples of TP10S bender control system products. The contents of each chapter are summarized as follows.;

- ❑ Chapter 1 (Operating Panel) Introduces the Use of Operating Panel of Bending Machine Control System;
- ❑ Chapter 2 (Application Examples) Illustrates how to operate the control system with examples;

Appendix Q provides the interface specifications and common problems handling of various devices in the system for users to browse quickly.

Applicable object

This manual provides information on the installation and commissioning of TP10S bender control system products, designed for engineers, maintenance personnel and electricians with general automation knowledge.

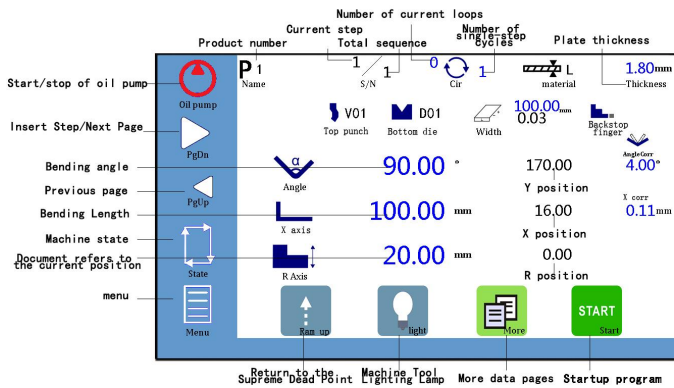
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1.1 Basic page introduction

1.1.1 Programming page

The following figure is the home page of bending machine control system programming.



1.1.2 More Data Settings

Click on the icon on the main page of programming , You can access more data settings pages:

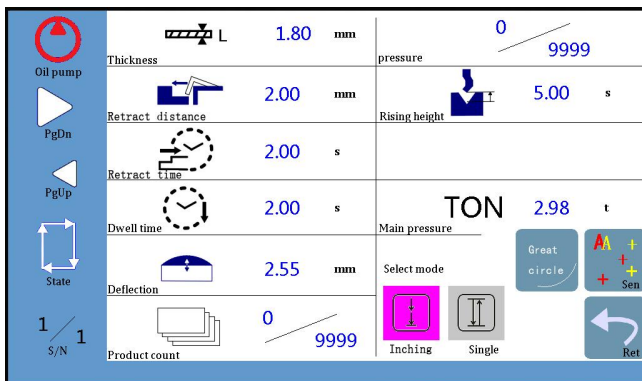











Table 1-1 Introduction of Parameters (1)

parameter	Definition	Remarks
Plate thickness 	Thickness of individual workpiece	
Retract distance 	The concession distance of the shield (X-axis) can be set at each step.	Enter the backoff distance in the back field
Retract time 	The retract time of the Top punch (Y axis) can be set at each step, and the timing starts at the speed change point.	If the upper module has not reached the upper dead point after this time, it will stop moving upward and enter the next step in single or auto cycle mode.
Dwell time 	The time from the speed change point to the start of the pressure relief of the machine (set at each step)	
Job count 	Number of currently processed jobs/total set jobs ,  Indicates unavailability	
Bending pressure TON	Pressure applied in bending	Optional
Deflection compensation 	Compensation of Deflection and Deformation in Workpiece Processing	Optional
Great circle 	Enabling Big Arc Function	

Click to display more data settings . Different working modes correspond to different pages. The following is the interface corresponding to the click mode:

Continuous interval time	<input type="text" value="1.00"/> s	Variable speed point position	<input type="text" value="40.00"/> mm
Point move (dwell time)	<input checked="" type="radio"/> Nil <input type="radio"/> Have	Top stop position	<input type="text" value="40.00"/> mm
X axis	<input checked="" type="radio"/> Absolute <input type="radio"/> Relative	Clamping point corr	<input type="text" value="1.00"/> mm
Pause time (clamping point)	<input type="text" value="1.00"/> s	Press point corr	<input type="text" value="1.00"/> mm
Pause time (fast turn slow)	<input type="text" value="1.00"/> s	Step delay	<input type="text" value="1.00"/> s
Buzzer	<input checked="" type="radio"/> Nil <input type="radio"/> Have	Changing positioning condition	<input checked="" type="radio"/> At once <input type="radio"/> Step again
Mold density	<input checked="" type="radio"/> Nil <input type="radio"/> Have	Auto calculate	<input type="radio"/> Nil <input checked="" type="radio"/> Have
Isplay comments	<input checked="" type="radio"/> Nil <input type="radio"/> Have	Deceleration within safe distance	<input checked="" type="radio"/> Nil <input type="radio"/> Have
Deceleration within safe distance	<input checked="" type="radio"/> Nil <input type="radio"/> Have	Press point corr	<input type="text" value="1.00"/> s


Menu Back

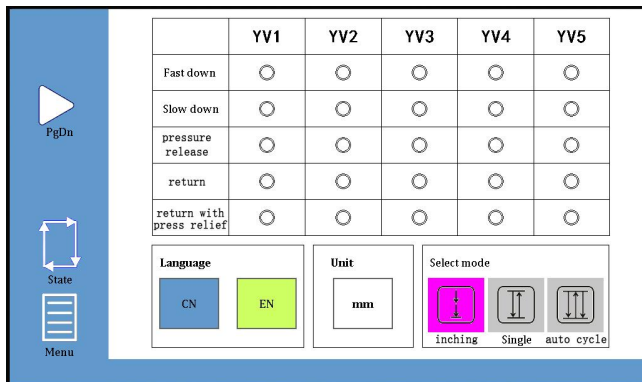
Table 1-2 Introduction of Parameters (2)

parameter	Definition	Remarks
Continuous interval time		The interval between successive processing steps
Dwell time in inching mode	If effective, stop slowly and relieve pressure until the holding time, and do not return automatically after the relief is completed.	If the pedal is released after stepping down to the speed change point, device will automatically relieve pressure.
X-axis incremental/absolute	Selection of X-axis position motion mode	
Pause time (clamping point)	The pause time when the Ram changes from slow down to clamping the workpiece	After the X-axis retreat positioning is completed (or after the pause time), continue to slow down. If the pause time is set to 0, it will continue to slow down and bend.
Pause time (speed change mute point)	The pause time of the Ram from fast down to slow down (i.e. to the speed change point)	Slow down after this pause time. If the pause time is set to 0, the Ram will go down quickly and slowly.

Buzzer	Select whether to enable	The steps are listed in the table
Mold density	Select whether to enable	Whether password is required to open the upper and lower mold library
Isplay comments	Select whether to enable	Adjust whether the function is displayed
Deceleration within safe distance	Select whether to enable	Whether to enable the safe distance deceleration function
Variable speed point position	Ram position changed from fast down to slow down	Setting of shift point position
Top stop center position	Highest point of Ram stroke	
Clamping point correction	Compensation according to the position of clamping point	
Press point corr		Position of pressure holding point correction
Step delay		Change interval time

1.2 Parameter setting

Click on the menu icon on the main page of programming , Select "Parameter Settings" from the pop-up menu to enter the parameter settings page.



Operational parameters can be configured on this page. Please refer to the following steps for parameter setting.

1. On the main page of parameter setting, you can choose YV1~YV5 valve output configuration, interface language and working mode.





There are four motion states of Ram: fast down, slow down, return and pressure relief.



The output of four motion states may be different for different models, so the output configuration (YV1 ~ YV5) is needed here.

Interface Language Selection: Chinese and EN (English) Options

Choice of working mode: Inching mode 、Single time 、continuity 


Table 1-3 Working Model


Pattern	Explain
Inching mode 	 click (or step on a foot) Start the program, step down the Ram and move downward, release and stop. Step on the Ram and move upward, then release and stop; when the speed change point is released, the X-axis back stop material will return to the original, so that it is easy to bend the same pedal down. Automatic step change of support system in point mode.
Single mode 	 click (or step on a foot) Start the program, step on the foot, slide

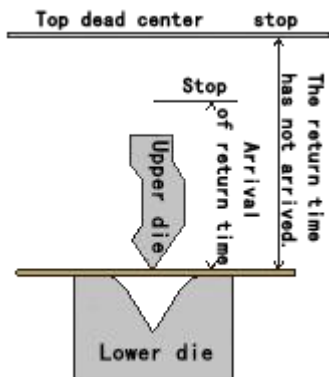
	down and press down to the bottom, after the holding time arrives, automatically return to the next step.
auto cycle mode 	 click (Or step down once) Start the program, step down, slide down and press down to the bottom. When the holding time arrives, it will automatically return to the next step, so that the cycle can be completed until all the steps are completed. In auto cycle mode, auto cycle intervals can be set on more data settings pages



<Remarks>

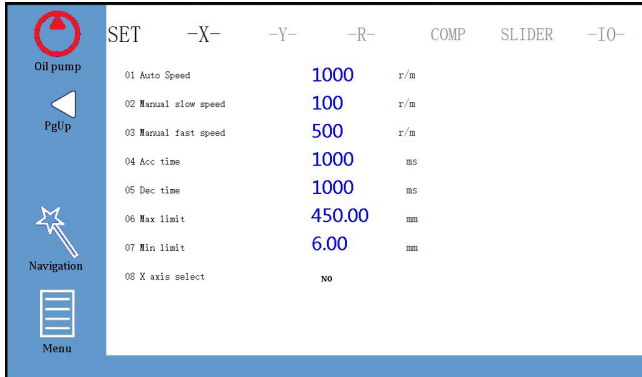
- 1) Point mode is used in calibration, single mode is used in normal operation, and auto cycle mode is used in testing machine.
- 2) In the "Manual Moving" and "X/Y/R Axis Navigation" teaching pictures, the mode automatically changes to the slow point mode, after exiting these pictures, it will automatically switch to the original mode.
- 3) If you first step on the switch, then step on the switch is invalid; unlock the switch, then step on the switch.

If the program does not start, step on it for the first time (Or press on the screen ) It will start the program and step down again before moving downward.

In single mode or auto cycle mode, the Ram moves upward. If the return time is valid  and the return time arrives (the Ram has not reached the upper dead point), the Ram will no longer move upward and enter the next step.



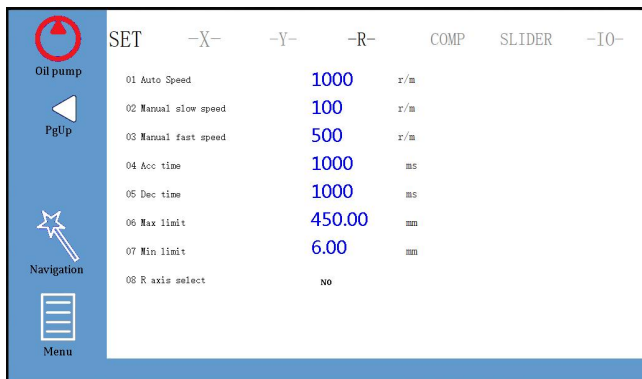
2. Click  on the page will pop up a dialog box prompting users to log in, please enter the correct password (0313), and then click  again to start setting parameters:




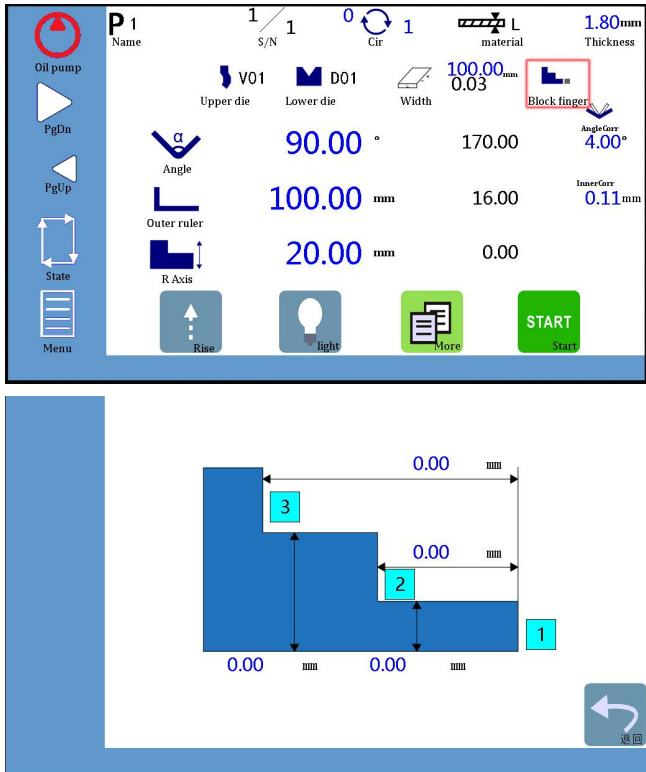
X/Y/R Axis Settings

On the parameter setting page, the operator can set the motion parameters of the X/Y axis (Y2/R axis is optional), as well as the pressure and Ram parameters in the bending process.

Click "R Axis is valid" to enable the R Axis, as shown in the following figure:

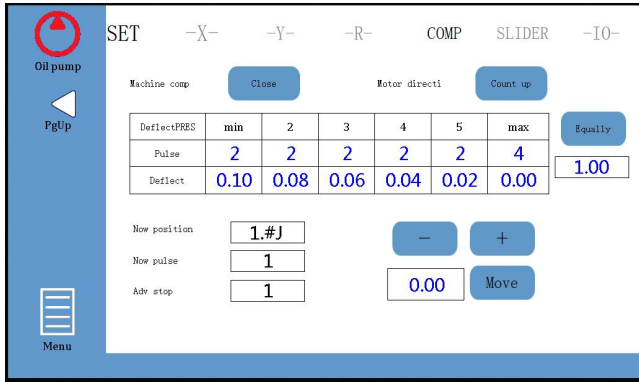


After that, the R-axis related information and setting icons are displayed on the programming page. Clicking on the red box , the gear parameters of the gear finger can be set. It is convenient to select different gear according to the workpiece processed.



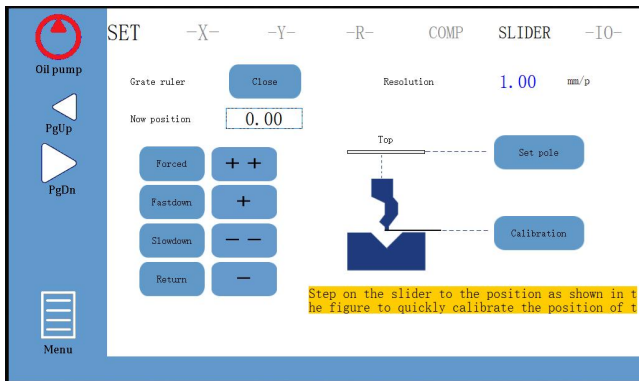
Comp setting

Operators can record the bending pressure and deflection under different electrical signals on the '-COMP-' page. The system will calculate the linear relationship between the bending pressure and voltage, deflection and voltage according to the internal algorithm, so that the actual operation can be easily compensated according to the specific input pressure and deflection values. Given that the simulated values of pressure and deflection are set on the Machine State page, see Chapter 1.3 Machine State for details.



SLIDER setting

Operators can set relevant parameters on the 'SLIDER' page and set the linear scale according to the actual situation, as shown in the following figure:




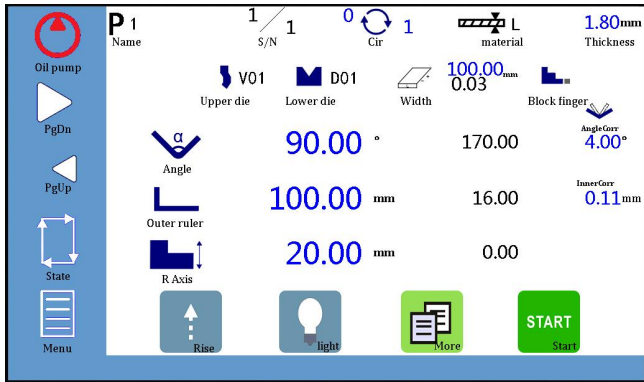
<Remarks>

- 1) Pressure relief time: The return journey begins after the duration of pressure relief arrives.
- 2) Oil pump automatic shutdown delay: When the machine is not operated, the oil pump automatically shuts down after the time arrives. Default: 1800 seconds, setting range: 300-3276.7 seconds.

1.3 Machine state

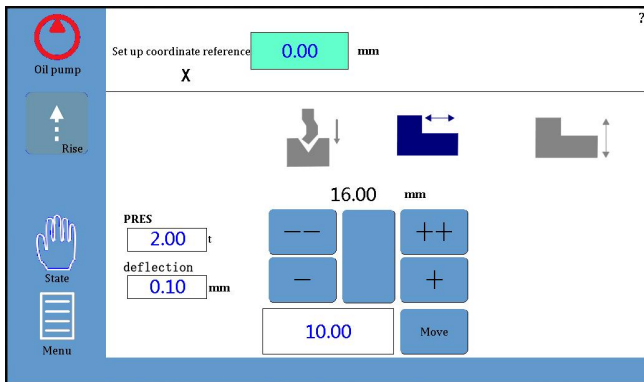
Operators can access machine status pages in a variety of ways.


As shown below, on the main programming page, click on the icon  to enter the machine status page.

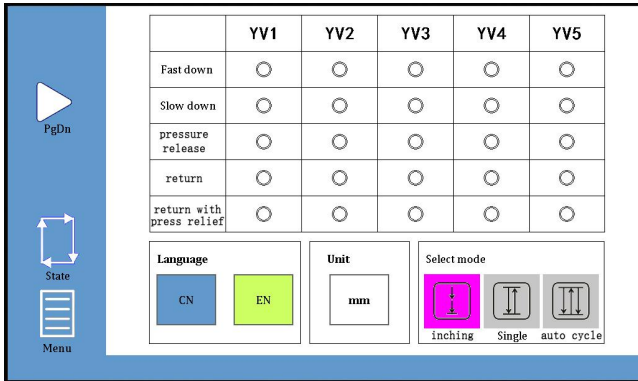


As shown below, you can enter the machine status page by manually moving the page and

clicking on the icon  on the left.

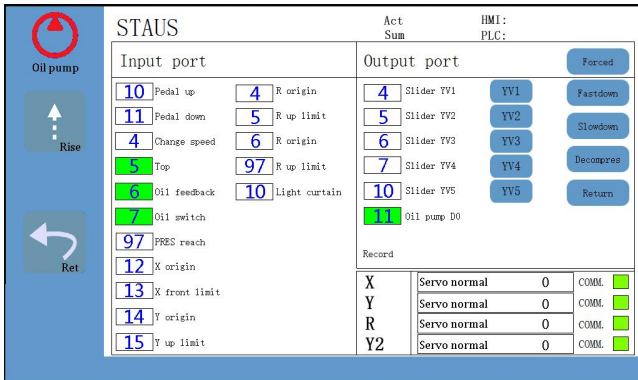


Click  to enter the machine status page



On the machine status page, the operator can observe the input/output signals of the system and analyze the possible problems more conveniently.

In the output window, click **Forced**, and the lower window will display the functional control status of each output port, as shown in the following figure:




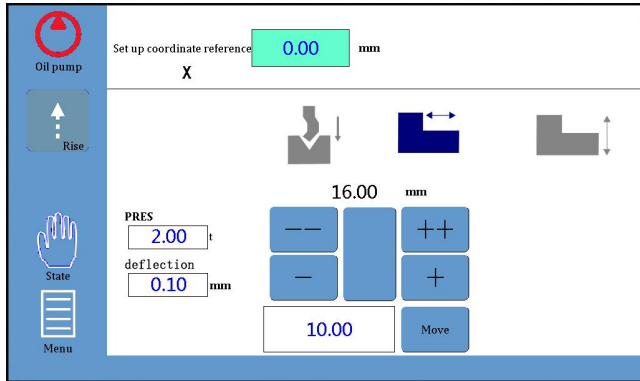
If the box corresponding to the input/output command shows green, it indicates that the signal or function is normal.

Pole: Set the maximum height of the rise, which can be set only after the linear scale is selected.

1.4 Manual movement

Operators can move Y axis (Ram), X axis (back shield) or R axis (finger shield) in manual mode.

1. Click on the menu icon  in the main page of programming, click on "Manual Move" in the pop-up menu, and enter the manual page (to set the coordinates of X/Y/R axis reference point, you need to enter the password "0313"):




2. Setting up X-axis reference points

Use the measuring tool to measure the length of a reference position (from clamping point to back shield), and then write the measured value in the settings above the back shield

icon .


3. Setting up the reference point of Y-axis

Step on the foot and press it down to the bottom. Then use the measuring tool to measure the length of a reference position (from the bottom of the Bottom die to the top of the Top


punch). Finally, write the measured value in the settings above the Ram icon .


4. Setting Reference Points for R-axis


The R-axis is used to select the finger shield, and the X-axis and R-axis can cooperate with the movement to prevent the collision of the die. Operators use measuring tools to measure the distance between the working plane of the Bottom die and the lower plane of the stop


finger, and write the measured values in the above settings .

5. In the above screen - /++ for manual slow/fast movement, click the "move" button on the corresponding page, the X/Y/R axis will move the specified distance at the set speed, and then click the button again to stop the movement.

◆ Set the page at the reference point of the selected axis and hold it down . The motor of the axis moves slowly in the direction of increasing count.

◆ Set the page at the reference point of the selected axis and hold it down . The motor of the axis moves slowly in the direction of subtraction.

◆ Set the page at the reference point of the selected axis, press and hold , and the motor of the axis moves rapidly in the direction of increasing count.

◆ Set the page at the reference point of the selected axis, press and hold , and the motor of the axis moves rapidly in the direction of subtraction.

While moving the axis, the current value of the coordinates of the X/Y/R axis changes accordingly until it moves to the appropriate position.

Attention: This system has the function of setting position limit. If the given position exceeds the set minimum/maximum limit, the system will prompt "the given position exceeds the

limit" and invalid  whenever it is pressed.

1.5 Mould management

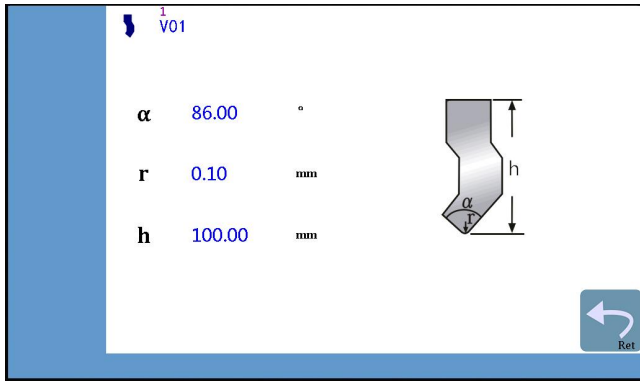
The numerical control system automatically calculates the programming value of X/Y/R axis according to the selected die, bending angle and bending length.

Die parameters are the basis of system calculation and must be accurate

1.5.1 Top punch editing

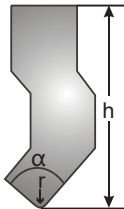


1. Click on the module icon on the programming page and enter the die editing page.



2. As an example, the upper model in the following figure is input (alpha: angle of upper model, r: chamfer, h: height of upper model)


α 88.00 °
r 0.20 mm
h 150.00 mm



3. After the data input is completed, click on the input field next to it and name the die according to its own naming rules. The current model can be saved with the given naming. (Up to 30 upper model information can be saved)

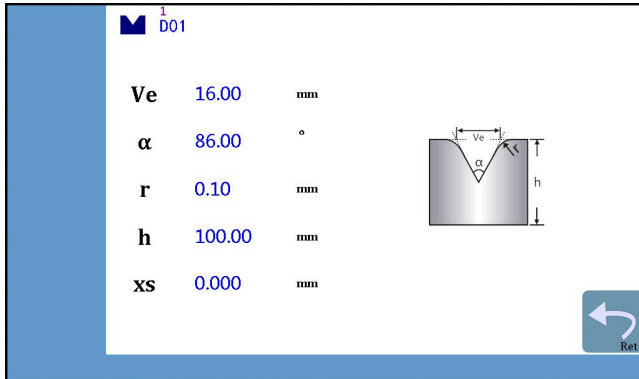
4. After completing the above steps, the upper model data will be automatically saved for subsequent use.

5. Click on the top icon , Then click  or  you can browse saved die information.

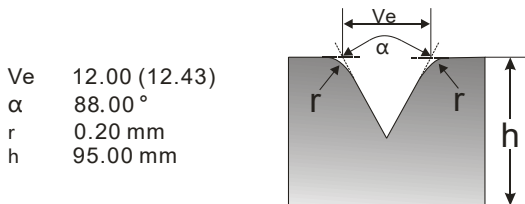
6. Click on the top icon , Return to the programming page.


1.5.2 Lower mode editing

1、Click on the icon on the edit page  , Enter the die editing page as follows:




2、For example, input the lower mode data (Ve: width of opening, alpha: angle of opening, r: chamfer, h: height of lower mode)



3.After the input of the lower model data is completed, Click  Next input field, Name the die according to its own naming rules, and save the current Bottom die with a name (up to 40 Bottom die information can be saved)

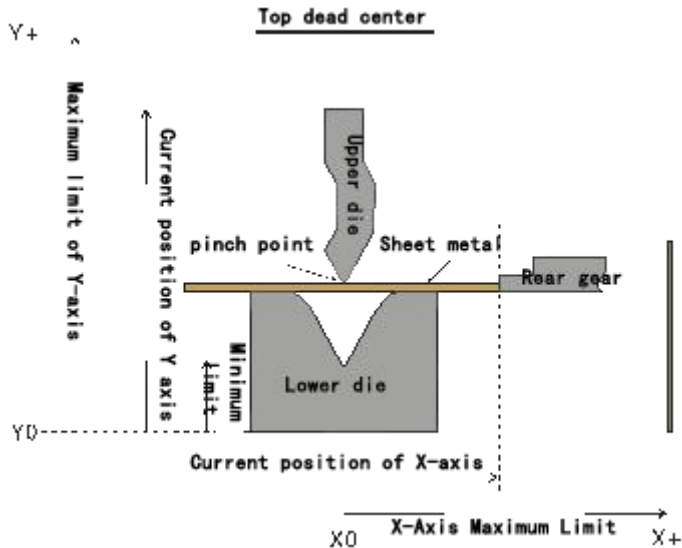
4. After completing the above steps, the lower model data will be automatically saved for subsequent use.

5.Click on the icon below  , Then click  or  you can browse saved moulds.

6.Click Icon  , return to the programming page.

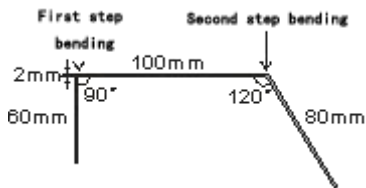
2.Examples of application

Combining panel and machine tool operation, this chapter introduces how to process a workpiece which needs multiple bending with a specific example. The X/Y axis position and motion direction sketches are as follows:




2.1 Example explanation

This example is illustrated by programming the following products:



<Remarks>

- 1) If you encounter an emergency or need to return during the operation, you can click the button  to return to the top dead point.

2) If the backstop concession distance is set, the backstop concession begins after the clamping time arrives.

1、 Select the Bottom die opening V_e

Referring to the table below, if the thickness of the bending plate is 2 mm, the groove with 6 times the width of the plate thickness, that is, the groove with 12 mm of the bending groove V_e , should be selected.

Criteria for choosing the opening of the Bottom die

Workpiece thickness T (mm)	0.6~2.5	3~8	10~50
Opening width of Bottom die W (mm)	6T	8T	10T

2、 Bending step

Step 1: Bending angle is 90.00 degrees, bending length L is 60.00 mm

Step 2: Bending angle 120.00 degrees, bending length L 80.00 mm

3、 Choice of working mode

Three working modes are available: point, single and auto cycle.

These working modes all support automatic step change, which will automatically enter the next step after the first step of bending is executed.

<Remarks> Please refer to the section "1.2 parameter settings" for details of the relevant working modes.


2.2 Choice of working mode



1、turn on electricity

First, turn on the main power switch on the cabinet, and then start the oil pump (the machine does not operate at this time).

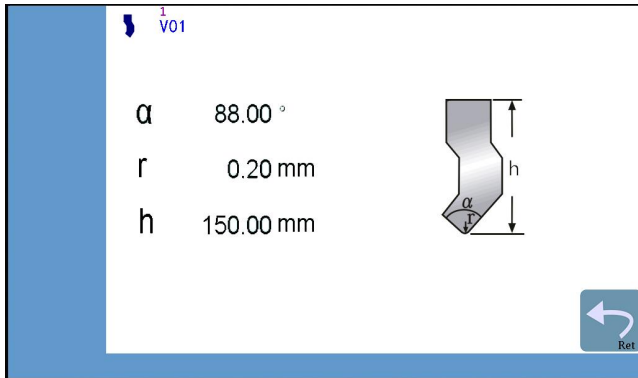
<pay attention> Do not press the emergency stop button, otherwise the machine can not operate and the oil pump can not start.

2、Display Panel Foundation Settings

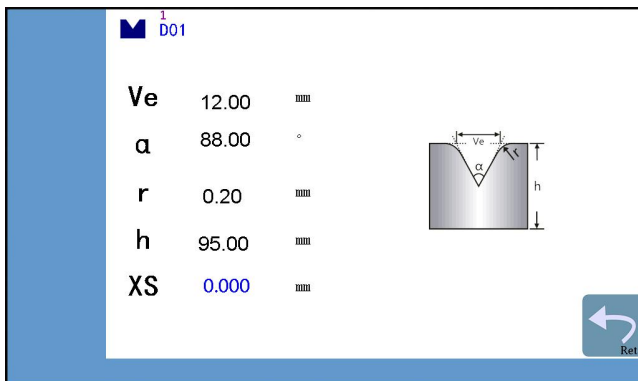
1) Click on the icon  on the main page of programming and input the thickness of the sheet (2mm)


2) Click on the die Icon  or , Edit the die (top/bottom) on the pop-up page.

The upper model is edited as follows:



The following model is edited as follows:





- 3) Click on the icon  on the main programming page to enter more bending data:

<Remarks> For more details, please refer to the section "More Data Settings Page 1.2.2".


3、Calibration by Manual Moving Mode

Operators can move Y axis (Ram), X axis (back shield) and R axis (finger shield) for position calibration in manual mode.

- 1) On the programming page, click on the menu icon  and select "Manual Move" from the pop-up menu to enter the manual page.

- 2) Click - /++ or  button to move the selected Y axis (Ram)/ X axis (back shield)/ R axis (shield finger). When each axis is moved, the current value of the axis coordinates changes accordingly, and the movement can stop until it moves to the appropriate position.


- 3) Setting the reference point for the X-axis

Use the measuring tool to measure the length of a reference position (from clamping point to back shield), and then write the measured value in the settings above the back shield icon .

A method of measuring the length of the backstop from the clamping point to the backstop: after X-axis moves any distance, take a piece of sheet material and place it between the upper and Bottom dies, push the sheet material to hold back the backstop at one side; then step down, make the Top punch move downward to just press the sheet (a little strength but the sheet material is not deformed). Finally, step on the foot to make the Top punch return to the upper dead point, and measure the impression marks and the small plate. The vertical distance on the side of the back shield is the length from the clamping point to the back shield.

- 4) Setting the reference point of Y axis

Use the measuring tool to measure the length of a reference position (from the bottom of the Bottom die to the top of the Top punch), and then write the measured value in the

settings above the back block icon .

A method of measuring the distance from the bottom of the Bottom die to the top of the Top punch: step on the foot to make the Top punch return to the upper dead point, move the Y axis for a certain distance at will, step on the foot, make the Top punch move downward to the Ram position (that is, the position can no longer be downward), step on the foot and do not put down, and finally measure the vertical distance from the bottom of the Bottom die to the top of the Top punch.

Appendix:

Analysis and Treatment of Common Problems

Table B-1 Common Problems Analysis and Treatment

Problem description	Reasons and Solutions
Oil pump can't start	<ul style="list-style-type: none"> ● Whether the emergency stop button is loosened or not. ● Whether the feedback signal of the oil pump is normal or not. ● The oil pump icon on the touch screen needs to be pressed for 3 seconds.
Stop after start of oil pump	<ul style="list-style-type: none"> ● Short self-closing delay of oil pump ● Loosening of coil of contactor ● Emergency stop of loosening feedback signal of oil pump
Servo communication is not good	<ul style="list-style-type: none"> ● Is the communication line between CPU and backstop servo, servo and servo well connected?
XY Axis Servo (Manual) Can't Move	<ul style="list-style-type: none"> ● Is Servo Communication Normal ● Whether the servo alarms (if the alarm can not be cleared, it needs to be re-energized). ● Whether the motor wires are connected or not.
Y-axis servo (manual) cannot be moved	<ul style="list-style-type: none"> ● The Top punch is raised to the top (the upper dead point should have a signal)
When the parameters are set, there is no response by pressing "START" or pedal switch on the touch screen.	<ul style="list-style-type: none"> ● Whether the emergency stop button is loosened or not. Whether the oil pump is open or not. ● Whether the servo system is normal or not. ● Whether the Top punch has been raised to the top (if the alarm cannot be given, it needs to be re-energized).

Hydraulic brake does not move	<ul style="list-style-type: none"> ● Whether the emergency stop button is loosened or not ● Whether the oil pump starts or not ● Whether the gate is configured (setting parameters page on touch screen).
Abnormal motion of Ram	<ul style="list-style-type: none"> ● Check whether the setting of pressure holding time "pressure relief time" and "return time" is reasonable. ● Whether the transmission point and dead point information is normal. ● Start-up of Oil Pump ● Release of emergency stop switch ● Hole-in hand moving screen (if XY axis is not debugged at this time)
The bending angle error of the first cutter is very large (>5°)	<ul style="list-style-type: none"> ● Whether the cutter die is flat or not. ● Whether the height measured after depressurization is consistent with the height calculated by the system, if it is not consistent to re-axis calibration. ● Check whether the set parameters of the cutter die and the thickness of the plate are correct. ● Whether the accuracy of the selected screw (belt) is insufficient. ● Whether the thickness of the workpiece plate and the abrasive tool selected are reasonable or not, the first point in the section "2.1 Example Explanation" of the Selection Rules Reference Chapter ● The workpiece is made of steel with great elasticity, which needs angle compensation.
X-axis automatic mode positioning is not in place	<ul style="list-style-type: none"> ● Whether the installation of the screw rods on both sides of the bending machine is not parallel leads to a fixed position of the motor; the X-axis can be moved throughout the manual movement to verify the existence of this problem.
Wide Bending Angle Error	<ul style="list-style-type: none"> ● Check whether the machine pressure is enough
Calibrate the angle, change a piece of sheet metal after the bending angle is not right	<ul style="list-style-type: none"> ● The bending parameters of sheets with different materials and widths are different, which should be set and compensated separately.
Next Step Sequential Bending Angle Error	<ul style="list-style-type: none"> ● Whether the number of abrasives used in the next step has changed.
Incorrect Angle Compensation Value	<ul style="list-style-type: none"> ● The safety height of the Bottom die has been exceeded, and the system automatically limits ([bending depth + compensation] > minimum height).