alidynamics

Servo Press System

User Manual

Index

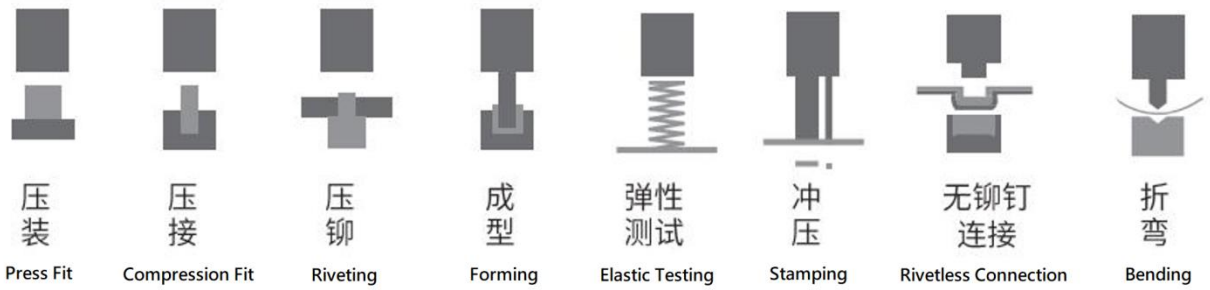
1. System Introduction

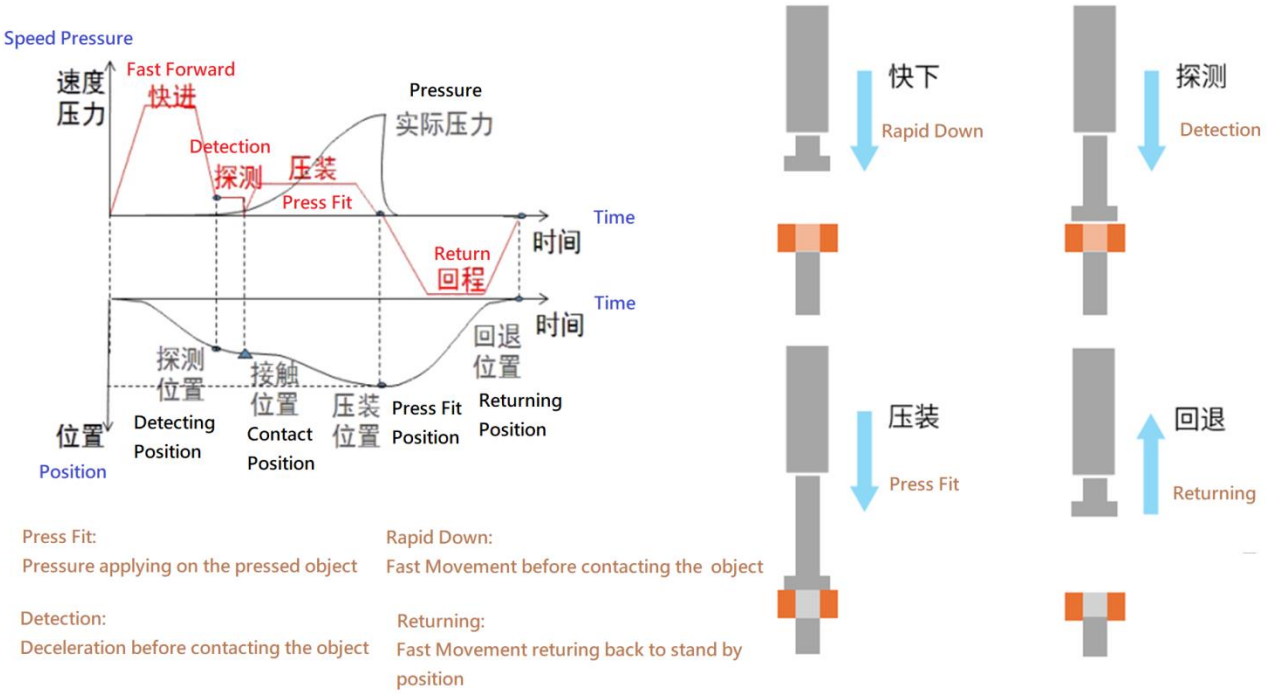
The servo press control system is developed based on the intelligent driver GSHD, utilizing a PC platform for the human-machine interaction component. In addition to basic functions such as parameter settings and status monitoring, it is specially designed with a position-pressure curve display to observe the pressure control process and perform historical data analysis, effectively meeting the needs of precision production.

2. Pressing Process Introduction

The servo press machine is widely used in industries such as automotive assembly, motor assembly, and bearing press-fitting. It is equipped with a high-precision servo motor and pressure sensor, enabling accurate real-time feedback of position and pressure. The press-fitting mode can be selected as either "position control / mode" or "pressure control / mode." In position control mode, the servo press can assess the quality of the workpiece based on feedback pressure values. Similarly, in pressure control mode, quality can be evaluated through position feedback.

During the press-fitting process, the servo press features multiple monitoring methods, including points, windows, and envelope lines, which can display the press-fitting curve in real time, save historical press-fitting curves, and more.





Press Fit:
Pressure applying on the pressed object

Rapid Down:
Fast Movement before contacting the object

Detection:
Deceleration before contacting the object

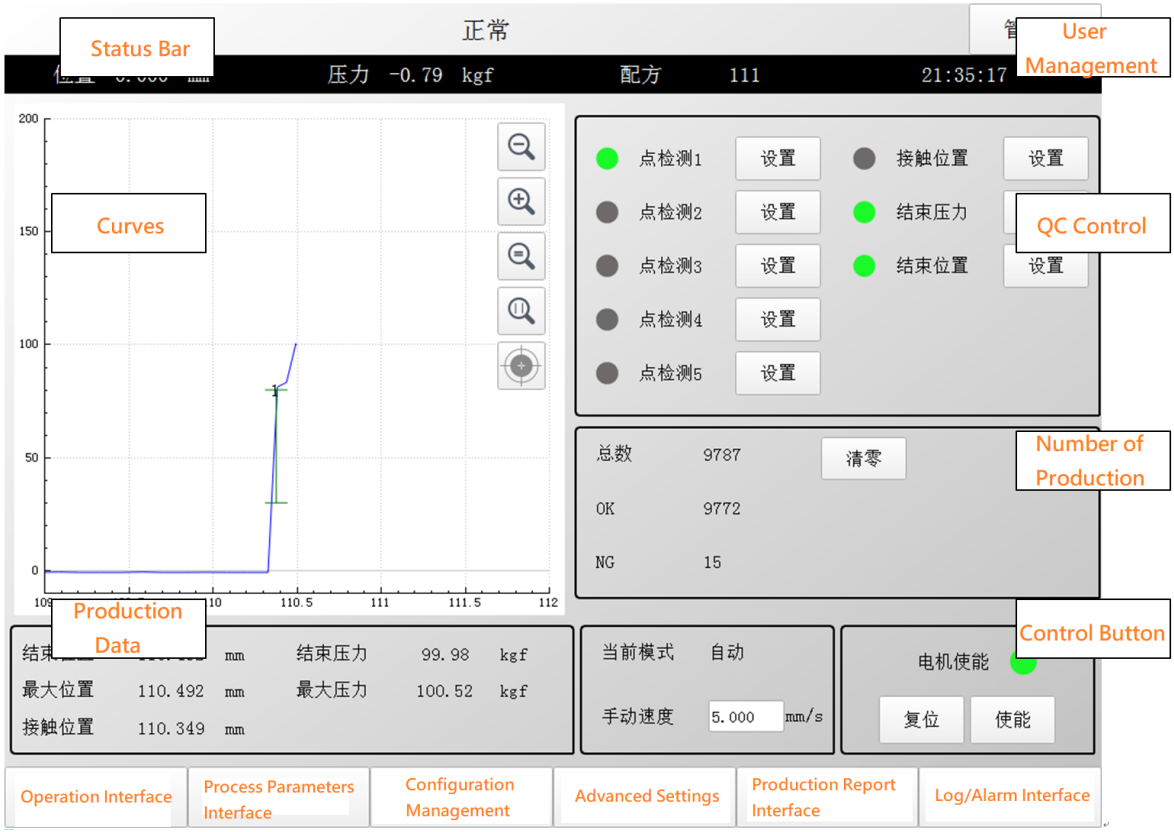
Returning:
Fast Movement returing back to stand by position

3. Operation Interface Introduction

The interface is divided into six main sections: Operation Interface, Process Parameters Interface, Configuration Management, Advanced Settings, Production Report Interface, and Log/Alarm Interface.

The system currently supports three user levels: Operator, Administrator, and Manufacturer. Users can manage these levels by triggering the user button in the upper right corner of the touchscreen, allowing login and logout operations as needed. Administrator and Manufacturer-level users can access the Advanced Settings interface for special functions and control loop parameter settings.

3.1 Operation Interface



1. User: Click to log in/log out users.

2. Status Bar: A. Position: Current press head position.

B. Pressure: Current press head pressure.

C. Configuration: Currently used process configuration.

3. Curves:

a.  : Zoom Out: Reduces the curve display.

b.  ： Zoom In: Enlarges the curve display

c.  Auto Adjust: Automatically adjusts the window display based on current curve values.

d.  ：User-Defined Range: Displays based on the oscilloscope range values set by the user.

e.  ：Crosshair Measurement Tool: Assists users in measuring the position and pressure values at any point on the curve.

4. Production Data Bar

a. End Position: Position of the press head after pressing is complete.

b. End Pressure: Pressure of the press head after pressing is complete.

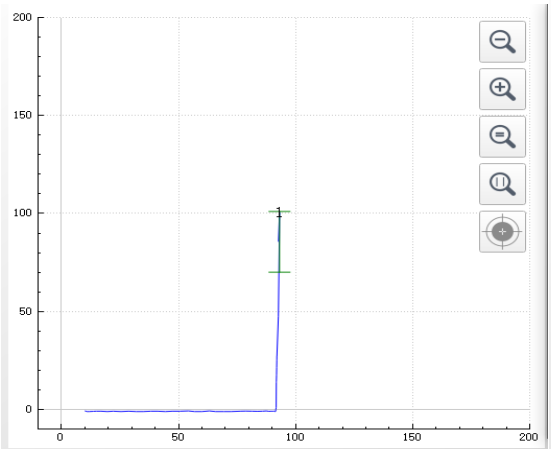
c. Maximum Position: Maximum position of the press head during the pressing process.

d. Maximum Pressure: Maximum pressure of the press head during the pressing process.

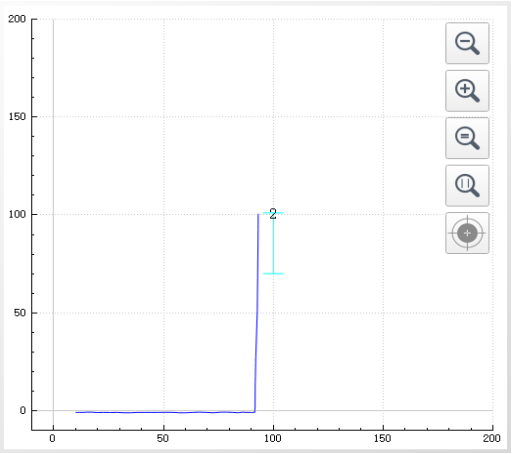
e. Contact Position: Position where the press head contacts the product.

5. Quality Control Interface

a. Point Test



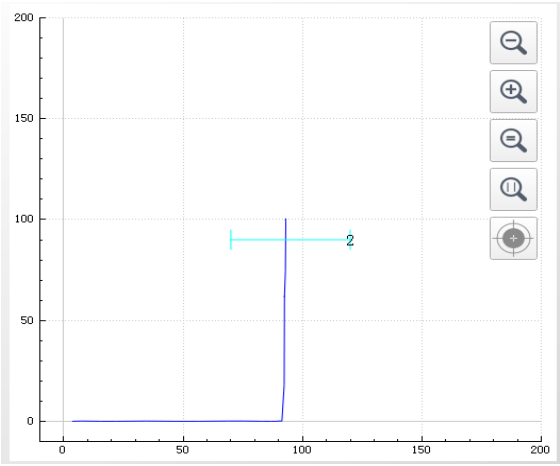
（Fig 1-OK）

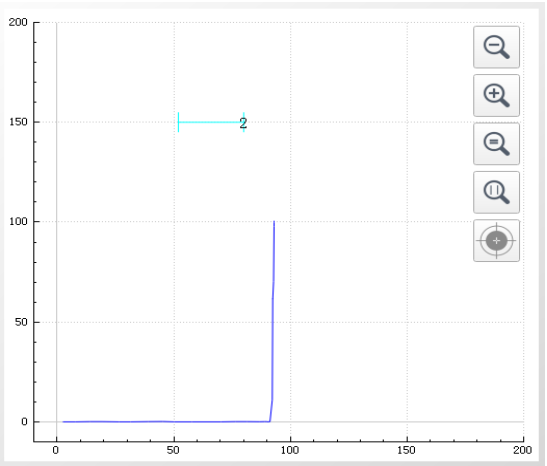


（Fig 2-NG）

Position Mode: At a specific position point, determines if the pressure at that point is within the range. (As shown in Figures 1-OK and 2-NG, the curve passes within the set range line; otherwise, it is considered NG.)

- **Set Position**: Specifies the position point to be detected.
- **Detected Value**: Captures the pressure value at that point.
- **Upper Pressure Limit**: Sets the upper limit for the pressure at the detection point.
- **Lower Pressure Limit**: Sets the lower limit for the pressure at the detection point.





（Fig 3-OK）　　（Fig 4-NG）

Pressure Mode: At a specific pressure point, determines if the position at that point is within the range. (As shown in Figures 3-OK and 4-NG, the curve passes within the set range line; otherwise, it is considered NG.)

- **Set Pressure**: Specifies the pressure point to be detected.
- **Detected Value**: Captures the position value at that point.
- **Upper Position Limit**: Sets the upper limit for the position at the detection point.
- **Lower Position Limit**: Sets the lower limit for the position at the detection point.

b. Contact Point Check

Detected Value: Captures the position value at the contact point.

Upper Limit: Sets the upper limit for the position at the detection point.

Lower Limit: Sets the lower limit for the position at the detection point.

c. End Pressure Check

Detected Value: Captures the end pressure value.

Upper Limit: Sets the upper limit for the pressure at the detection point.

Lower Limit: Sets the lower limit for the pressure at the detection point.

d. End Position Check

Detected Value: Captures the end position value.

Upper Limit: Sets the upper limit for the position at the detection point.

Lower Limit: Sets the lower limit for the position at the detection point.

6. Production Count Bar

a. Total Count: Indicates the total number of products processed in the current work.

b. OK Count: Indicates the number of qualified products in the current work.

c. NG Count: Indicates the number of defective products in the current work.

7. Manual/Automatic Operation Bar

a. Current Mode: Current equipment state (Manual/Automatic).

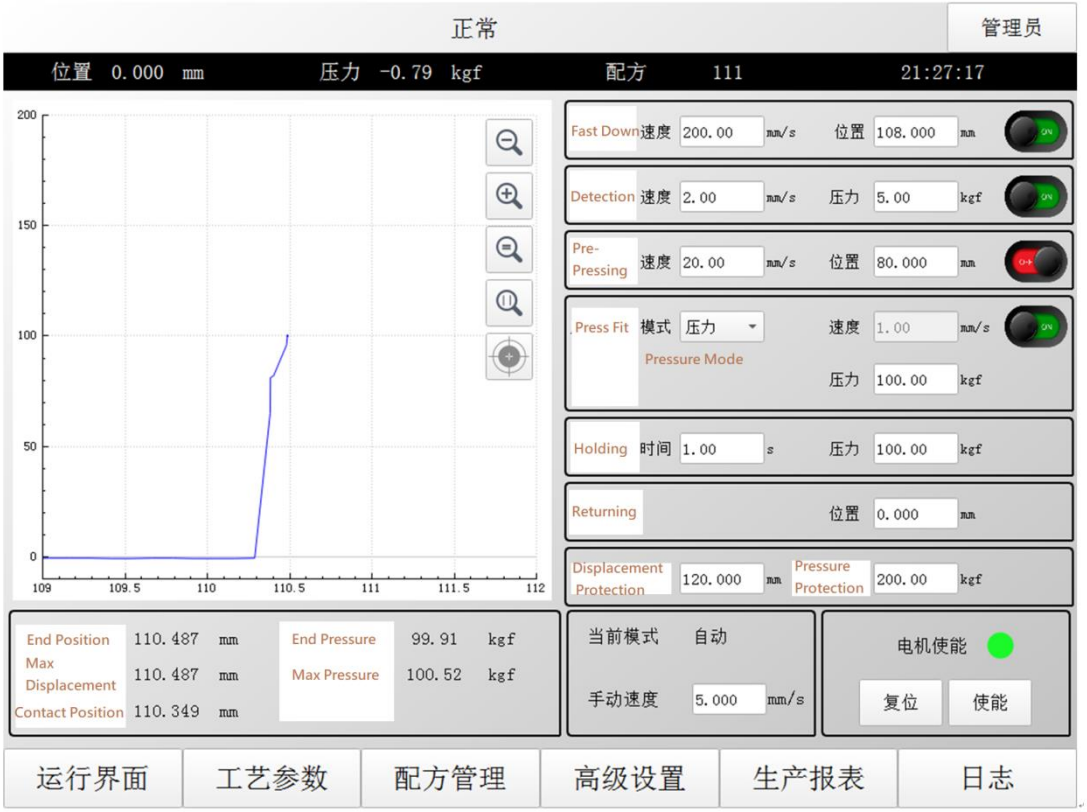
b. Manual Speed: Speed for moving up/down in manual mode.

c. Motor Enable: Enable button to manually trigger motor up/down enable. A green light indicates the motor is enabled. Additionally, a homing operation is automatically performed after each motor enable.

d. Reset Button: Clicking clears the current clearable alarms and performs a homing operation.

3.2 Process Parameters Interface

Click "Process Parameters" to enter the process parameter setting interface (the entire process is divided into stages: Fast Down --> Detection --> Pre-Pressing --> Pressing --> Holding --> Return, with each stage configurable to be enabled or disabled).



Process Parameters Bar

a. **Fast Down**

- **Speed**: Fast descent movement speed.
- **Position**: Target position for fast descent movement. (*Note: This position is recommended to be 1-2 mm above the product surface.*)

b. **Detection**

- **Speed**: The press head approaches the contact load at this speed from the fast descent end position. (*Note: Adjust speed between 1–30 mm/s based on load rigidity.*)
- **Pressure**: Pressure threshold for the press head contacting the product. If the actual pressure exceeds this value during the probing stage, it is considered correct contact with the product. Unit: Kgf.

c. **Pre-Pressing**

- **Speed**: Pre-pressing movement speed. (*Note: Adjust speed between 1–30 mm/s based on load rigidity.*)
- **Position**: Target position for pre-pressing movement. (*Note: Used to reduce pressing time for larger pressing strokes.*)

d. **Pressing**

- **Mode**: Position Mode, Pressure Mode.
- **Speed**: Pressing movement speed.
- **Position**: Target position for pressing movement in position mode.
- **Pressure**: Target pressure for pressing movement in pressure mode.

e. **Holding**

- **Time**: Holding stage duration.
- **Pressure**: Holding pressure. (*Note: In pressure mode, the system executes the holding pressure and time; in position mode, the system executes only the holding time.*)

f. **Return**

- **Position**: Target position for return movement.

g. **Protection Parameters**

- **Protection Displacement**: If the actual position of the press head exceeds this value during pressing, the system alarms and stops movement.
- **Protection Pressure**: If the actual pressure exceeds this value during pressing, the system alarms and stops movement.

3.3 Configuration Interface

a. **New:** Create a new current process parameter configuration.

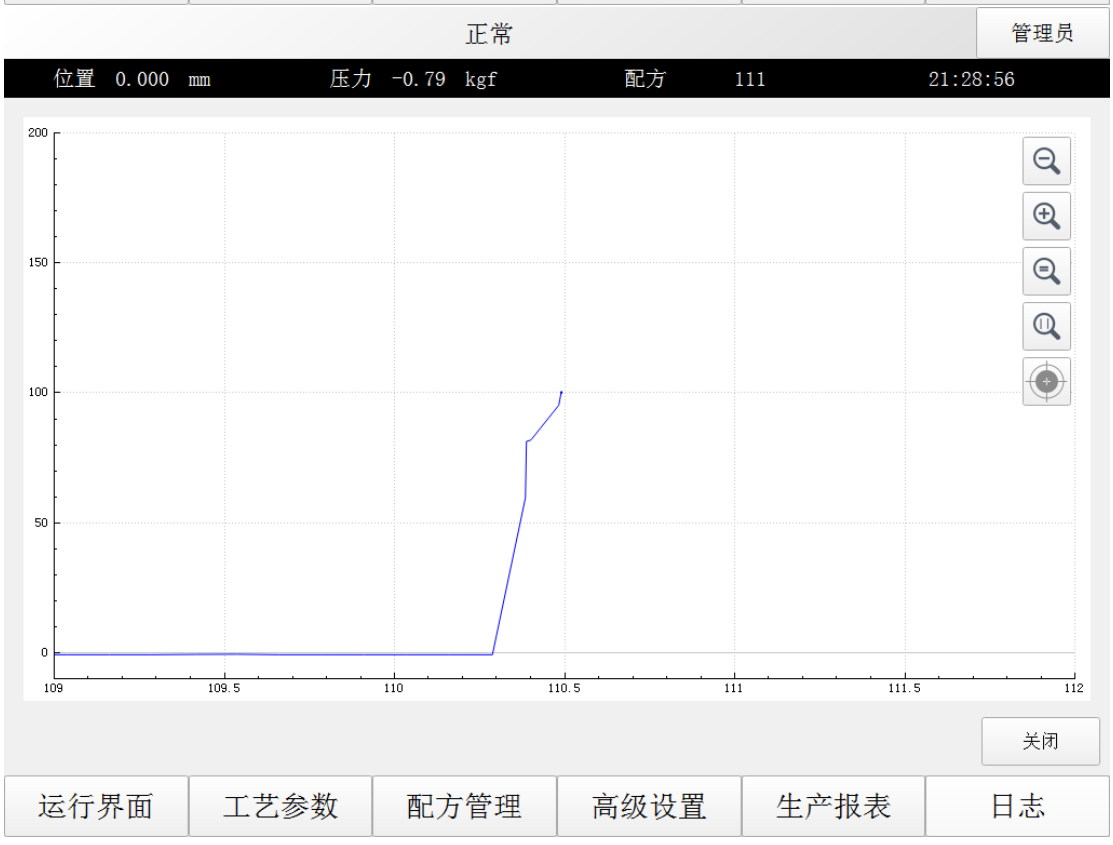
b. **Load:** Load the selected configuration into the process parameters. Note: After loading a new file, the system will enter a restart process to take effect, during which a connection error alarm may appear. Perform a reset operation to resolve.

c. **Delete:** Delete the selected configuration.

d. **Up/Down Buttons:** Appear when the list exceeds one page, used for navigating up and down pages

3.4 Production Report Interface

时间	接触位置	结束位置	结束压力	最大位置	最大压力	质量
2022-02-07 21:22:20	110.348	110.492	99.79	110.492	101.01	OK
2022-02-07 21:20:46	110.346	110.492	100.52	110.492	100.83	OK
2022-02-07 21:20:38	110.346	110.494	100.52	110.494	101.01	OK
2022-02-07 16:51:53	110.353	110.491	99.79	110.491	100.52	OK
2022-02-07 16:51:44	110.351	110.497	99.79	110.497	100.52	OK
2022-02-07 16:51:32	110.349	110.498	99.91	110.498	100.52	OK
2022-02-07 11:16:02	110.348	110.487	99.79	110.487	100.52	OK
2022-02-07 11:10:19	110.350	110.492	100.40	110.492	100.52	OK
2022-02-07 11:00:08	110.349	110.487	100.40	110.487	100.52	OK
2022-02-07 10:59:53	110.348	110.487	100.40	110.487	100.52	OK
2022-02-07 10:50:01	110.348	110.485	100.04	110.485	100.52	OK
2022-02-07 10:49:15	110.348	110.490	99.91	110.490	100.52	OK
2022-02-07 10:47:41	110.347	110.486	100.40	110.486	100.52	OK



a. Production Report: Used to record key data information during the production process, including production time, contact position, end position, end pressure, maximum position, maximum pressure, and product quality results. All production data is stored by date, and users can trace data by selecting the corresponding date and triggering the query button.

b. Curve Viewing: Select the data to be observed from the list and trigger the "View Curve" button to load the historical curve into the oscilloscope for detailed analysis by the user.

3.5 Log/Alarm Interface

a. Log/Alarm: Primarily used to record system alarms, logged in the order of their occurrence. Users can perform fault analysis by using the page navigation buttons in the list.

3.6 Advanced Setting

a. **System Parameters**

- **Reduction Ratio**: The reduction ratio of the transmission mechanism between the motor output shaft and the actuator screw.
- **Lead**: The pitch of the actuator screw.
- **Maximum Stroke**: The maximum stroke of the actuator.

b. **Motion Parameters**

- **Acceleration**: The speed increase per second in position mode.
- **Deceleration**: The speed decrease per second in position mode.
- **Return Speed**: The movement speed of the press head during return.

c. **Curve Range**

- **Horizontal Axis Minimum**: The minimum position on the curve display range horizontal axis.
- **Horizontal Axis Maximum**: The maximum position on the curve display range horizontal axis.
- **Vertical Axis Minimum**: The minimum pressure value on the curve display range vertical axis.
- **Vertical Axis Maximum**: The maximum pressure value on the curve display range vertical axis.

d. **Pressure Loop Parameters**

- **Proportional Coefficient**: Kp, representing the pressure rise slope. A larger value results in faster pressure rise but may cause overshoot.
- **Ramp Time**: The time for pressure rise (generally unchanged).
- **Output Saturation Value**: The upper limit proportion exceeded during Kp and Ki adjustments (generally unchanged).

e. **Other Parameters**

- **Empty Loop Test**: Enables cyclic operation after activation.

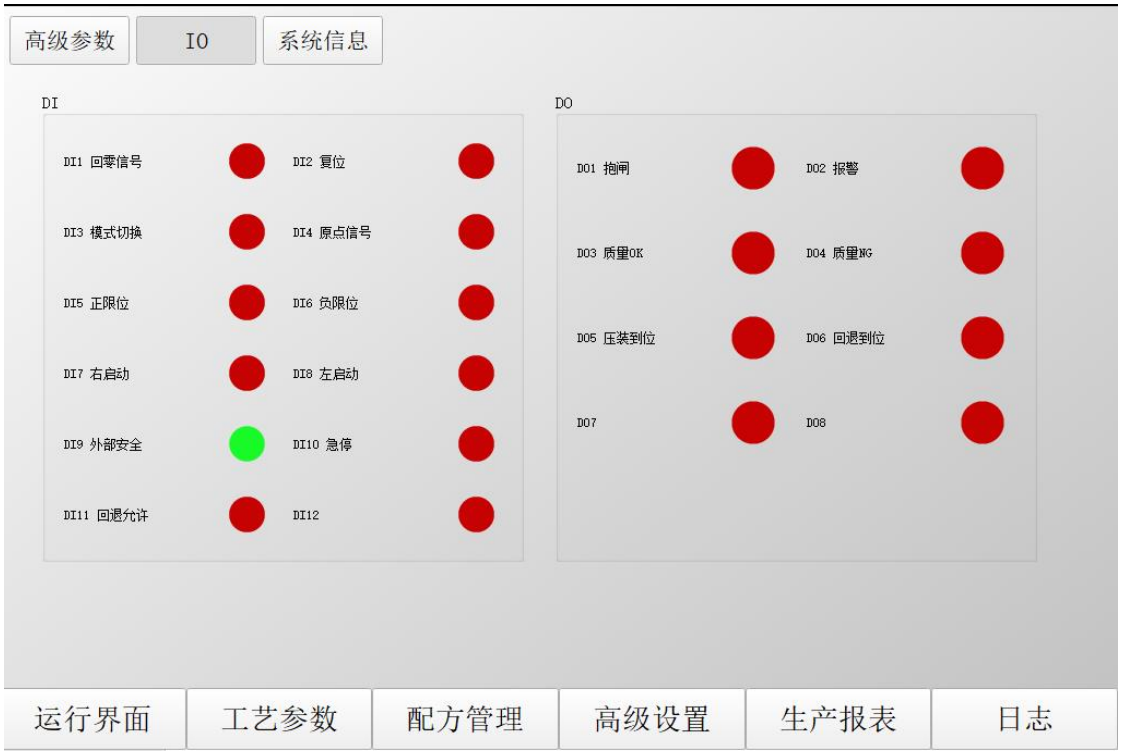
f. **Curve Mode**

- **Position-Pressure**: Oscilloscope in the operation interface with position as the horizontal axis and pressure as the vertical axis.
- **Time-Pressure**: Oscilloscope in the operation interface with time as the horizontal axis and pressure as the vertical axis.

g. **Initialization**

- **Alarm Clear**: Clears only the current alarm.
- **Enable**: Powers on the motor for movement after clicking; green indicates the motor is powered.
- **Homing**: Returns to the origin from the current position.

h. **DI/DO Signal List**: Used to observe the status of system input/output signals, where green indicates triggered and red indicates not triggered.



Note: After modifying advanced parameters, you need to enter the Configuration Management interface and click "Download" to send the parameters to the driver.

3.7 IO Interaction and Pin Definitions

a. Input Signal Definitions and Pins

Type	Command	Definition	Pin	Remarks
Digital Input	Set Zero Command	DI1	C2-3	
	Return	DI2	C2-20	Interaction with external PLC avaliable
	Switch Mode	DI3	C2-31	Interaction with external PLC avaliable, Auto/Manual Switch
	Home Signal	DI4	C2-14	
	Limit +	DI5	C2-32	
	Limit -	DI6	C2-15	
	Left Start	DI7	C3-5	Interaction with external PLC avaliable
	Right Start	DI8	C3-15	Interaction with external PLC avaliable
	External Safe	DI9	C3-6	Interaction with external PLC avaliable
	Emergency Stop	DI10	C3-16	Interaction with external PLC avaliable
	Return Approval	DI11	C3-7	Interaction with external PLC avaliable

b. Output Signal Definitions and Pins

Type	Command	Definition	Pin	Remarks
Digital Output	Brake Output	D01	C2-2	
	Alarm Output	D02	C2-33	Interaction with external PLC avaliable
	Quality "OK"	D03	C2-16	Interaction with external PLC avaliable
	Quality "NG"	D04	C2-17	Interaction with external PLC avaliable
	Pressing in Place	D05	C2-8	Interaction with external PLC avaliable
	Return in Place	D06	C2-18	Interaction with external PLC avaliable

Type	Name	Definition	Pin	Remarks
Power	24V	24V-	C2-1	
		24V+	C2-19	
		24V-	C3-19	
		24V+	C3-9	

Pressure Sensor Amplifier Analog Definition 0–10V between AN+ and AN- corresponds to the pressure sensor range.

Type	Name	Definition	Pin	Remarks
Analog Input	AI-1	AI-1+	C2-8	
		AI-1-	C2-26	

c. Driver IO Configuration

Run the desktop program DriverStudio, 

select the connection to modify the parameters in the underlying driver. Digital IO

2.8 Common Alarm / Error

Alarm Content	Cause	Solution
Servo Alarm, Enable Loss	1. Check if the fast descent speed is too high. 2. Check if an unsuitable position causes excessive current during pressing. 3. Emergency stop alarm triggered.	1. Reset, then modify the fast descent speed. 2. Reset, then adjust to a suitable pressing position. 3. Check if the emergency stop has been activated.
No Response in Manual Mode for Up/Down Movement	The press head position is above the homing signal, preventing the homing point from being found.	After powering on, go to Advanced Parameters/Enable, manually move downward a certain distance, then reset to home.
Pressure Exceeds Protection Value	1. Check if the current position is reasonable, leading to overpressure.	Reduce the position parameter.
Displacement Overlimit	1. Probing is enabled but no product is detected. 2. Protection displacement is set too small.	Adjust to a suitable fast descent position or increase the protection displacement.
Operation Timeout	The operation cycle exceeds the set cycle time.	Modify the operation cycle time in the Process Parameters Interface.
Positive/Negative Limit Alarm	The actuator has reached the positive or negative limit.	Adjust the positive and negative limit positions of the actuator as needed.
No Return After Pressing in Place	Check if the IO return permission signal is normal.	A return permission signal is required after pressing in place to initiate return.
External Safety Alarm	The light curtain has been triggered.	Ensure the light curtain is not obstructed.