E-Serials Device

E300 Operation Manual

	■ Read and follow these instructions and all safety blocks carefully. ■ Have only trained and qualified persons install, operate, or service this unit.
	■ Give this manual to the operator.
	■ For help, call your distributor.

Contents

Preface

Purpose

This document provides guides to use the E300 device for the jobs.

According to this document, you can learn how to program the product by the E300 device.

Audience

This document is intended for:

- ❑ Technical support engineer
- ❑ Installation and Commissioning engineer
- ❑ operating staff

Organization

This document consists of three chapters and is organized as follows.

Chapter	Content
Chapter 1 Outline	This chapter describes the features, appearance, and electrical specification of the E300 device.
Chapter 2 Programming	This chapter guides the user how to program the product by the E300 device.
Chapter 3 Basic Operation	This chapter describes the basic operation of the E300 device.

Conventions

Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
	**WARNING** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.
	**CAUTION** Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury to personnel and damage to equipment. It may also be used to alert against unsafe practices.
	**MANDATORY** Always be sure to follow explicitly the items listed under this heading.
	**PROHIBITED** Must never be performed.
	**NOTE** or **TIP** Provides additional information to emphasize or supplement important points of the main text.

General Conventions

Convention	Description
Times New Roman	Normal paragraphs are in Times New Roman.
Boldface	Names of files, directories, folders, and users are in **boldface**. For example, log in as user **root**.
`Courier New`	Terminal display is in `Courier New`.
Italic	Book titles are in *italics*.

GUI Conventions

Format	Description
Boldface	Buttons, menus, parameters, tabs, windows, and dialog titles are in **boldface**. For example, click **OK**.
XX > XX	Multi-level menus are in **boldface** and separated by the ">" signs. For example, choose **File** > **Create** > **Folder**.

Keyboard Operation

Format	Description
Key	Press the key. For example, press **Enter** and press **Tab**.
Key 1+Key 2	Press the keys concurrently. For example, pressing **Ctrl+Alt+A** means the three keys should be pressed concurrently.
Key 1, **Key 2**	Press the keys in turn. For example, pressing **Alt**, **A** means the two keys should be pressed in turn.

Chapter 1 Outline

1.1 Introduction

The E300 is a dedicated NC (numerical control) device for the Torsion Bending Machine, which combines the expertise of ESTUN for many years and provides a complete economic solution for the Torsion Bending Machine with the support of unique drive control technology.

The E300 device adopts the integral product structure, built-in high-performance A8 processor, and configures 5.6 inch, 640 × 480 dot matrix, 18 full color display screen, and integrated IO ports, serial ports and USB port.

The E300 device is designed to be operated via the buttons on the front panel. At the same time, the pump switch and the emergency stop button are installed in the customized suspension cabinet to meet the user's requirements, as shown in Figure 1-1.

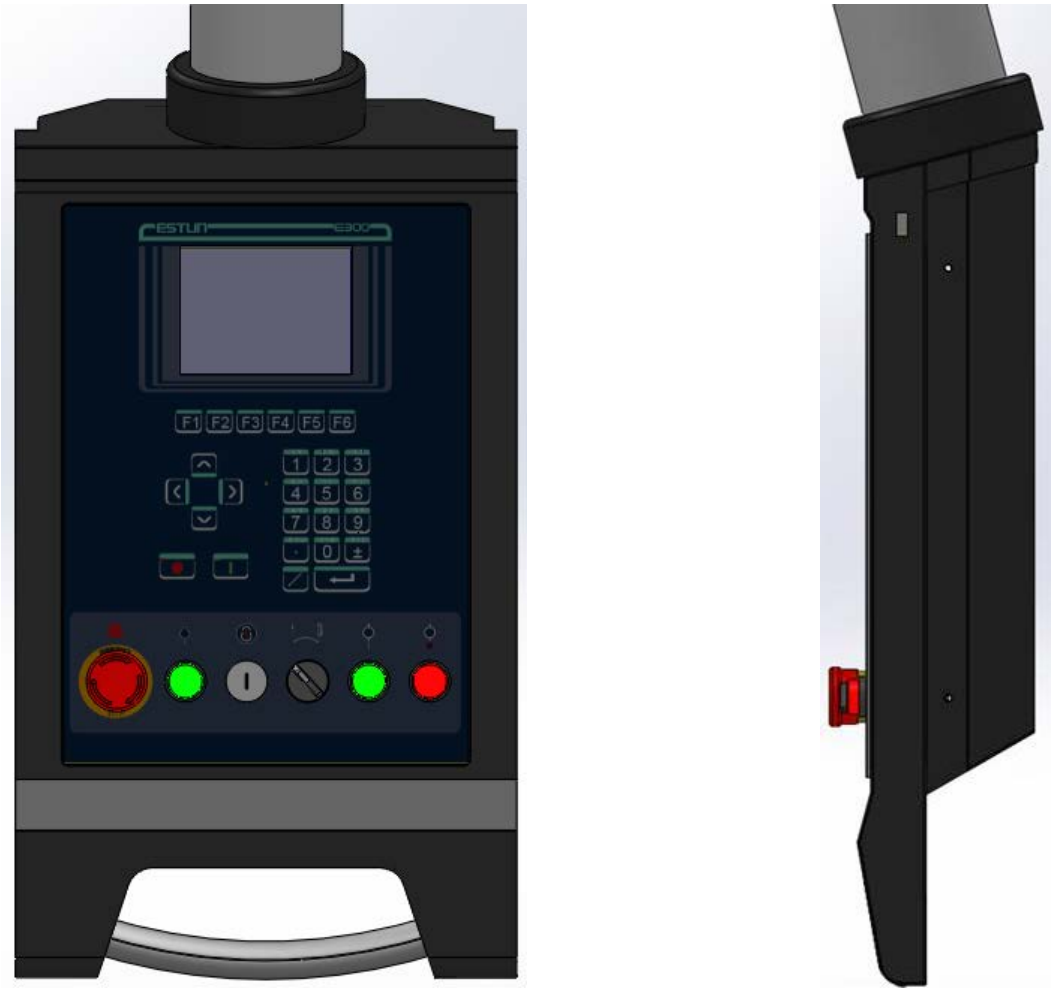


Figure 1-1 The suspension cabinet

1.2 Features

The E300 device inherits ESTUN classic mode of operation, through a simple and intuitive parameter configuration interface to complete the bending machine control operation. Its friendly interface, easy to use, practical function, and has the following features:

- 4 axes are supported, viz, X-axis, Y-axis, R-axis and C-axis.
- Automatic calculation of the block position, according to the bending angle, material, thickness and mold parameters.
- The back gauge can be controlled in a high-accuracy since the servo systems control X-axis and R-axis.
- Optional hydraulic or mechanical to control the C-axis.
- Program in absolute value or angle.
- You can backup, restore, import and export the parameters, for commissioning the machine easily.
- Edit the program in one page, for improving the operating efficiency.
- You can program the dwell time (holding time) andretracting delay by the device instead of the time relay.
- Interference or collision of the die can be avoided.
- The opening distance can be adjusted, for improving the operating efficiency.
- Automatically adjust the clamping point position.
- You can view the status of inputs, outputs, valves and faults on the **Monitor** page at any time.
- Automatically adjust the zero position of the R-axis.
- Materials and die informations are programable.
- Three of operation mode (Jog, Single, Continuous) for the jobs.
- Language setting and unit setting.
- IO ports can be allocated freely, and the device can detect them for avoid the repeat.
- Bilateral positioning and unilateral positioning.
- Slug clearance function.
- Teaching or search the reference point.
- The Axis, which is controlled by a servo system, can be manually moved.
- Real-time memory the parameters, positions and programs against the unexpected accidents such as interruption of power supply.

1.3 Appearance

Control Panel

Figure 1-2 is the appearance of the suspended device, and it includes many elements.

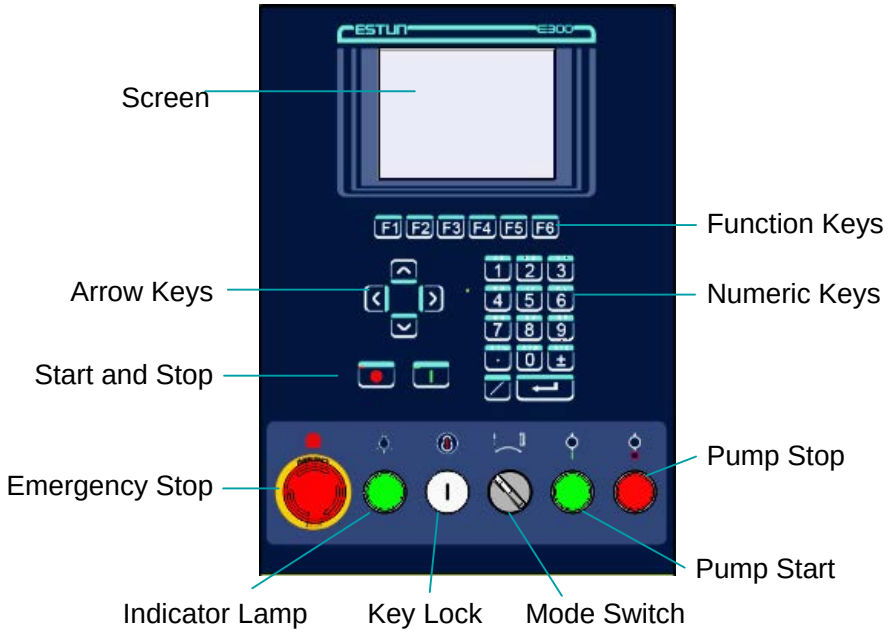


Figure 1-2 Appearance of the suspended device

Table 1-1 lists the description of each element.

Table 1-1 Description of each element

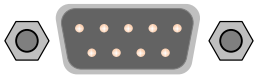
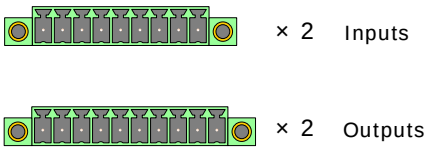
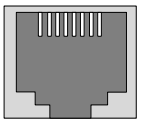
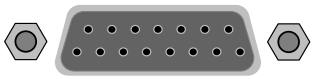
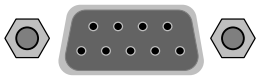
Element	Description
Screen	5.6 inch, 640 × 480 dot matrix, 18-bit full color display screen.
Function Keys	Function keys, which corresponding to options on below of each page.
Numeric Keys	It consists of **CLEAR**, **NUMBERS**, **POINT**, ± and **ENTER**. They are often used in programming and settings.
Arrow Keys	Press these buttons can move the cursor.
Start and Stop	Press **START** key when your program has been completed, and each axis can perform the positioning. Press **STOP** key, the machine can stop running.
Mode Switch	Turn this switch for switching the operation mode between **Single** and **Jog**. <**NOTE**>: For switching the operation mode to **Continuous** mode, turn the switch to **Single** mode, and set the parameter **Automatic** to **Enable** on the HMI.
Emergency Stop	In the case of emergency stop use the **EMERGENCY STOP** controller.
Key Lock	A key lock, which can turn ON or turn OFF the device.

Indicator Lamp	When the device is power on, the indicator lamp can be lighted.
Pump Start	Press this button can turn on the oil pump, indicating the machine is ready.
Pump Stop	Press this button can turn off the oil pump, indicating the machine is unable to run. In addition, this signal can be cut off when **EMERGENCY STOP** button was pressed down.

Ports

There are 6 kinds of ports on the E300 device, which can connect the external devices. Table 1-2 lists the description of them.

Table 1-2 The description of Ports

Port	Diagram	Amount	Description
USB	—	1	Connect a U disk, which can help the user by performing many operations such as update, import or export the parameters, dies and programs.
DB-9 (Male)		1	Reserved.
IO		4	● 2 groups of inputs, each group have 9 pins. ● 2 groups of outputs, each group have 10 pins.
RJ45		1	Connect the servo system by CAN protocol.
DB-15 (Female)		1	Connect the external device, which controls C-axis.
DB-9 (Female)		2	Reserved.

1.4 Electrical Specifications

Power Supply

Item	Voltage	Rated Current	Starting Current
Minimum	20	1.2	-
Standard	24	2	-
Maximum	28.8	3	3
Unit	V	A	A

Inputs

Input Voltage	24VDC±10%
Input Current	5mA
Signal Characteristic	H-level is not greater than 30V L-level is not greater than 1.2V
Effective Level	H-level

Outputs

Output structure	Open Collector
Output Voltage	Not greater than 30VDC
Output Current	Not greater than 150mA
Signal Characteristic	H-level is not greater than 30V L-level is not greater than 1.0V
Effective Level	L-level

Encoder

Supported Type	Differential / Line Driver	Complementally / Voltage
Supply Voltage	5V DC	12V DC
Supply Current	500mA	
Response Frequency	500KHz	
Input Phases	A, B, C, A\, B\, C\	
Output Phases	A, A\, B, B\, C, C\	A, B, C
Output Voltage	H-level is not less than 80%VCC L-level is not greater than 0.3V	

Communication	Protocol	CAN	RS485	RS232
	Transmission Rate	1 Mbps	10 Mbps	115.2 Kbps
	Terminal Resistance	Build-in		None
	ESD	16KV HBM		15KV HBM

Analog Input	Type	Voltage
	Range	From －10V to ＋10V
	Resolution	12bit
	Channels	3 channels
	Sampling Frequency	Not greater than 78KHz

Analog Output	Type	Voltage
	Range	－10V to ＋10V
	Resolution	12bit
	Channels	2 channels (AO1 to AO4)

Environment	Operating TMP	0℃ to 40℃
	Operating Humidity	5% to 95%, no condensation
	Storage TMP	－20℃ to 70℃
	Storage Humidity	5% to 95%, no condensation

Chapter 2 Programming

2.1 Page Structure

Power up the device and wait for a while, the screen can display the initial page (Single-Step) automatically, as shown in Figure 2-1.

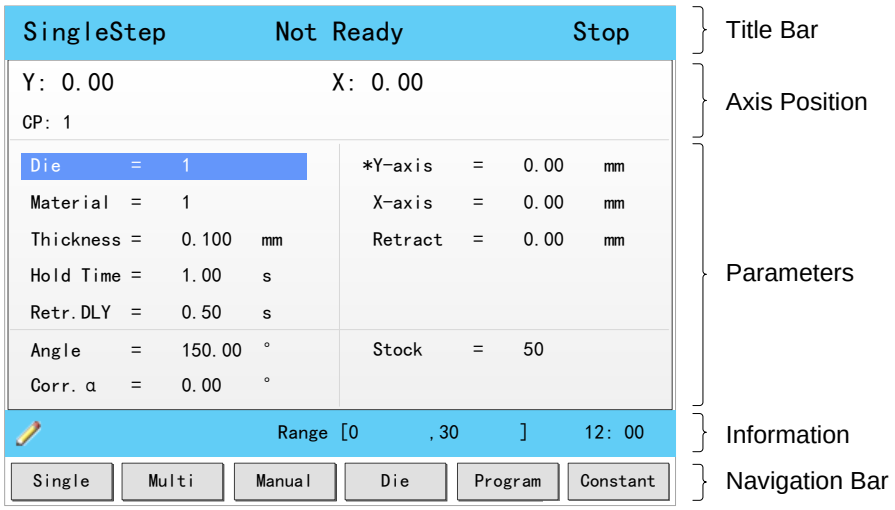


Figure 2-1 The initial page

Title Bar

This area is displayed on every page, and from left to right are **Page Name**, **System Status**, and **Operation Mode** in turn.

- Page Name: displayed the current page's name, e.g. **SIngleStep**, **Multi**, **Program**.
- System Status: displayed the current system status. There are six system statuses, as shown in Table 2-1.

Table 2-1 The description of the system status

System Status	Description
Not Ready	When power up the device, the system detects the signal **Pump** is turned OFF, this system status is displayed.
Idle	● When this system status is displayed, the signal **Pump** is turned ON, and the signal **RDY** is also turned ON. ● Only under this system status, the machine can run the programming after you has completed the program and press down the **START** key.

System Status	Description
Run	When the system is working, this status is displayed. ● When you press **STOP** key on the operation panel, the machine stops and the system status is switched to **Idle**. ● If the **Count Mode** is set to **Cnt Down**, when the counting has been finished, (**Stock** is 0), the machine stops and the system status is switched to **Idle**. ● When any problem doesn't meet the device settings or prevents normal operation is detected, the machines stops and the system status is switched to **Alarm**.
Alarm	When any problem doesn't meet the device settings or prevents normal operation is detected, the status is displayed. Follow the section **Appendix D Alarm List**, solving the fault according to the fault message, and then move the cursor on **Clear**, and press **ENTER** key, so that the system can try to reset.

❑ Operation Mode: displayed the current operation mode. There are three operation modes, as shown in Table 2-2.

Table 2-2 The description of the operation mode

Operation Mode	Description
Single	● Switch the operation mode to **Single**, and the parameter **Automatic** to **Disable**, this operation mode is displayed on the page. ● In this operation mode, you shall change step by stepping on the foot switch (Pedal Signal) when the previous step has been finished.
JOG	Switch the operation mode to JOG, this operation mode is displayed on the page.
Continue	● Switch the operation mode to **Single**, and the parameter **Automatic** to **Enable**, this operation mode is displayed on the page. ● In this operation mode, the system can change step automatically when the previous step has been finished.

Axis Position

This area displays the current position value of the axes.

INFO	In general, the default issued E300 device is the standard version, which only supports the control of X-axis and Y-axis. For the more features, you can contact ESTUN.

Parameters

This area displays the parameters information. Each page has corresponding parameters, for details about the parameters see the description of the other sections in this manual.

Information

This area displays the information of each parameter, including editing value and range. The right side of this area is the system time.

Navigation Bar

This area displayed each main page you may be switched, corresponding to the **F1** to **F6** keys on the operation panel.

Table 2-3 lists the descriptions of each main page.

Table 2-3 The descriptions of each main page

Key	Page	Description
F1	Single	This page is used for setting the parameters of the single-step programming. Single-step programming is commonly employed for quick bending.
F2	Multi	This page is used for setting the parameters of the Multi-step programming. Multi-step programming is commonly employed for the complex bending, which consist of many different bending steps.
F3	Manual	The servo axes, which are controlled by servo motor, can be moved manually with the arrow keys in this page. You can perform this operation without starting the device.
F4	Die	This page lists the information of the set and stored dies.
F5	Program	This page lists the information of the set and stored programs.
F6	Constant	The commonly used parameters are displayed on **Constant** page.

2.2 Operation Flow

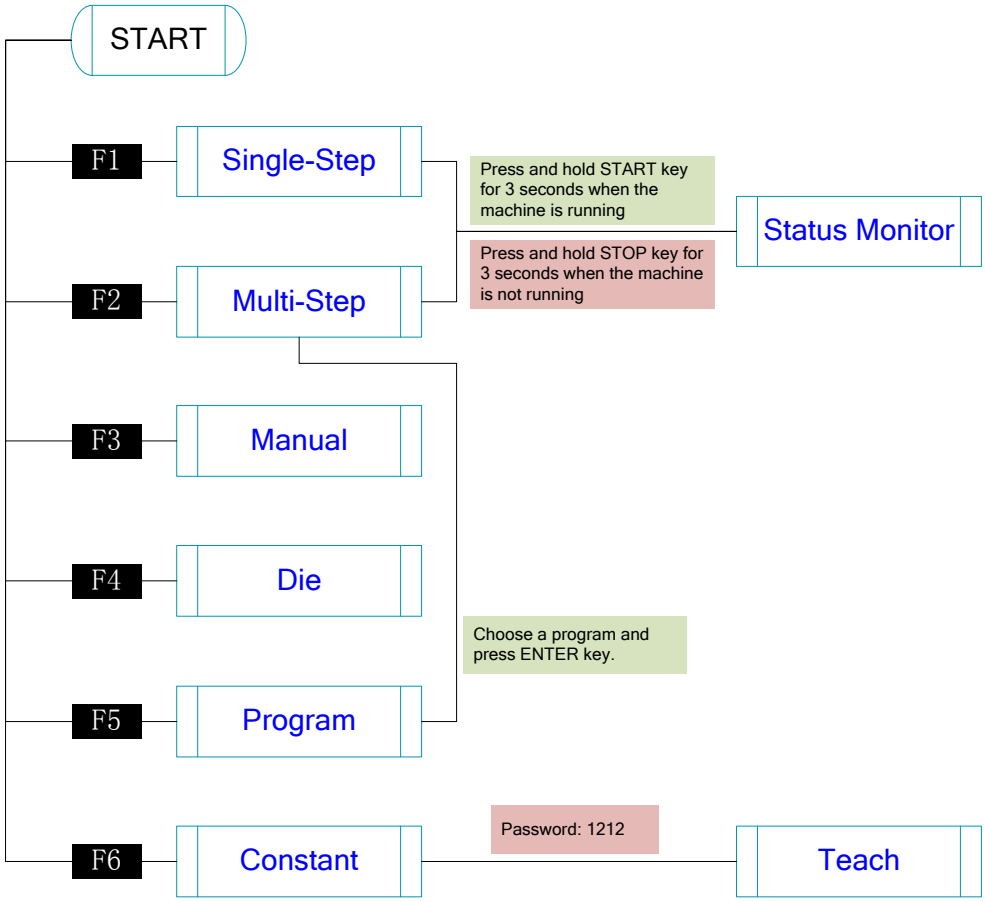


Figure 2-2 Operation flow diagram

2.3 Single-Step

Description

You can program the bending steps for the same settings on this page, which is commonly employed for quick bending.

This page is the initial page when you power up the device. Press **F1** key to enter the **Single-Step** page, as shown in Figure 2-3.

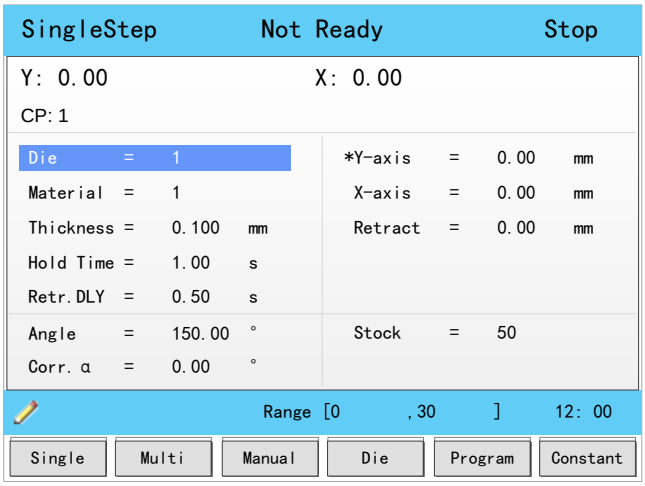


Figure 2-3 The Single-Step page

Table 2-4 lists the description of the parameter on this page. You can refer to this table when you edit the parameters on this page.

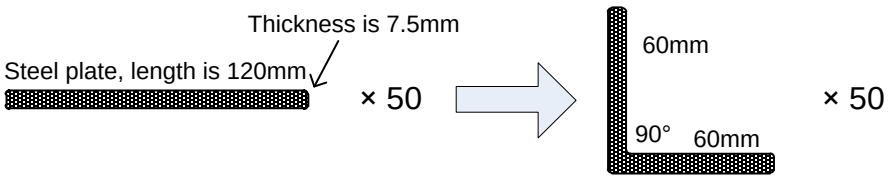
Table 2-4 The description of the parameter on Single-Step page

Parameter	Description
Die	**Default** 1 **Range** 0 to 30 **Unit** — **Description** Set a desired die ID for the program. The parameters of the die can be edited on **Die** page.
Material	**Default** 1 **Range** 1 to 6 **Unit** — **Description** Set a desired material ID for the program, which is used for calculating the bending depth. The parameters of the material can be edited on **Material Table** page.
Thickness	**Default** 0 **Range** 0.000 to 99.999 **Unit** mm **Description** The thickness of the sheet.
Hold Time	**Default** 0 **Range** 0.00 to 99.99 **Unit** s **Description** The hold (dwell) time of punch at the bending point.
Retr.DLY	**Default** 0 **Range** 0.00 to 99.99 **Unit** s **Description** The wait time before the X-axis performs the retract.

Parameter	Description	
Angle	**Default**	0
	Range	0.00 to 180.00
	Unit	°
	Description	Set a desired angle value in the selected bending step.
Corr. α	**Default**	0
	Range	-90.00 to 90.00
	Unit	°
	Description	This parameter is valid when the bending method is angle, which indicates the correction on angle to the current bending step . For example: If the programmed value is 90, while the actual measured value is 92, then this parameter shall be set to -2. If the programmed value is 90, while the actual measured value is 88, then this parameter shall be set to 2.
Y-axis	**Default**	0
	Range	0.000 to 9 999.999
	Unit	mm
	Description	The programmed value for the Y-axis.
X-axis	**Default**	0
	Range	0.000 to 9 999.999
	Unit	mm
	Description	The programmed value for the X-axis.
Retract	**Default**	0
	Range	0.000 to 9 999.999
	Unit	mm
	Description	Retract distance of the selected axis in the current bend. The "backgauge retract" is started when the beam is pinching the sheet.
Open	**Default**	0
	Range	0.00 to 99.99 or 0.000 to 9 999.999
	Unit	s or mm
	Description	Set the opening distance or opening time for the opening process.
Stock	**Default**	0
	Range	-1 to 999 999
	Unit	—
	Description	The stock counter is incremented or decremented after each end of a program cycle, which depends on the settings of the parameter **Count Mode**. Set it to -1, indicating the stock count is disabled. Set it to other value: When the **Count Mode** is **Cnt Down**, the stock counter in production mode is decreased by 1 after each product cycle. When the counter has reached 0, the machine is stopped. When the **Count Mode** is **Cnt Up**, the stock counter in production mode is increased by 1 after each product cycle.

Example

We take the following process as an example to describe the programming.



In this example, we can learn a set of the basic data: material is steel; X-axis is 60; bending-angle is 90; thickness is 7.5; stock is 50.

We decide to program the process by the given angle, and supposing the die **ID** is 1.

In addition, we can set some other necessary parameters according to our experience, such as holding time is 3, retracting delay is 2, and retract distance is 5.

Follow the below procedure to perform the program.

1. Move the cursor on Die, and type 1.
   Note: For details about the setting of the die, see the section **2.6 Die Settings**.
2. Move the cursor on **Material**, and type **1**.
3. Move the cursor on **Thickness**, and type **7.5**.
4. Move the cursor on **Hold Time**, and type **3**.
5. Move the cursor on **Retr. DLY**, and type **2**.
6. Move the cursor on **X-axis**, and type **60**.
7. Move the cursor on **Retract**, and type **5**.
8. Move the cursor on **Angle**, and type **90**.
9. Move the cursor on **Stock**, and type **50**.
   Note: please set the **Count Mode** to **Cnt Down** on the **Constant** page beforehand.
10. Press **START** key on the operation panel.

Now, the servo-axis can start to positioning. When the machine is ready, it can be produced.

2.4 Multi-Step

Description

You can program the bending steps for the different settings on this page. Multi-step programming is commonly employed for the complex bending, which consist of many different bending steps.

Press **F2** key to enter the **Multi-Step** page, as shown in Figure 2-4.

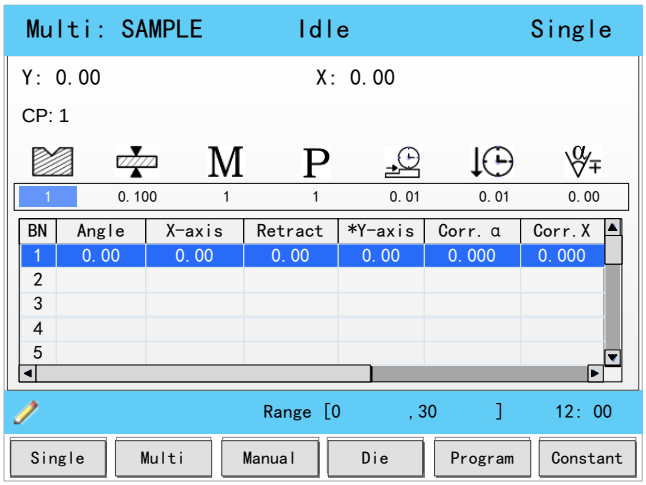


Figure 2-4 The Multi-Step page

Table 2-5 lists the description of the parameter on this page. You can refer to this table when you edit the parameters on this page.

Table 2-5 The description of the parameter on Multi-Step page

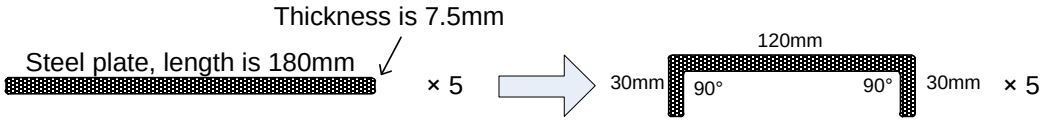
Parameter	Description
	**Default** 1 **Range** 0 to 30 **Unit** — **Description** Set a desired die ID for the program. The parameters of the die can be edited on **Die** page.
	**Default** 0 **Range** 0.000 to 99.999 **Unit** mm **Description** The thickness of the sheet.
M	**Default** 1 **Range** 1 to 6 **Unit** — **Description** Set a desired material ID for the program, which is used for calculating the bending depth. The parameters of the material can be edited on **Material Table** page.
P	**Default** 0 **Range** -1 to 999 999 **Unit** — **Description** The stock counter is incremented or decremented after each end of a program cycle, which depends on the settings of the parameter **Count Mode**. Set it to -1, indicating the stock count is disabled. Set it to other value: When the **Count Mode** is **Cnt Down**, the stock counter in production mode is decreased by 1 after each product cycle. When the counter has reached 0, the machine is stopped. When the **Count Mode** is **Cnt Up**, the stock counter in production mode is increased by 1 after each product cycle.

Parameter	Description
	**Default** 0 **Range** 0.00 to 99.99 **Unit** s **Description** The wait time before the X-axis performs the retract.
	**Default** 0 **Range** 0.00 to 99.99 **Unit** s **Description** The hold (dwell) time of punch at the bending point.
	**Default** 0 **Range** -90.00 to 90.00 **Unit** ° **Description** This parameter is valid when the bending method is angle, which indicates the correction on angle to the whole bending. For example: If the programmed value is 90, while the actual measured value is 92, then this parameter shall be set to -2. If the programmed value is 90, while the actual measured value is 88, then this parameter shall be set to 2.
BN	**Default** 1 **Range** 1 to 25 **Unit** — **Description** This parameter indicates the current bending step in the program.
Angle	**Default** 0 **Range** 0.00 to 180.00 **Unit** ° **Description** Set a desired angle value in the selected bending step.
X-axis	**Default** 0 **Range** 0.000 to 9 999.999 **Unit** mm **Description** The programmed value for the X-axis.
Retract	**Default** 0 **Range** 0.000 to 9 999.999 **Unit** mm **Description** Retract distance of the selected axis in the current bend. The "backgauge retract" is started when the beam is pinching the sheet.
Open	**Default** 0 **Range** 0.00 to 99.99 or 0.000 to 9 999.999 **Unit** s or mm **Description** Set the opening distance or opening time for the opening process.
Y-axis	**Default** 0 **Range** 0.000 to 9 999.999 **Unit** mm **Description** The programmed value for the Y-axis.

Parameter	Description	
Corr. α	**Default**	0
	Range	-90.00 to 90.00
	Unit	°
	Description	This parameter is valid when the bending method is angle, which indicates the correction on angle to the current bending step. For example: If the programmed value is 90, while the actual measured value is 92, then this parameter shall be set to -2. If the programmed value is 90, while the actual measured value is 88, then this parameter shall be set to 2.
Corr.X	**Default**	0
	Range	-99.99 ～ 99.99
	Unit	mm
	Description	When the actual axis position is not corresponding with the displayed value, it is possible to correct the position with this parameter. For example: If the programmed value is 100.00, while the actual measured value is 102.05, then this parameter shall be set to -2.05. If the programmed value is 100.00, while the actual measured value is 98.05, then this parameter shall be set to 1.95.
Repeat	**Default**	1
	Range	1 to 99
	Unit	—
	Description	Set the repetition times for the selected bending step.

Example

We take the following process as an example to describe the programming.



In this example, there are 2 bending steps, and we can learn a set of the basic data: material is steel; one X-axis is 30 and other is 120; bending-angle is 90; thickness is 7.5; stock is 50.

We decide to program the process by the given angle, and supposing the die **ID** is 1.

In addition, we can set some other necessary parameters according to our experience, such as holding time is 3, retracting delay is 2, and retract distance is 5.

Follow the below procedure to perform the program.

2. Move the cursor on  (Die), and type **1**.

   Note: For details about the setting of the die, see the section **2.6 Die Settings**.

3. Move the cursor on  (Thickness), and type **7.5**.

4. Move the cursor on  (Material), and type **1**.

5. Move the cursor on  (Stock), and type **5**.

6. Move the cursor on  (Retr. DLY), and type **2**.

7. Move the cursor on  (Hold Time), and type **3**.

8. Move the cursor on **Angle** where **BN** is 1, and type **90**.

9. Move the cursor on **X-axis** where **BN** is 1, and type **30**.

10. Move the cursor on **Retract** where **BN** is 1, and type **5**.

11. Move the cursor on **BN**, and press **ENTER** key.
    Then, press **OK** on the pop-up dialog-box to create a new bending step.

12. Then, press **OK** on the pop-up dialog-box to create a new bending step.

13. Move the cursor on **X-axis** where **BN** is 2, and type **120**.

14. Move the cursor on **Retract** where **BN** is 2, and type **5**.

15. Press **START** key on the operation panel.

Now, the servo-axis can start to positioning. When the machine is ready, it can be produced.

2.5 Manual Movement

The servo axes, which are controlled by servo motor, can be moved manually with the arrow keys in **Manual** page. You can perform this operation without starting the device.

Perform this operation can help you adjust or commission the machine.

To enter the **Manual** page, power up the device and wait for the device displays the default page, and then press F3 key, as shown in Figure 2-5.

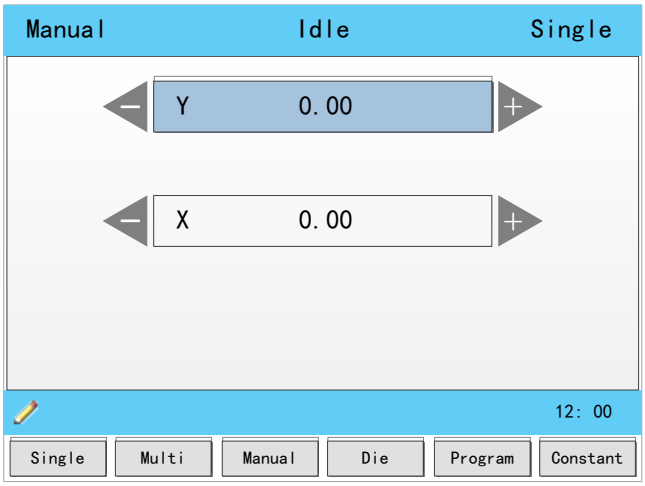


Figure 2-5 The Manual page

- Press the arrow keys **UP** and **DOWN** to select the desired servo-axis.
- Press the arrow keys **LEFT** and **RIGHT** to select proper movement direction.

2.6 Die Settings

To program the process by the given angle, it is necessary to set parameters of the die.

Press F4 key to enter the **Die** page, as shown in Figure 2-6.

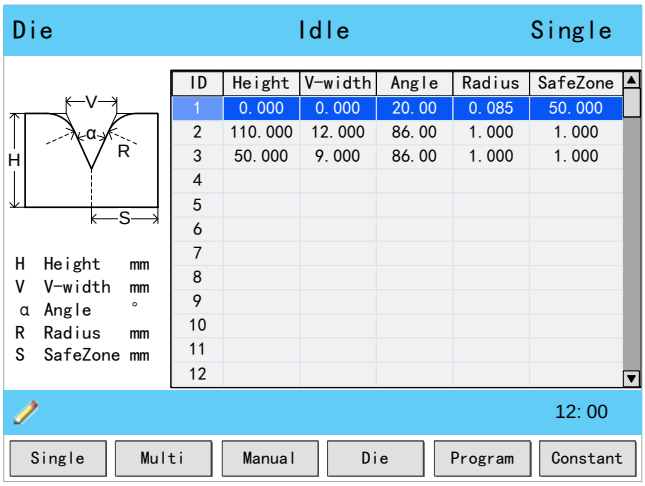


Figure 2-6 The Die page

- Press arrow keys **UP** and **DOWN** to select the desired die **ID**.
- Press arrow keys **LEFT** and **RIGHT** to select the desired parameter of the die.
- Press **NUMERIC** keys to type the proper value.

The technical parameters diagram of the die are as shown in Figure 2-7.

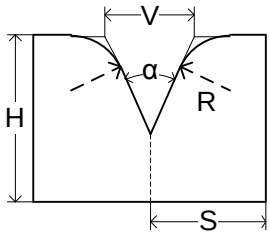


Figure 2-7 The technical parameters diagram of the die

- H: The height of the die, which is used in the bend depth calculation.
- V: The length of V-opening, which is the distance between the touching lines crossing.
- α : The angle of the die.
- R: The radius of the edges of the V-opening.
- S: Safety distance, which will be used in the case an R-axis, is mounted. This to prevent finger to die collision. The indicated minimum value is computed automatically from the die dimensions as follows:
  S = FS ＋ V / 2, in which:
  FS = flat section on the back side of the V-grove
  V = opening value.

2.7 Bend Correction

It is necessary to commission the machine before your actual processing, in order to win an accurate bending result.

For performing it, you can program a bending process on **Single-Step** page, and operate the machine to complete one processing.

Then, measure the actual bending angle, bending depth, and the distance of the back gauge.

Check whether the bending result is corresponding with your requirement.

Angle correction

The range of this parameter is from -90 to 90.

When the actual axis position is not corresponding with the displayed value, it is possible to correct the position with this parameter.

For example:

- When the programmed and displayed value is 90, while the actual axis position value is 92, then you shall set the **Corr.** α to **-2**.
- When the programmed and displayed value is 90, while the actual axis position value is 88, then you shall set the **Corr.** α to **2**.

Y-axis correction

The range of this parameter is from －99.999 to 99.999.

When the actual axis position is not corresponding with the displayed value, it is possible to correct the position with this parameter.

It may be repeating to set **Corr. Y**. However, we can learn from experience, program the process by the given angle, and measure the depth of 1 degree as the unit length. Then, program the process by the given depth, and set **Corr. Y** according to the unit length. Repeat this operation, until the bending result is corresponding with your requirement.

X-axis correction

The range of this parameter is from －99.999 to 99.999.

When the actual axis position is not corresponding with the displayed value, it is possible to correct the position with this parameter.

The setting of X-axis correction is same with Angle correction. For example:

- When the programmed and displayed value is 100.00, while the actual axis position value is 102.05, then you shall set the **Corr. X** to **-2.05**.
- When the programmed and displayed value is 100.00, while the actual axis position value is 98.05, then you shall set the **Corr. X** to **1.95**.

INFO	The machine can stop any time in Single-Step bending, and then you can modify the programmed value of X-axis, so **Corr. X** is not necessary in Single-Step programming. However, there are a number of bending steps in Multi-Step programming, and **Corr. X** is assigned to each step.

2.8 Program Management

2.8.1 Create a Program

Press **F5** key to enter the **Program** page, as shown in Figure 2-8.

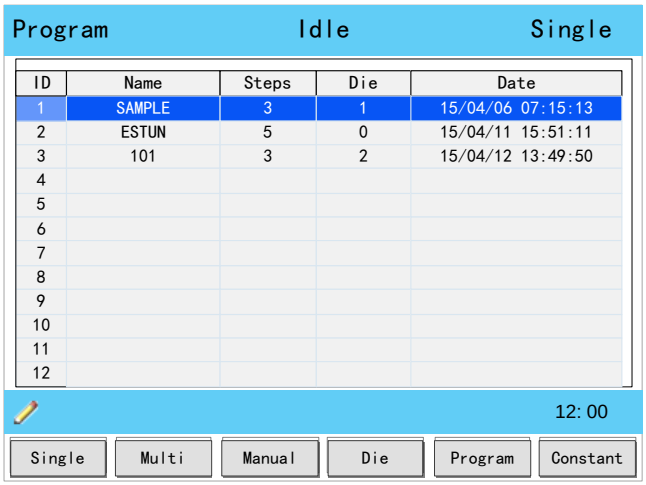


Figure 2-8 The Program page

Move the cursor on the program **Name**, and press NUMBERS keys to type a desired name. The typing method is 10 keys, that is, the numbers and letters on the same key can be switched by pressing several times. For example, **2**, **C** and **D** are in the same key, press once, shown as 2; quickly press twice, shown as C; quickly press three times, shown as D.

Press **ENTER** key to confirm your typing, the software can generate the **Steps**, **Die** and **Date**.

2.8.2 Edit the Program

Move the cursor on the program **ID** you want to edit, and press **ENTER** key to enter the **Multi-Step** page. In addition, when you enter the **Multi-Step** page, the selected program has been loaded.

For details about the program see the section **2.4 Multi-Step**.

2.8.3 Delete a Program

Move the cursor on the program **ID** you want to delete, and press **CLEAR** key. The page can display a dialog for asking whether to delete the selected item. Press **OK** to delete the selected program.

2.9 Teaching

In order to obtain the position values of the servo axes, the user needs to perform **Teaching** operation before the bending process, which can indicate the current position of the servo axis.

The diagram of machine coordinate system is as shown in Figure 2-9. You can refer to this diagram to complete the teaching value of the measurement and set.

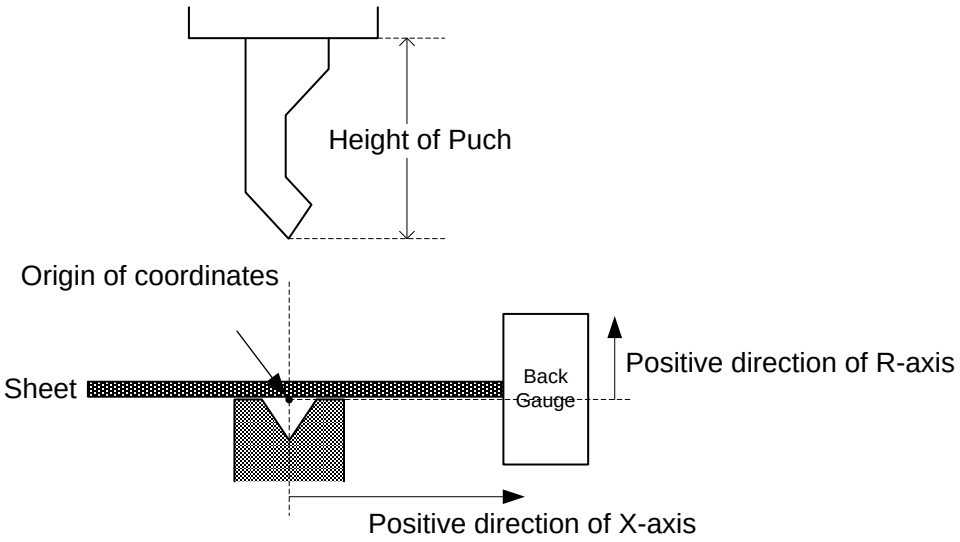


Figure 2-9 Coordinate system of machine

Type the password **1212** in **Constant** page to enter **TechIn Para** page, as shown in Figure 2-10.

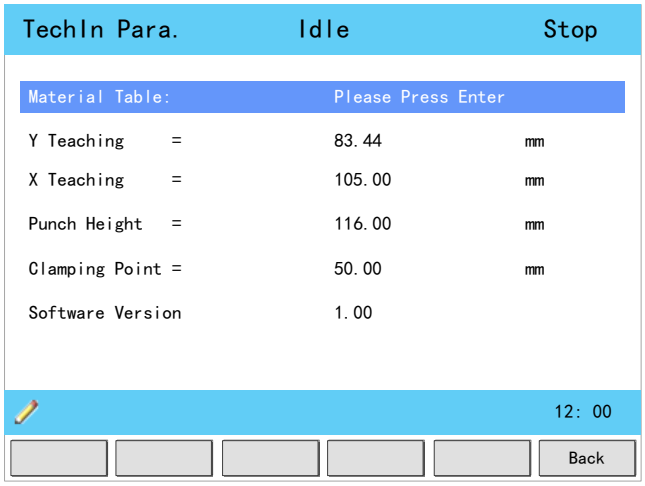


Figure 2-10 **TechIn Para** page

Press the arrow keys **UP** and **DOWN** to select a parameter, and type the desired value for them.

Y Teaching and Clamping Point

The purpose of teaching Y-axis is obtaining the comparative position value of clamping point. When you teach Y-axis, it is necessary to estimate the position value of the Y-axis in advance. For example, if the position of the Y-axis is estimated to be 50mm, and the procedure is as follows:

Step 2 Select the parameter **Y Teaching** in **TechIn Para page**, and set it to **50**.

Step 3 Return to the Single-Step page, and set the parameter **Angle** to **180**, and the other parameters can be set arbitrarily.
In general, when the machine is in clamping, the punch just against the top of the sheet, so the bending Angle is set to 180, in order to ensure that the sheet was clamped.

Step 4 Run the device, and record the Y-axis position displayed on the device when the process is in **Dwell**.

Step 5 Enter the **TechIn Para** page again, and fill the recorded value in the parameter **Clamping Point**.

INFO	The relation between **Y Teaching** and **Clamping Point** is comparative. If the position of Y-axis has been changed, you must perform the above procedure for obtaining the value of **Clamping Point** again.

----End

X Teaching

To teach the X-axis, you can measure the actual position of the X-axis, that is to say, measure the linear distance between the V-opening center of the die and back gauge.

Although there are many methods for teaching X-axis, their purpose is to ensure the processing accuracy. It is recommended that the user can run the machine once after roughly measuring the distance, that is, program a simple Single-Step program. For example, the measurement of the X-axis distance of 100mm, and the procedure is as follows:

Step 6 Select the parameter **X Teaching** in **TechIn Para** page, and set it to **100**.

Step 7 Return to the Single-Step page, and set the parameter **X-axis** to **100**, and the other parameters can be set arbitrarily.
Here we need not to consider the error from the machine itself.

Step 8 Run the machine. When the bending step has been completed, measure and record the worked sheet.

Step 9 Enter the **TechIn Para** page again, and fill the recorded value in the parameter **X Teaching**.

INFO	It is necessary to perform the above procedures for several times for ensuring the accuracy of the working.

----End

R Teaching

To teach the R-axis, you can measure and record the actual position of the R-axis directly, that is, measure the vertical distance between the top of the die and the back gauge. Then, enter the **TechIn Para** page again, and fill the recorded value in the parameter **R Teaching**.

Chapter 3 Basic Operation

3.1 Start

How to start

Press **START** key to startup the machine when you complete the program on Single-Step page or Multi-Step page, the servo-axis can start to positioning. When the machine is ready, it can be produced.

However, it is unavailable to press **START** key on other pages.

Start state

When the device is running, its indicator lamp can be lighting. In addition, you can see the status on the top of page is **RUN**.

3.2 Stop

How to stop

There are 3 cases for stopping the device.

- **Stop by a fault**: If any fault occurred during the operation, the machine can stop automatically.
- **Normally Stop**: it also includes the following case:
  - Manual stop: press **STOP** key, the running machine can stop.
  - Count is finished: for the **Count Mode** is **Cnt Down**, when the **Stock** is **0**, the running machine can stop automatically.
- **Emergency Stop**: press down **EMERGENCY STOP** button, the power supply of the system can be cut off.

Stop state

When the device is stopped, its indicator lamp can be lighting. In addition, you can see the status on the top of page is **Idle** or **Alarm**.

3.3 Alarm and Reset

Alarm information

As shown in Figure 3-1, which indicates a fault had occurred during the operation. It is necessary to solve it for recovering the running machine.

Figure 3-1 An alarm information occurred

How to reset

Follow the section **Appendix D Alarm List**, solving the fault according to the fault message, and then move the cursor on **Clear**, and press **ENTER** key, so that the system can try to reset.

However, the fault message may display again if the fault hasn't been solved properly.

Move the cursor on **Cancel** and press **ENTER** key, the **AlarmInfo** dialog-box can be hidden temporarily. To display it again, press **CLEAR** key when the page is on **SingleStep** or **Multi-Step**.

3.4 Monitor

You can view the ports allocation, valve status and fault list on **Status Monitor** page.

- ❑ Press and hold **START** key for 3 seconds when the machine is running.
- ❑ Press and hold **STOP** key for 3 seconds when the machine is not running.

Valve state

When you enter **Status Monitor** page, you can view the **Valve Status** tab, as shown in Figure 3-2.

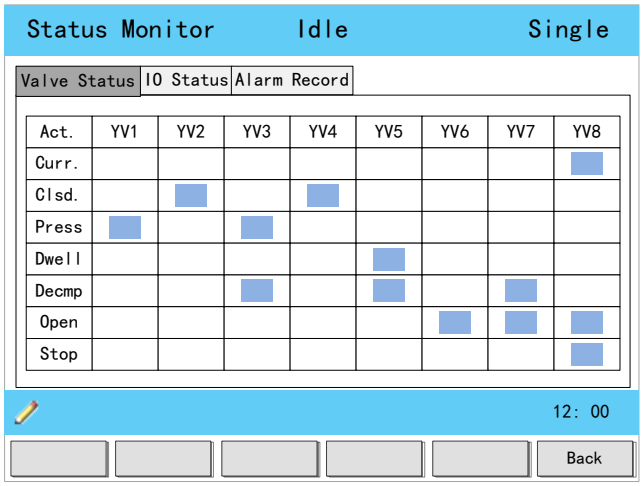


Figure 3-2 Valve status monitored

On **Valve Status** tab, you can view the output status of valves. Blue background indicates the port is turned ON while **Blank** indicates the port is turned OFF.

You can view the current valve status on **Curr.** row, and the other rows shows the allocation in corresponding process.

For example, you have allocated the process **Press** as **YV1** and **YV3**, when the machine is in **Press** process, the **Curr.** Row displays on **YV1** and **YV3**.

I/O state

Press arrow key **RIGHT** on the **Valve Status** tab, you can view the **IO Status** table, as shown in Figure 3-3.

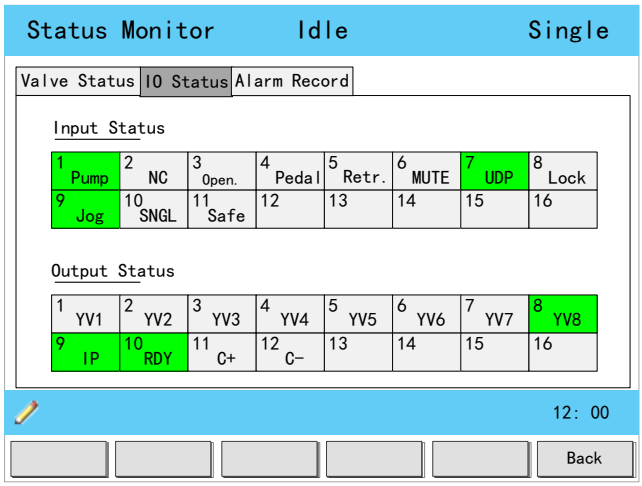


Figure 3-3 IO status monitored

Green background indicates the port is turned ON, while **Blank** indicates the port is turned OFF.

Alarm history

Press arrow key **RIGHT** on the **IO Status** tab, you can view the **Alarm Record** table, as shown in Figure 3-4.

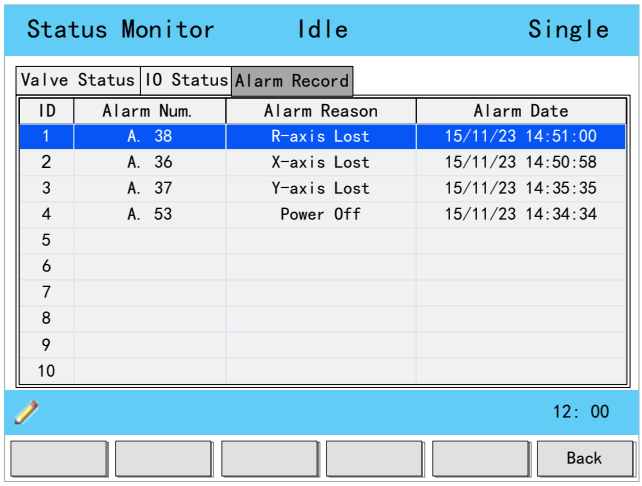


Figure 3-4 Alarm history page

- ID: numbering for the alarm list, descending sort by **Alarm Date**, i.e. ID 1 is the latest fault message.
- Alarm Num: to show the code of the fault. For detail about solving the faults, see the section **Appendix D Alarm List**.
- Alarm Reason: to show summary record of the fault.
- Alarm Date: to show when this fault occurred.

3.5 Constant

The commonly used parameters are displayed on **Constant** page, as shown in Figure 3-5.

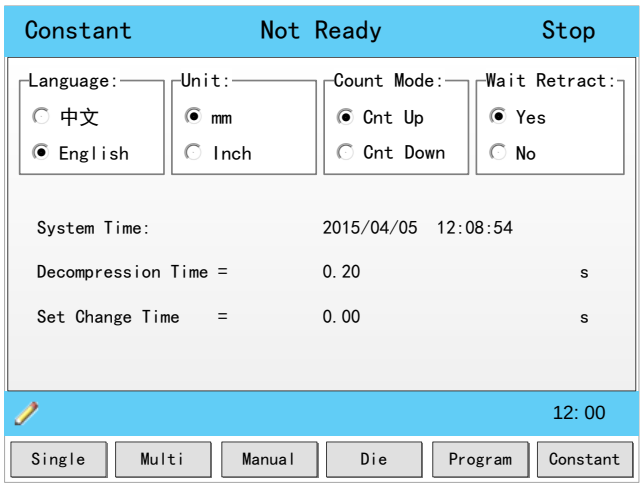
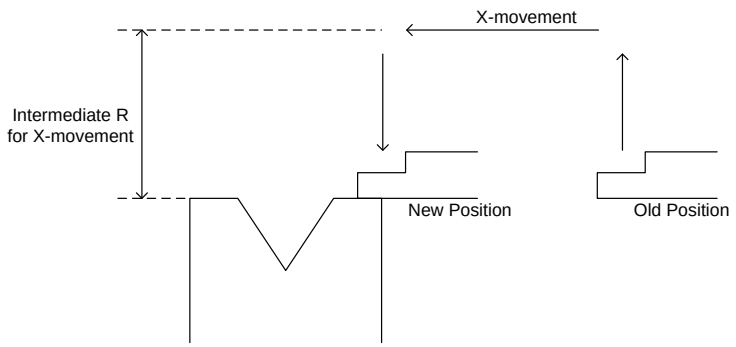


Figure 3-5 The Constant page

Table 3-1 list these parameters and their description.

Table 3-1 The description of the parameters on **Constant** page

Parameter	Description
Language	Select a desired language for the pages.
Unit	Select a desired length scale for the dimensions. E300 can convert the current dimensions automatically when you change this parameter.
Count Mode	Select a desired stock count mode. ● To select **Cnt Up**, the stock counter in production mode is increased by 1 after each product cycle. ● To select **Cnt Down**, the stock counter in production mode is decreased by 1 after each product cycle. When the counter has reached 0, the control is stopped. Down counting can be useful if a pre-planned quota must be produced. Up counting could be used to give a report on production progress.
Wait Retract	In the case of a retract, let the Y-axis wait until the retract is finished. ● To select **Yes**, when the Y-axis reaches the clamping point, the Y-axis is stopped and the retract is started. When the retract is completed, the Y-axis moves on. ● To select **No**, the retract is started when the Y-axis passes the clamping point, the Y-axis does not stop.
System Time	Set to a proper time for the system. The format is **yyyy/MM/dd HH:mm:ss**. For example, 2015/11/23 14:51:00.
Decompression Time	Set the duration for the decompression process. This parameter affects the time for tuning ON the valve of **Decmp**.
Set Change Time	Set a waiting time for entering next step when the previous step is completed.
Intermediate R	Temporary position for the R-axis, to avoid collision as a result of movement of the X-axis. The value 0 disables this functionality. When programmed not equal to zero this position will be active when the X-axis has to move inside the safety zone of the die. The sequence will be as follows: a. The R-axis is moved to the intermediate position; b. then the X-axis is moved to its intended position; c. finally the R-axis is moved to its intended position. 

Appendix A Glossary

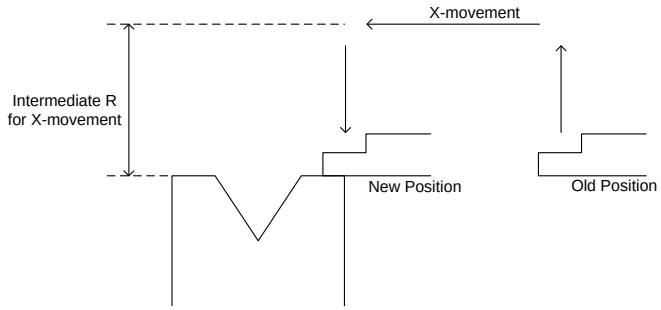
Glossary	Description
Axis	A reference direction, which can make the parts of the machine do the linear motion or rotation motion.
Machine Coordinate System	Cartesian coordinate system based on machine zero, which is fixed on the machine.
Computerized Numerical Control, CNC	Fulfill the numerical control the processing functions by the computer.
Reference Position	A fixed point along the axis, which can be referenced to the origin of the machine.
Hardware Limit	A limit position, which is mounted in the machine, can limit the movement of the parts.
Software Limit	A limit range, which is programmed in the device, can limit the movement of the parts.
Mute	A position where the process switches from Fast-Closing to Pressing.
DA (Digital to Analog)	To convert the Digital signal into the Analog signal. In general, decode the digital signal and convert into a corresponding level, which can form a step shape signal, and then perform a low-pass filtering.
AD (Analog to Digital)	To convert the Analog signal into the Digital signal. The analog signal is subjected to a line filter, and then samples the hold circuit to be a step shape signal, and then the step shape signal is converted into a binary code by the encoder, that is, the desired digital signal.
Upper Dead Point, UDP	The critical position for the movement of the beam, where the beam cannot continue to move upwards.
Punch	Also known as male mold, which is a die part forming the shape of the end face.
Die	Also known as female mold, which is a die part forming the shape of the outer.
Lower Dead Point, LDP	The critical position for the movement of the beam, where the beam cannot continue to move downwards. The theoretical position is at the lowest point of the V-Opening.
Fast Closing	One process of the bending step, which can make the beam moves to Mute fast.
Pressing	One process of the bending step, which can make the beam moves from Mute to bending point.
Dwell	In order to ensure the formation of the workpiece, it is necessary to keep the pressure for a period of time when the punch has been reached the bending point, against the tensile strength of the material.
Decompression	One process of the bending step, which can remove the pressure from the sheet.
Opening	One process of the bending step, which can make the beam moves towards the UDP.

Appendix B Parameters Lists

INFO	The double asterisk (**) at the front of the parameter indicates this parameter is displayed when you have updated the function.

Constant

Language	**Default**	中文
	Range	中文; English
	Unit	—
	Description	Select a desired language for the pages.
Unit	**Default**	mm
	Range	mm; Inch
	Unit	—
	Description	Select a desired length scale for the dimensions. E300 can convert the current dimensions automatically when you change this parameter.
Count Mode	**Default**	Cnt up
	Range	Cnt up; Cnt Down
	Unit	—
	Description	Select a desired stock count mode. ● To select **Cnt Up**, the stock counter in production mode is increased by 1 after each product cycle. ● To select **Cnt Down**, the stock counter in production mode is decreased by 1 after each product cycle. When the counter has reached 0, the control is stopped. Down counting can be useful if a pre-planned quota must be produced. Up counting could be used to give a report on production progress.
Wait Retract	**Default**	Yes
	Range	Yes; No
	Unit	—
	Description	In the case of a retract, let the Y-axis wait until the retract is finished. ● To select **Yes**, when the Y-axis reaches the clamping point, the Y-axis is stopped and the retract is started. When the retract is completed, the Y-axis moves on. ● To select **No**, the retract is started when the Y-axis passes the clamping point, the Y-axis does not stop.

System Time	**Default**	—
	Range	—
	Unit	—
	Description	Set to a proper time for the system. The format is **yyyy/MM/dd HH:mm:ss**. For example, 2015/11/23 14:51:00.
Decompression Time	**Default**	0.20
	Range	0.00 to 99.99
	Unit	s
	Description	Set the duration for the decompression process. This parameter affects the time for tuning ON the valve of **Decmp**.
Set Change Time	**Default**	0
	Range	0.00 to 9.99
	Unit	s
	Description	Set a waiting time for entering next step when the previous step is completed.
** Intermediate R	**Default**	5
	Range	0.00 to 99.99
	Unit	mm
	Description	Temporary position for the R-axis, to avoid collision as a result of movement of the X-axis. The value 0 disables this functionality. When programmed not equal to zero this position will be active when the X-axis has to move inside the safety zone of the die. The sequence will be as follows: a. The R-axis is moved to the intermediate position; b. then the X-axis is moved to its intended position; c. finally the R-axis is moved to its intended position. 

Material Table

ID	**Default**	—
	Range	1 to 6
	Unit	—
	Description	The number of the material, which shall be set on the programming page.
MatName	**Default**	—
	Range	Steel; Aluminum; Zn; Stainless Steel; Material5; Material6
	Unit	—
	Description	The name of the material, which is unable to set.

TStrength	**Default**	—
	Range	0 to 9 999 999
	Unit	N/mm^2
	Description	The tensile strength of the selected material.
EModulus	**Default**	—
	Range	0 to 9 999 999
	Unit	N/mm^2
	Description	The elastic modulus of the selected material.

TechIn Para

Y Teaching	**Default**	0
	Range	0.000 to 9 999.999
	Unit	mm
	Description	Set a taught position for Y-axis. See the section **2.9 Teaching** to perform the teaching operation.
X Teaching	**Default**	0
	Range	0.000 to 9 999.999
	Unit	mm
	Description	Set a taught position for X-axis. See the section **2.9 Teaching** to perform the teaching operation.
** R Teaching	**Default**	0
	Range	0.000 to 9 999.999
	Unit	mm
	Description	Set a taught position for R-axis. See the section **2.9 Teaching** to perform the teaching operation.
Punch Height	**Default**	0
	Range	0.000 to 9 999.999
	Unit	mm
	Description	Set this value according to the technical parameters of the punch.
Clamping Point	**Default**	0
	Range	0.000 to 9 999.999
	Unit	mm
	Description	Set a taught position for the clamping point. See the section **2.9 Teaching** to perform the teaching operation.
Software Version	**Default**	—
	Range	—
	Unit	—
	Description	Display the current version of the software.

Program

Name	**Default**	—
	Range	The maximum length is 12 characters, which may contain letters and numbers as available on the keyboard.
	Unit	—
	Description	A unique name to identify a product program.
 Die	**Default**	1
	Range	0 to 30
	Unit	—
	Description	Set a desired die ID for the program. The parameters of the die can be edited on **Die** page.
M Material	**Default**	1
	Range	1 to 6
	Unit	—
	Description	Set a desired material ID for the program, which is used for calculating the bending depth. The parameters of the material can be edited on **Material Table** page.
 Thickness	**Default**	0
	Range	0.000 to 99.999
	Unit	mm
	Description	The thickness of the sheet.
 Hold Time	**Default**	0
	Range	0.00 to 99.99
	Unit	s
	Description	The hold (dwell) time of punch at the bending point.
 Retr.DLY	**Default**	0
	Range	0.00 to 99.99
	Unit	s
	Description	The wait time before the X-axis performs the retract.
P Stock	**Default**	0
	Range	-1 to 999 999
	Unit	—
	Description	The stock counter is incremented or decremented after each end of a program cycle, which depends on the settings of the parameter **Count Mode**. Set it to -1, indicating the stock count is disabled. Set it to other value: When the **Count Mode** is **Cnt Down**, the stock counter in production mode is decreased by 1 after each product cycle. When the counter has reached 0, the machine is stopped. When the **Count Mode** is **Cnt Up**, the stock counter in production mode is increased by 1 after each product cycle.

	**Default**	0
	Range	-90.00 to 90.00
	Unit	°
	Description	This parameter is valid when the bending method is angle, which indicates the correction on angle to the whole bending. For example: If the programmed value is 90, while the actual measured value is 92, then this parameter shall be set to -2. If the programmed value is 90, while the actual measured value is 88, then this parameter shall be set to 2.
Steps	**Default**	1
	Range	1 to 25
	Unit	—
	Description	This parameter displays how many steps in the selected program.
BN	**Default**	1
	Range	1 to 25
	Unit	—
	Description	This parameter indicates the current bending step in the program.
X-axis	**Default**	0
	Range	0.000 to 9 999.999
	Unit	mm
	Description	The programmed value for the X-axis.
Y-axis	**Default**	0
	Range	0.000 to 9 999.999
	Unit	mm
	Description	The programmed value for the Y-axis.
** R-axis	**Default**	0
	Range	0.000 to 9 999.999
	Unit	mm
	Description	The programmed value for the R-axis.
** C-axis	**Default**	0
	Range	0.000 to 9 999.999
	Unit	mm
	Description	The programmed value for the C-axis.
Retract	**Default**	0
	Range	0.000 to 9 999.999
	Unit	mm
	Description	Retract distance of the selected axis in the current bend. The "backgauge retract" is started when the beam is pinching the sheet.

Corr. α	**Default**	0
	Range	-90.00 to 90.00
	Unit	°
	Description	This parameter is valid when the bending method is angle, which indicates the correction on angle to the current bending step . For example: If the programmed value is 90, while the actual measured value is 92, then this parameter shall be set to -2. If the programmed value is 90, while the actual measured value is 88, then this parameter shall be set to 2.
Corr.Y	**Default**	0
	Range	-99.99 to 99.99
	Unit	mm
	Description	Correction on the Y-axis position, in case absolute programming is used or bottoming is selected for a bend.
Angle	**Default**	0
	Range	0.00 to 180.00
	Unit	°
	Description	Set a desired angle value in the selected bending step.
Repeat	**Default**	1
	Range	1 to 99
	Unit	—
	Description	Set the repetition times for the selected bending step.
Open	**Default**	0
	Range	0.00 to 99.99 or 0.000 to 9 999.999
	Unit	s or mm
	Description	Set the opening distance or opening time for the opening process.

Die

Height	**Default**	0
	Range	0.000 to 999.999
	Unit	mm
	Description	The length from the top to the bottom of the die.
V-width	**Default**	0
	Range	0.000 to 999.999
	Unit	mm
	Description	The width of the V-opening.
Angle	**Default**	88
	Range	0.00 to 180.00
	Unit	°
	Description	The angle of the V-opening.
Radius	**Default**	1
	Range	0.000 to 999.999
	Unit	mm
	Description	The radius of the V-opening edges.

SafeZone	**Default**	10
	Range	0.000 to 999.999
	Unit	mm
	Description	To prevent back gauge to die collision, the movement of the R-axis shall be kept in this value add half of V-width.

Appendix C Timing Charts

As shown Figure C-1 and Figure C-2, you can view two timing charts, which are taken one ordinary bending step as the examples for representing the working status of each component.

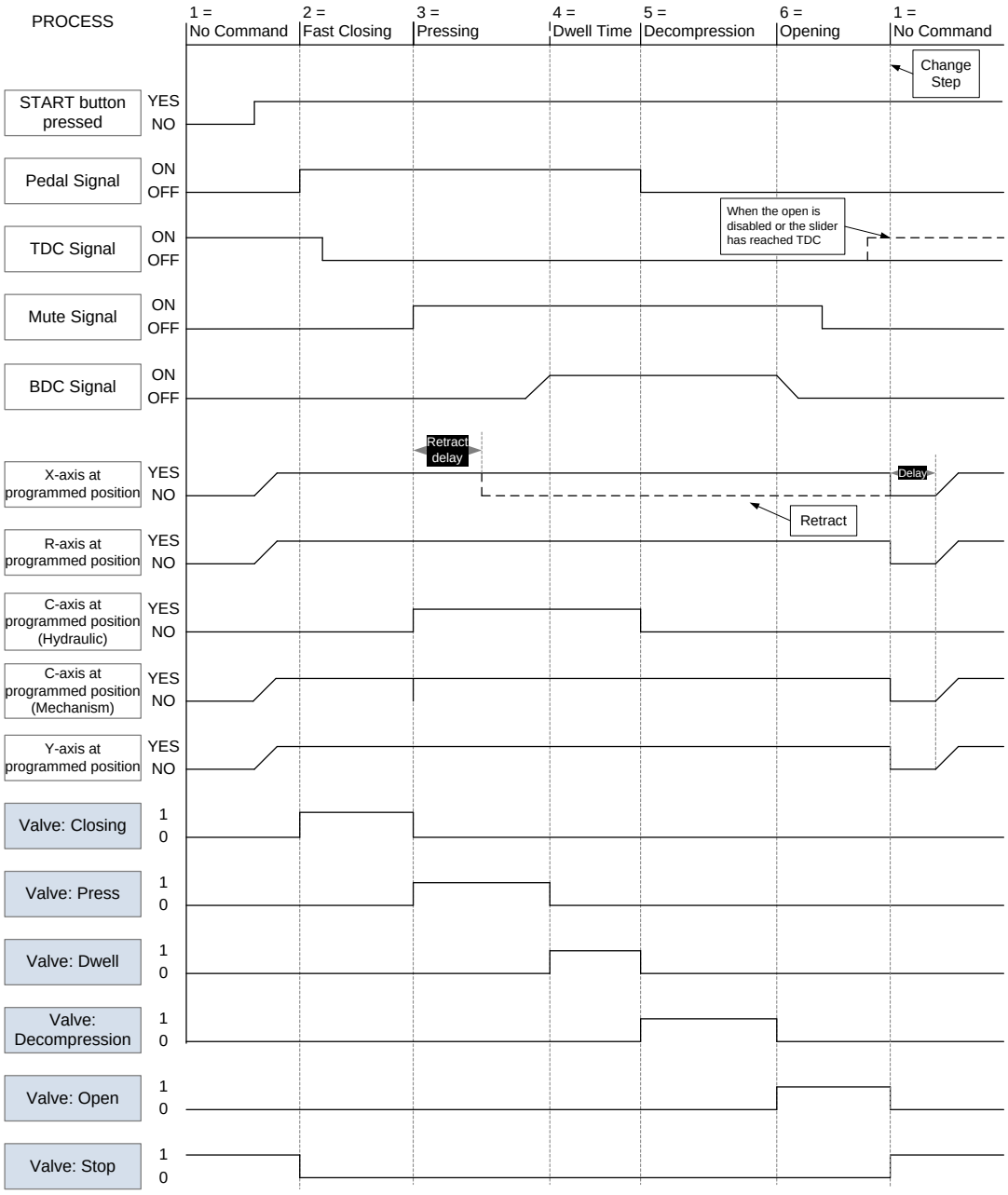


Figure C-1 Timing Chart A

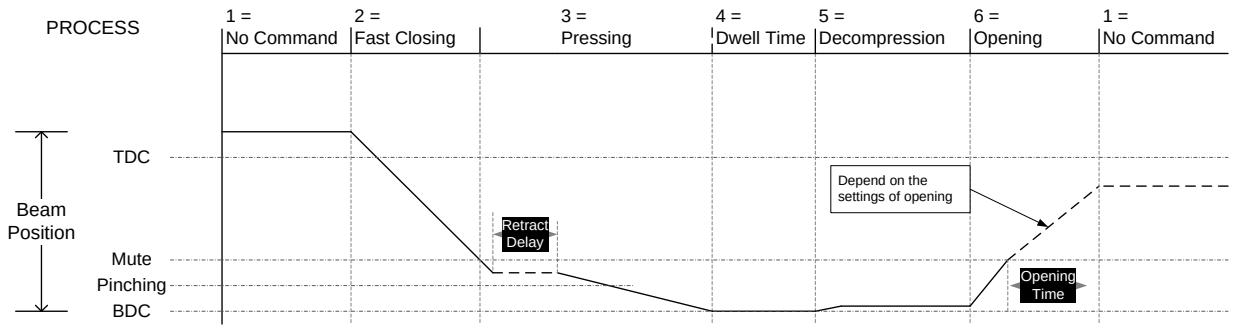


Figure C-2 Timing Chart B

INFO	■ In the case of retracting, let the Y-axis wait until the retract is finished, you shall set the parameter **Wait Retract** to **Yes**. ■ When the beam has reached the TDC in opening, the **TDC signal** can be turned ON and the beam stops the moving. ■ If you have set the parameter **Retract** in your programming, the X-axis can start retracting when the **Retr.DLY** time has been finished. Then, the X-axis will not reposition until the next step is started. ■ The opening time is started when the **Mute Signal** is turned from ON to OFF.

Appendix D Alarm List

No.	Alarm Name	Cause	Solution	Remove
A.02	Beam not in UDP	The beam is not on UDP when the process is performed.	You must manually move the beam to the UDP, and then continue your processing.	Automatic
A.03	Beam in mute	Both UDP signal and MUTE signal become effective at the same time.	Check the UDP signal and MUTE signal; only one signal shall be turned ON at the same time.	Automatic
A.04	Over MIN Pos.X	The position value of X-axis is less than minimum value.	Modify **Min. Value** in **X-PARM** page.	Automatic
A.05	Over MAX Pos.X	The position value of X-axis is greater than maximum value.	Modify **Max. Value** in **X-PARM** page.	Automatic
A.06	Over MIN Pos.Y	The position value of Y-axis is less than minimum value.	Modify **Min. Value** in **Y-PARM** page.	Automatic
A.07	Over MAX Pos.Y	The position value of Y-axis is greater than maximum value.	Modify **Max. Value** in **Y-PARM** page.	Automatic
A.08	Over MIN Pos.R	The position value of R-axis is less than minimum value.	Modify **Min. Value** in **R-PARM** page.	Automatic
A.09	Over MAX Pos.R	The position value of R-axis is greater than maximum value.	Modify **Max. Value** in **R-PARM** page.	Automatic
A.10	Safe Err	External safety signal such as Emergency Stop, Safety Door, and Safety Light Curtain was error.	Please check its wiring and port allocation.	Automatic
A.21	Counter Over	If the **Count Mode** is **Cnt Down**, when the **Stock** is **0**, the running machine can stop automatically.	Just modify **Stock** to another desired value, the machine can run again.	Manual
A.22	Pedal Err	The pedal signal is error.	Please check its wiring and port allocation.	Manual
A.23	Dies Collision	There may be a collision occurring, which is calculated by the system.	Please check and modify the correlative parameters to a properly value.	Manual
A.31	Machine not ready	The oil-pump signal is error.	Please check its wiring and port allocation.	Automatic

No.	Alarm Name	Cause	Solution	Remove
A.32	Mode Err	No mode signal or both the **Single** and **JOG** signals become effective at the same time.	Check whether the signals of **Single** and **Jog** is properly wired and allocated.	Manual
A.33	Mode_OPT_Err	Switch the operation mode when the machine was running.	This fault message will be displayed, and the machine stops right now.	Automatic
A.35	Communication Err	In the non-initialized state, the internal communication of the device is interrupted.	Contact ESTUN.	Manual
A.36	X-axis Lost	The system has no communication with the servo drive of X-axis.	Check the servodrive of X-axis and Check whether the CAN communication port is disconnected.	Manual
A.37	Y-axis Lost	The system has no communication with the servo drive of Y-axis.	Check the servodrive of Y-axis and Check whether the CAN communication port is disconnected.	Manual
A.38	R-axis Lost	The system has no communication with the servo drive of R-axis.	Check the servodrive of R-axis and Check whether the CAN communication port is disconnected.	Manual
A.39	Can Send Err.	Send the data by CAN failed.	Check whether the CAN communication port is disconnected.	Manual
A.40	Drive Para. Err.	The setting of parameter **Servo ID** is incorrect.	Modify the **Servo ID** and then press **Clear** to reset the alarm.	Manual
A.41	X-axis Err	The servo s in the alarm state.	See the servo user manual.	Manual
A.42	Y-axis Err	The servo is in the alarm state.	See the servo user manual.	Manual
A.43	R-axis Err	The servo is in the alarm state.	See the servo user manual.	Manual
A.51	DIO port Err	The port allocation is incorrect.	Check and renumber the port allocation.	Manual
A.52	System locked	The license of the device is incorrect.	Contact ESTUN or manufacturer.	Manual
A.53	Power Off	The power supply is lower than the rated value.	—	Manual
A.60	DRV Err Code 2310	Overcurrent	See the servo user manual.	Manual
A.61	DRV Err Code 3100	The servo was instantaneous outage.	See the servo user manual.	Manual
A.62	DRV Err Code 3110	Overvoltage	See the servo user manual.	Manual
A.63	DRV Err Code 3120	Under voltage	See the servo user manual.	Manual

No.	Alarm Name	Cause	Solution	Remove
A.64	DRV Err Code 5080	RAM chip exception	See the servo user manual.	Manual
A.65	DRV Err Code 5210	AD sampling exception	See the servo user manual.	Manual
A.66	DRV Err Code 5420	The bleeder resistor was damaged	See the servo user manual.	Manual
A.67	DRV Err Code 5421	Regeneration exception	See the servo user manual.	Manual
A.68	DRV Err Code 5581	Parameter sum check exception	See the servo user manual.	Manual
A.69	DRV Err Code 5582	Electronic gear error	See the servo user manual.	Manual
A.70	DRV Err Code 5583	Motor type parameter or drive type parameter error	See the servo user manual.	Manual
A.71	DRV Err Code 6100	Illegal error code	See the servo user manual.	Manual
A.72	DRV Err Code 6120	PDO mapping error	See the servo user manual.	Manual
A.73	DRV Err Code 6300	CAN communication error	See the servo user manual.	Manual
A.74	DRV Err Code 7303	Serial encoder error	See the servo user manual.	Manual
A.75	DRV Err Code 7305	Incremental encoder error	See the servo user manual.	Manual
A.76	DRV Err Code 7380	Resolver error	See the servo user manual.	Manual
A.77	DRV Err Code 8100	CAN communication error	See the servo user manual.	Manual
A.78	DRV Err Code 8110	CAN bus overflow	See the servo user manual.	Manual
A.79	DRV Err Code 8120	CAN bus was on PASSIVE	See the servo user manual.	Manual
A.80	DRV Err Code 8130	Heartbeat error	See the servo user manual.	Manual
A.81	DRV Err Code 8140	CAN bus was on BUS OFF	See the servo user manual.	Manual
A.82	DRV Err Code 8200	The length of CAN received message error	See the servo user manual.	Manual
A.83	DRV Err Code 8210	Received PDO length error	See the servo user manual.	Manual
A.84	DRV Err Code 8311	Overload	See the servo user manual.	Manual
A.85	DRV Err Code 8480	Overspeed	See the servo user manual.	Manual