



# Operation Manual

(Valve Test Bench)

*Issued by*

**Chongqing Weiyun Technology Development Co.,Ltd**

## Content

|  |        |
|--|--------|
| 1. Introduction .....  | - 1 -  |
| 1.1 Safety Criterion .....                                   | - 1 -  |
| 1.2 After-Sales Service .....                                | - 2 -  |
| 2. Working Principle .....                                   | - 3 -  |
| 2.1 Design Schematic Diagram .....                           | - 3 -  |
| 2.2 Circuit Schematic Diagram .....                          | - 3 -  |
| 3. Instructions .....  | - 3 -  |
| 3.1 Working Condition .....                                  | - 3 -  |
| 3.2 Technical Data .....                                     | - 4 -  |
| 3.3 Operation Instructions .....                             | - 5 -  |
| 3.3.1 Valve Test Console Stand .....                         | - 5 -  |
| 3.3.2 Horizontal Valve Test Stand .....                      | - 7 -  |
| 3.3.3 Vertical Valve Test Stand .....                        | - 8 -  |
| 3.3.4 Valve and Switch Function Indication .....             | - 9 -  |
| 3.3.5 Device Interface Connection Indication .....           | - 15 - |
| 3.3.6 Software Function Indication .....                     | - 19 - |
| 4.1 Equipment Operation Tutorial .....                       | - 23 - |
| 4.4.1 Prepare Pressure Test .....                            | - 23 - |
| 4.4.2 Valve Clamping Step .....                              | - 26 - |
| 4.4.3 Operation Process of Horizontal valve test stand ..... | - 29 - |
| 4.4.4 Operation Process of Vertical valve test stand .....   | - 37 - |
| 4. Precautions and Requirements for Equipment .....          | - 43 - |
| 5. Repair and Maintenance .....                              | - 45 - |
| 6. Attachment 1 .....  | - 47 - |
| 7.Attachment 2 .....   | - 48 - |

# 1. Introduction

The valve test bench is a customized equipment produced according to user's requirement of valve pressure testing. The equipment is divided into three parts: horizontal valve test stand, vertical valve test stand and valve test console stand. Horizontal valve test stand is mainly used for pressure testing of large-sized through valves, and can perform hydraulic and air tightness tests on valves. The vertical valve test stand is mainly used for pressure test of small size safety valve, and the valve test console stand is mainly used for setting and recording pressure test parameters.

This equipment is equipped with high pressure water pump and high pressure air pump. The highest theoretical output pressure of air pressure and water pressure is 450bar. Please select the appropriate pressure for pressure testing based on the pressure bearing capacity of the tested valve ,and do not operate under over pressure.



## **WARNING**

***The equipment is high-voltage equipment, which has safety risks. Please read this manual carefully before using the equipment.***

### 1.1 Safety Criterion

- 1) The equipment should be operated by strictly trained personnel according to the process or under the guidance of professional personnel;
- 2) All pipeline interfaces, especially high-pressure interfaces, cannot be disassembled or replaced arbitrarily;
- 3) The equipment needs to undergo routine maintenance as required;
- 4) After the equipment is used, the power must be cut off and completely unloaded;



## **WARNING**

- *The maximum intake pressure of the gas booster pump is 200bar, and exceeding 200bar will cause pump damage.*
- *Do not perform any operations on any workpiece or pipeline when the system is under pressure.*
- *High pressure gas pressure experiments are dangerous, especially for large-sized workpieces. It is recommended to conduct them outdoors or in a ground pit. When turning the valve, please operate slowly and take protective measures.*
- *During the operation of the equipment, operators are not allowed to leave the control panel;*
- *Before conducting a gas pressure test on the workpiece, please use a water medium for the pressure test. After passing the water pressure test, drain the water inside the workpiece thoroughly and conduct a pressure test;*
- *When conducting a hydraulic test on the equipment, it is necessary to first discharge the gas inside the valve, and when conducting a gas pressure test, it is necessary to first discharge the liquid inside the valve.*

## **1.2 After-Sales Service**

**Chongqing Weiyun Technology Development Co., Ltd.**

Address: 7-1-3, Zhonghaiwai Zhihuigang Industrial Park,

58 Jiade Ave., Beibei District, 400707

Chongqing City, China

Tel: 0086 (023) 67276820

Fax: 0086 (023) 63089919-8

Email: info@wingoil.com

## 2. Working Principle

### 2.1 Design Schematic Diagram

Referred as attachment 1

### 2.2 Circuit Schematic Diagram

Referred as attachment 2

## 3. Instructions

### 3.1 Working Condition

- 1) Ambient temperature:  $-10\sim 50^{\circ}\text{C}$ ;
- 2) Ambient humidity: 10%~100%
- 3) Power supply: Voltage AC  $220\text{V}\pm 10\%$ , frequency  $50\text{HZ}\pm 1$ ;
- 4) Water supply

Industrial filtration water: Total float  $\leq 5\text{ mg/L}$ , hardness  $\leq 10.6\text{Dh}$ , pressure  $\geq 0.3\text{MPa}$ ;

Clean circulating water: pressure  $0.2\text{Mpa}$ ;

## 3.2 Technical Data

### 1) Equipment Size

- Horizontal Valve Test Stand(mm): 2200L×1450W×1550H
- Vertical Valve Test Stand (mm):650L×650W×1000H
- Valve Test Console Stand(mm): 1250L×700W×1400H

### 2) Interface size

- Air source inlet:  $\phi 12$  PU quick connector
- Nitrogen inlet: G3/8"
- High pressure outlet: G3/8"
- Sensor connection:M20×1.5
- Pressure gauge connection:M20×1.5
- Air source gauge connection:M14×1.5

3) Access voltage: AC 220V± 10%, frequency 50 HZ ± 1

4) Drive gas pressure: ≤10bar

5) Test the pressure of nitrogen inlet :200bar

6) Test medium:Natural water (recyclable), Nitrogen (non- recyclable)

7) Noise:≤80dB(A)

8) Test pressure accuracy: The detection accuracy of the pressure sensor was 0.5%, and the control accuracy was ± 1%;

### 9) Horizontal valve test stand parameter

- Test pressure:1-38Mpa
- Valve inner diameter (mm): DN80-DN300
- Maximum length of valve:1m
- Bearing tension of the equipment frame body:150T

### 10) Vertical valve test stand parameter

- Test pressure:1-45Mpa

- Valve connection size: G1/2
- Adapter tooling size: 1/2 "NPT, 3/4" NPT, 1 "NPT

### 3.3 Operation Instructions

#### 3.3.1 Valve Test Console Stand



- **Valve Test Console Stand Function Indication**

|   |  |   |  |    |  |
|---|--|---|--|----|--|
| 1 | <i>Low Pressure Pump Switch-Water Supply Pump Switch</i> | 9 | <i>Test Start-Test Pressure Button</i> | 17 | <i>Low Pressure Gauge Switch-Low Pressure Test Pressure Gauge Switch</i> |
|---|--|---|--|----|--|

|   |  |    |   |    |   |
|---|--|----|---|----|---|
| 2 | <b>Gas Source Switch</b><br>-Nitrogen pump<br>Switch                                     | 10 | <b>PLC Screen-PLC</b><br>Control Screen   | 18 | <b>Bubble-Bubble Device</b><br>Switch   |
| 3 | <b>Low Pressure Pump Regulator</b><br>-Water Supply Pump<br>Pressure Conversion<br>Value | 11 | <b>Power Switch-Equipment</b><br>Power Switch                                   | 19 | <b>P-end Conversion Valve-P-end Shut-off</b><br>Value                         |
| 4 | <b>N2 Pressure Regulator-Nitrogen pump pressure Conversion valve</b>                     | 12 | <b>Bubble Observation Port-Bubble Observation Device</b>                        | 20 | <b>High Pressure Gauge Switch-High Pressure Test Pressure Gauge</b><br>Switch |
| 5 | <b>Emergency Stop-Emergency Stop Switch</b>  | 13 | <b>Drive Air Pressure Gauge-Nitrogen Drive Air Pressure Gauge</b>               | 21 | <b>N-end Conversion Valve-N-end Shut-off</b><br>Value                         |
| 6 | <b>Hp Switch-High Pressure Test Button</b>   | 14 | <b>Low Pressure Test Pressure Gauge</b>   | 22 | <b>Water-Gas Conversion Valve-Test Medium Selector Value</b>                  |
| 7 | <b>Test Stop-Test Pressure Stop Button</b>   | 15 | <b>Low Pressure Pump Gauge-Low Pressure Water Pump Drive Air Pressure Gauge</b> |    |   |
| 8 | <b>Computer Switch-PLC Screen Switch</b>   | 16 | <b>High Pressure Gauge-High Pressure Test Gauge</b>                             |    |   |



### 3.3.2 Horizontal Valve Test Stand



- Horizontal Valve Test Stand Function Indication

|   |                    |   |                    |
|---|--------------------|---|--------------------|
| 1 | <i>N-end Inlet</i> | 2 | <i>P-end Inlet</i> |
|---|--------------------|---|--------------------|

### 3.3.3 Vertical Valve Test Stand









- **Vertical Valve Test Stand Function Indication**




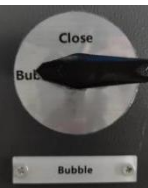


|          |  |          |   |          |  |          |                                      |
|----------|--|----------|---|----------|--|----------|--------------------------------------|
| <b>1</b> | <b>Unload-Medium</b><br><i>Unload Outlet</i> | <b>2</b> | <b>Gas Source</b><br><b>Switch-Cylinder</b><br><i>Clamping</i><br><i>Switch</i> | <b>3</b> | <b>Gas Source</b><br><b>Inlet-Clamping</b><br><i>cylinder Air</i><br><i>Source Inlet</i> | <b>4</b> | <b>Clamp-Clamping</b><br><i>Claw</i> |
|----------|--|----------|---|----------|--|----------|--------------------------------------|

### 3.3.4 Valve and Switch Function Indication

| Indication                                  | Status picture  | Status   |
|---|---|--|
| <i>Water Supply Pump Switch</i>             |    | <b>PULL UP</b> -Turn on the driving air of the corresponding booster pump                            |
| <i>Gas Source Switch</i>                    |    | <b>Press down</b> -Turn off the driving air of the booster pump                                      |
| <i>Low Pressure Pump Pressure Regulator</i> |  | <b>Rotate forward and pull upwards to unlock, rotate clockwise</b> -Increase drive air pressure      |
| <i>Nitrogen Pressure Regulator</i>          |  | <b>Rotate forward and pull upwards to unlock, rotate counterclockwise</b> -Reduce drive air pressure |
| <i>Emergency Stop Switch</i>                |  | <b>Press down</b> -Emergency turn off console power  |
|   |  | <b>Pull up and rotate</b> -Turn on switch, The console is working                                    |







|   |   |   |
|---|---|---|
|   |   | <i>normally</i>   |
| <i>Power Switch</i>                     |    | <b>Turn on-</b> the console power switch  |
|   |    | <b>Turn off-</b> the console power switch   |
| <i>High pressure Gauge Switch</i>       |    | <b>Turn off-</b> The pressure gauge corresponding to the valve is not working.  |
|   |  | <b>Turn on-</b> The pressure gauge corresponding to the valve is working.   |
| <i>Low Pressure Gauge Switch</i>        |  | <b>Turn counterclockwise-</b> open the low-pressure pressure gauge<br><b>Turn Clockwise</b> -close the high-pressure pressure gauge |
| <i>Medium Switching Three-way Valve</i> |  | <b>Test Medium</b> -water   |
|   |  | The valve is closed and Media stops entering the device   |

|                                     |   |  |
|-------------------------------------|---|--|
|                                     |    | <p><b>Test Medium</b> - nitrogen</p>   |
| <p><i>P-end Three-way Valve</i></p> |    | <p><i>Medium leads to the bubble observation device<br/>(To the bubble observation device, three-way valve ON)</i></p> <p><i>P-end test pressure</i></p> |
|                                     |   | <p><i>Valve is closed</i></p>  |
|                                     |  | <p><i>P-end test pressure</i></p>  |
|                                     |   |  |
| <p><i>N-end Three-way Valve</i></p> |  | <p><i>N-end test pressure</i></p>  |
|                                     |  | <p><i>Valve is closed</i></p>  |

|   |   |  |
|---|---|--|
|   |    | <p><i>Medium leads to the bubble observation device</i></p> <p><i>(To the bubble observation device, three-way valve ON)</i></p> |
| <p><i>Bubble Observation Three-way Valve (Low Pressure)</i></p> |    | <p><i>Medium to the unload</i></p>   |
|   |    | <p><i>Valve is closed</i></p>  |
|   |   | <p><i>Medium to the bubble observation device</i></p>  |
| <p><i>Clamping Cylinder Switch</i></p>                          |  | <p><i>Loose</i></p>  |
|   |  | <p><i>Clamp</i></p>  |

- **Valve Initial Status Table**

| Name  | Initial Status                                       | Initial Status Picture  |
|---|--|---|
| <i>Power Switch</i>                         | Close  |    |
| <i>Emergency Stop</i>                       | Open   |    |
| <i>Low Pressure Pump pressure regulator</i> | Close<br><i>(Unable to rotate counter-clockwise)</i> |   |
| <i>N2 pressure regulator</i>                | Close<br><i>(Unable to rotate counter-clockwise)</i> |  |
| <i>Low Pressure Gauge Switch</i>            | Close<br><i>(Unable to rotate clockwise)</i>         |  |
| <i>High Pressure Gauge Switch</i>           | Close  |  |

|  |                     |   |
|--|---------------------|---|
| <p><i>N-end Conversion Valve</i></p>     | <p><i>Close</i></p> |    |
| <p><i>P-end Conversion Valve</i></p>     | <p><i>Close</i></p> |    |
| <p><i>Water-Gas Conversion Valve</i></p> | <p><i>Close</i></p> |   |
| <p><i>Bubble</i></p>                     | <p><i>Close</i></p> |  |
| <p><i>Low Pressure Switch</i></p>        | <p><i>Close</i></p> |  |
| <p><i>Gas Source Switch</i></p>          | <p><i>Close</i></p> |  |



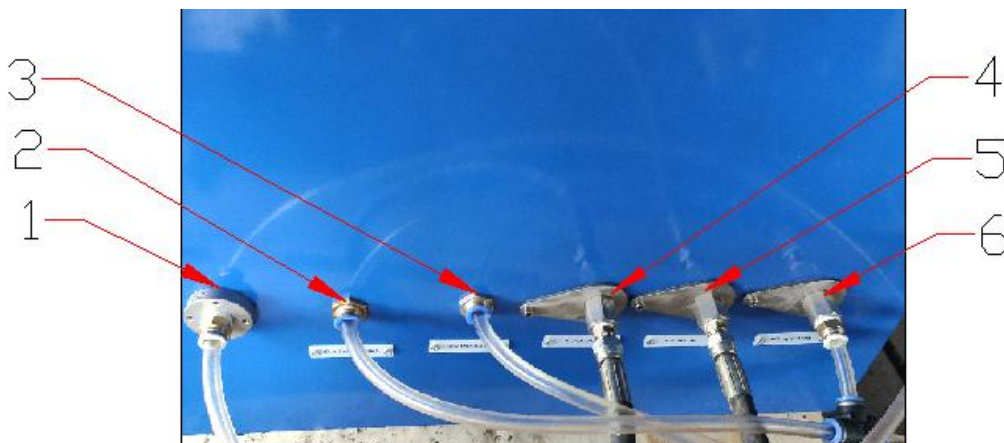


**NOTICE**

*After each valve test Stand test is completed, please restore the valve status of the equipment to its initial state.*

**3.3.5 Device Interface Connection Indication**

**3.3.5.1 Valve Test Console Stand Connector**



| Number | Name                             | Application   |
|--------|----------------------------------|---|
| 1      | <i>High Pressure Unload Port</i> | <i>Connect the high-pressure pipeline to guide the unloading medium to a safe place to release the pressure test pressure</i> |
| 2      | <i>Gas source Inlet</i>          | <i>For access to drive air</i>  |

|   |                            |   |
|---|----------------------------|---|
| 3 | <i>Liquid Medium Inlet</i> | <i>For access to the aqueous media</i>                                  |
| 4 | <i>P-end Inlet</i>         | <i>High-pressure outlet controlled by the “ P-end Conversion Valve”</i> |
| 5 | <i>N-end Inlet</i>         | <i>High-pressure outlet controlled by the “ N-end Conversion Valve”</i> |
| 6 | <i>Nitrogen Inlet</i>      | <i>For access to nitrogen</i>   |

### 3.3.5.2 Horizontal Valve Test Stand



| Number | Name               | Application                                   |
|--------|--------------------|---|
| 1      | <i>P-end Inlet</i> | <b>"P-end Inlet"</b> connected to the console |
| 2      | <i>N-end Inlet</i> | <b>"N-end Inlet"</b> connected to the console |

### 3.3.5.3 Vertical Valve Test Stand



| Number | Name                    | Application   |
|--------|-------------------------|---|
| 1      | <i>Gas Source Inlet</i> | Connect the drive air source to the clamping cylinder<br><i>(drive air)</i> |

|   |                                      |   |
|---|--------------------------------------|---|
| 2 | <i>Unload</i>                        | <i>Discharge the water medium that leaked to the test table</i> |
| 3 | <i>High pressure Connection port</i> | <i>P-end Inlet or N-end Inlet connected to the console</i>      |



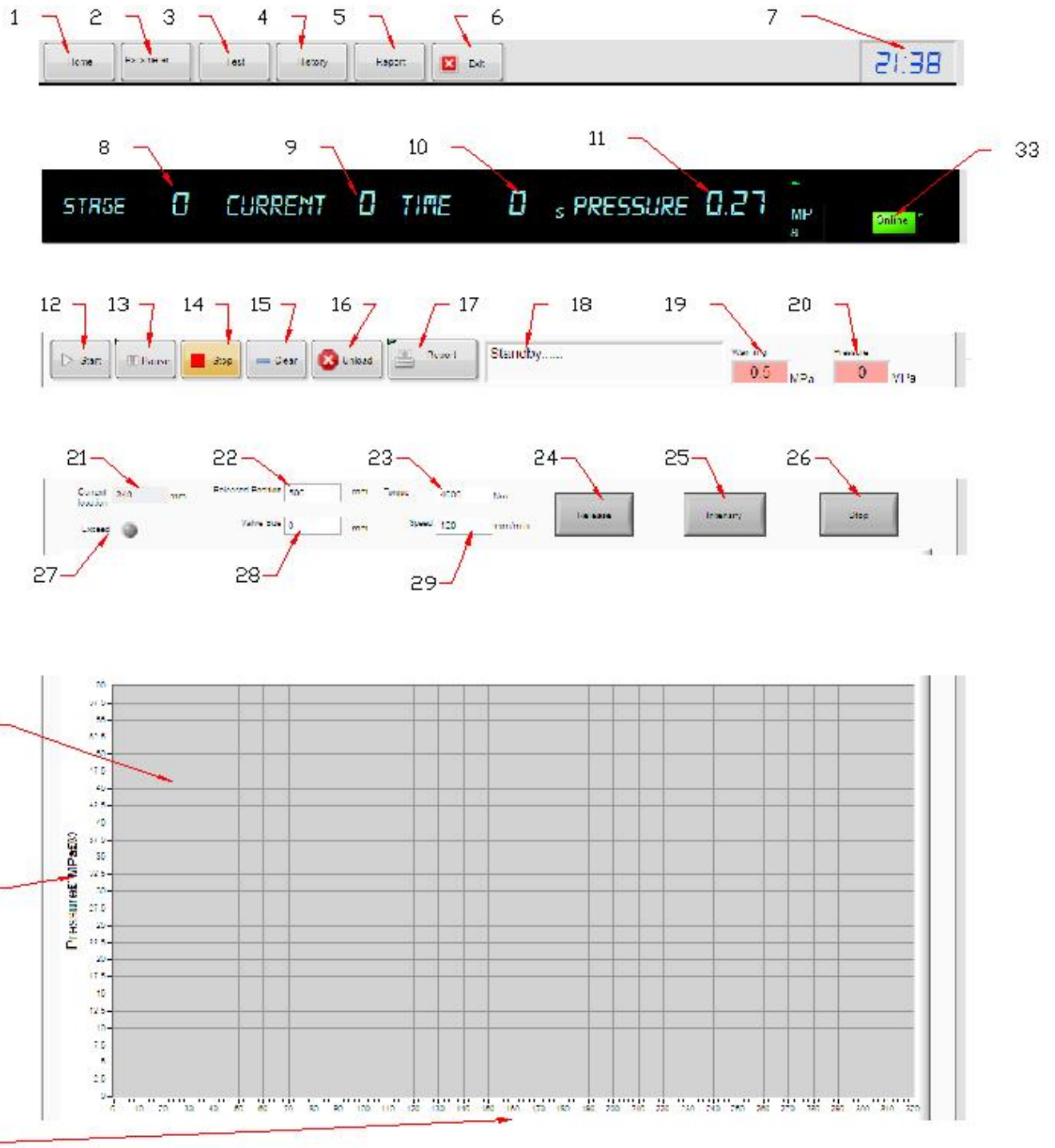
## **NOTICE**

***During the pressure test of the Vertical Valve Test Stand, please test the valve corresponding to the interface operation of the pressure test connection, and plug the high-pressure outlet that is not connected to the console with a plug. For example, when using the P-end Inlet interface to connect to a vertical valve pressure test bench, use a plug to block the N-end Inlet interface.***

### 3.3.6 Software Function Indication

#### 3.3.6.1 Home Interface Function Indication

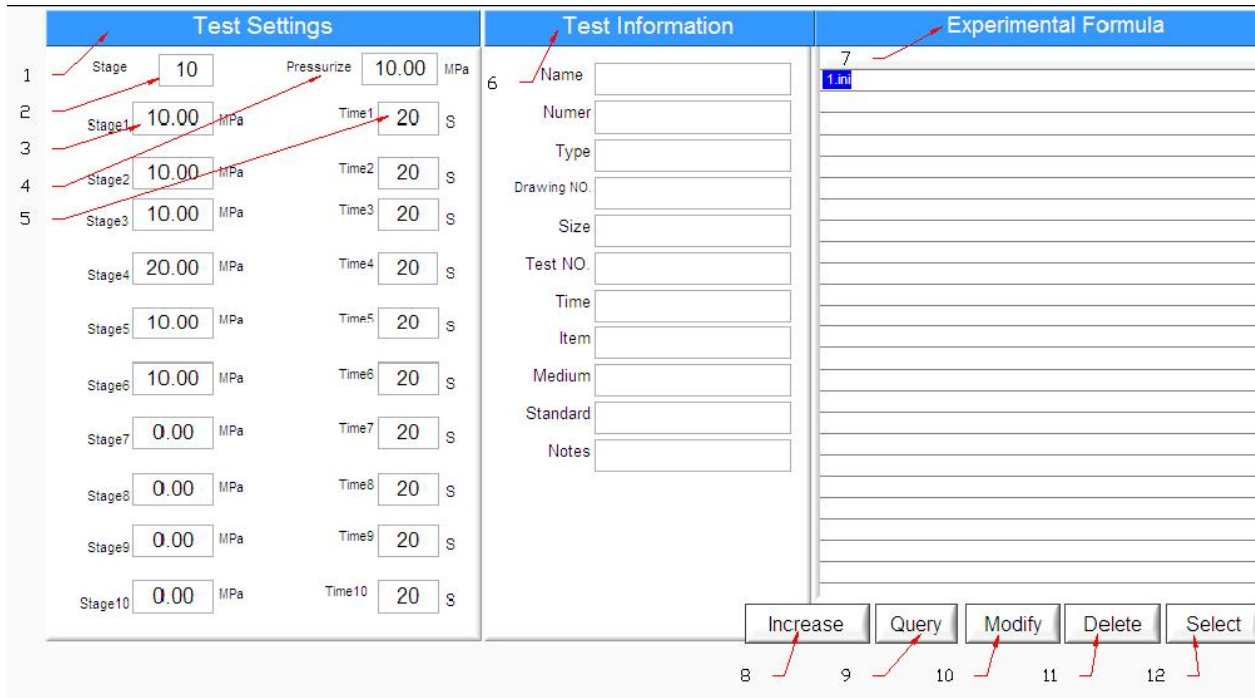
The Home interface is used to intensify and release the horizontal valve test stand .



|    |  |    |  |    |  |
|----|--|----|--|----|--|
| 1  | <i>Home interface</i>                      | 12 | <i>Start test pressure</i>   | 23 | <i>Fastening setting box</i>   |
| 2  | <i>Parameter interface</i>                 | 13 | <i>Pause test pressure</i>   | 24 | <i>Horizontal valve test stand to release the valve button</i>           |
| 3  | <i>Test parameter setting interface</i>    | 14 | <i>Stop test pressure</i>  | 25 | <i>Horizontal valve test stand to intensify the valve push button</i>    |
| 4  | <i>History recording interface</i>         | 15 | <i>Clear recording curve</i>   | 26 | <i>Horizontal valve test stand stop motion button</i>                    |
| 5  | <i>Report interface</i>                    | 16 | <i>Unload</i>  | 27 | <i>Horizontal valve test stand override alarm button</i>                 |
| 6  | <i>Exit software</i>                       | 17 | <i>Print report</i>  | 28 | <i>Valve fastening size position setting box</i>                         |
| 7  | <i>Time display</i>                        | 18 | <i>Status display bar</i>  | 29 | <i>Horizontal valve test table intensify / release speed setting box</i> |
| 8  | <i>Overall test stage display</i>          | 19 | <i>Pressure drop alarm value display</i>   | 30 | <i>Pressure time curves display</i>                                      |
| 9  | <i>Present test phase display</i>          | 20 | <i>Test real-time pressure display</i>   | 31 | <i>Pressure axis</i>   |
| 10 | <i>Stage pressure holding time display</i> | 21 | <i>Real-time opening and closing distance display of horizontal valve test stand</i> | 32 | <i>Time axis</i>   |
| 11 | <i>Real-time pressure display</i>          | 22 | <i>Horizontal valve test stand release valve position setting box</i>                | 33 | <i>Network status display</i>  |

### 3.3.6.2 Test Interface Function Indication

The Test interface is divided into three parts. Test Setting is used to set the pressure test parameters of the current test, Test Information is used to set the information of the current parameter test, and Experimental Formula is used to view the saved tests.



|   |                                       |   |   |    |                       |
|---|---------------------------------------|---|---|----|-----------------------|
| 1 | Test parameter settings               | 5 | Current stage holding pressure time setting frame | 9  | Query test parameter  |
| 2 | Test stage quantity setting box       | 6 | Test information                                  | 10 | Modify test parameter |
| 3 | Test stage pressure setting frame     | 7 | Test parameter model                              | 11 | Delete test           |
| 4 | Pressure drop alarm valve setting box | 8 | Increase new test                                 | 12 | Select test           |

### 3.3.6.3 History Interface Function Indication

The history interface is used to query information about historically saved pressure test reports.

Test Query

1 ↗

Time:

| File | Number | Pressure |
|------|--------|----------|
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |
|      |        |          |

Test Information

2 ↗

Drawing No.  Model

Product No.  Valve Size

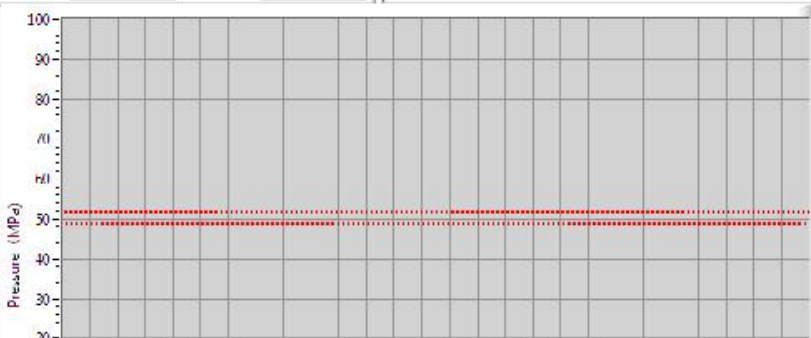
Workpiece  Factory No.

Test Time  Pressure

Date  Test Medium

Conclusion  End Pressure

Dimension



|   |  |
|---|--|
| 1 | <i>History Report Query</i>                    |
| 2 | <i>Test Report Print Information Input Box</i> |



## 4.1 Equipment Operation Tutorial

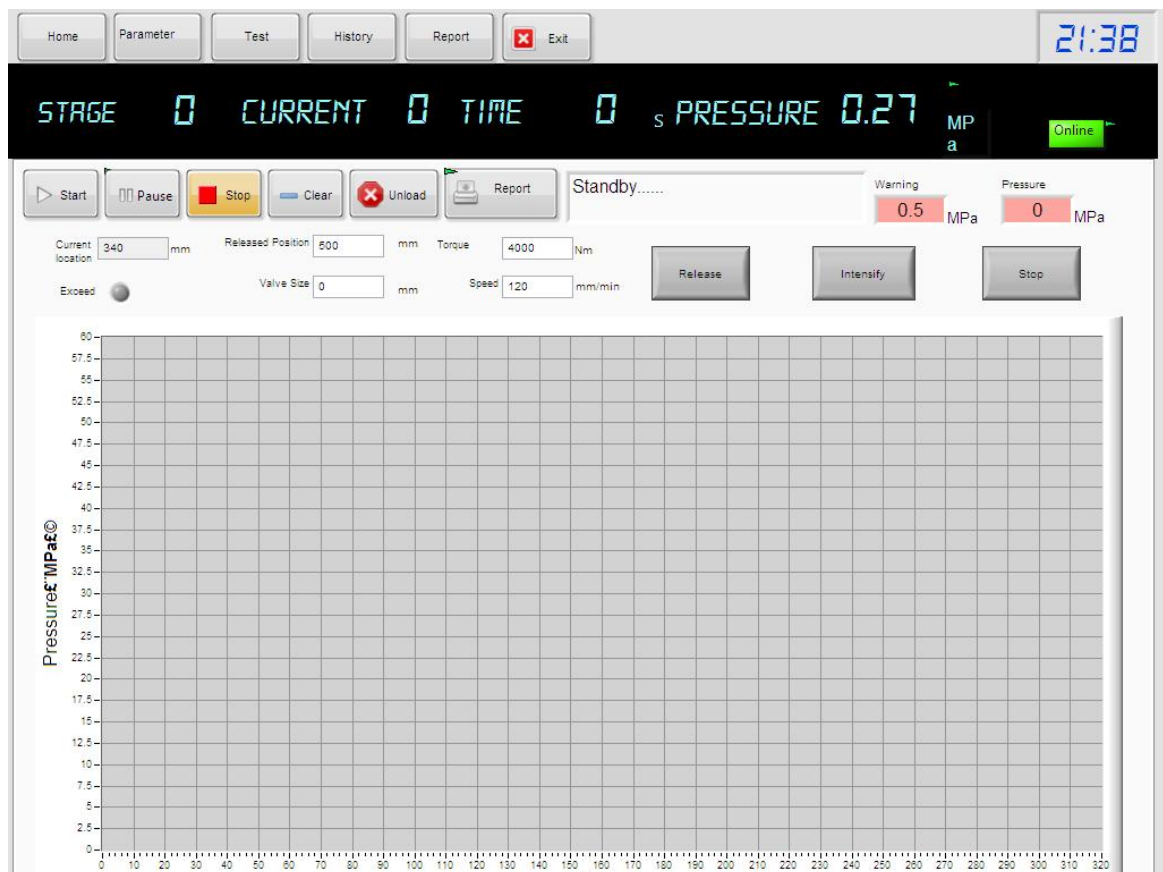
### 4.4.1 Prepare Pressure Test

4.4.1.1 Connect the pipelines between the equipment according to the interface identification content, and connect the power supply (voltage AC220V $\pm$  10%, frequency 50 HZ  $\pm$  1);

4.4.1.2 Turn clockwise "**Power Switch**" to open the main power switch;

4.4.1.3 Set up the horizontal valve test stand zero point;

4.4.1.3.1 Double click the "**PLC**" desktop  icon to open the pressure test software.



4.4.1.3.2 According to the distance between the two sides of the horizontal valve test table, enter a negative number (minimum-800) in the **"Valve Size"** dialog box, clamping force (maximum- 4000) in the **"Torque"** dialog box, and enter the end face movement speed (maximum-120) in the **"Speed"** dialog box;

4.4.1.3.3 Click **"Intensity"** to run the horizontal valve mobile end surface;

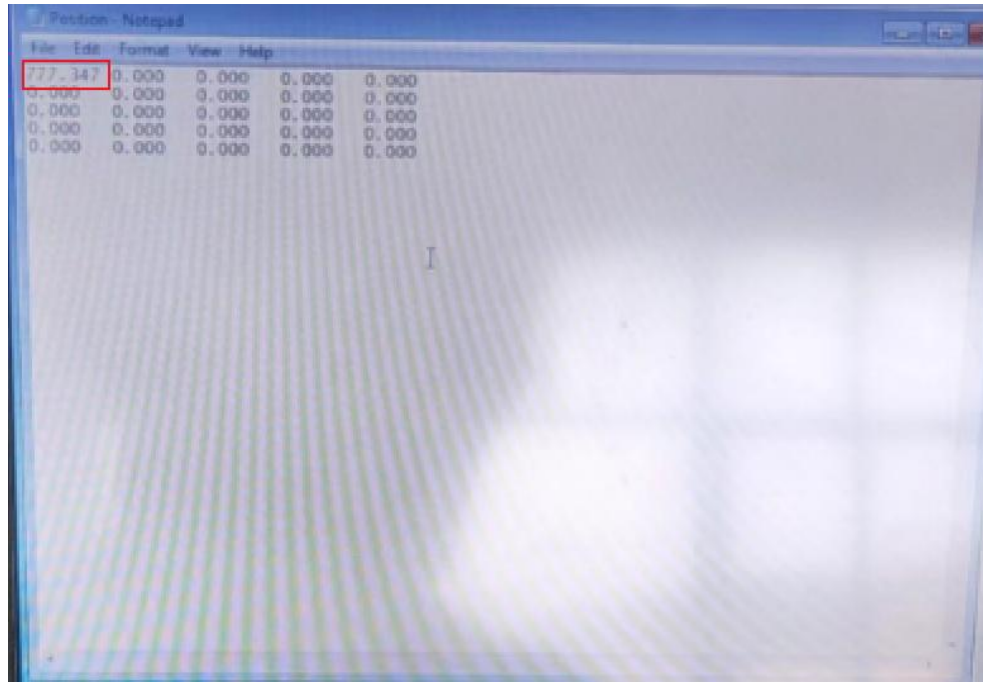
4.4.1.3.4 When the end face overlap, after the set clamping force can not make the mobile end face continually, the mobile end face will automatically stop running. If the end face does not overlap, please reduce the value in the **"Valve Size"** dialog box and continue this operation;



#### **WARNING**

***The device automatically stops running after the end surfaces overlap.***

4.4.1.3.5 After the end faces of the horizontal valve test stand overlap, click **"Exit"** to exit the software interface. Right click on the desktop icon of the testing software, click **"Open file location"** to open the file location, find and click on the **"Position"** file in the folder, and delete the first data. Click **"File"** and select **"Save"** from the dropdown menu to save the file and exit it;



## WARNING

*Just change the first data (the data selected in the box in the figure), and the other data will be the default data of the device system. If changed, it will cause the device system to malfunction.*

4.4.1.3.6 Click on the desktop icon to open the testing software, click on the gray rectangular button icon that appears after **"Exceed"**, observe the value in the dialog box after **"Current location"** returns to zero, and then click **"Exit"** to close the software;

4.4.1.3.7 Restart the software, and the device zero reset is completed;

## 4.4.2 Valve Clamping Step

### 4.4.2.1 Horizontal valve test stand pressure test steps



#### NOTICE

***The P-end is the fixed sealing surface of the horizontal valve test stand, and the N-end is the moving sealing surface of the horizontal valve test stand.***

4.4.2.1.1 Open the testing software, enter the size of the end face opening of the pressure test stand in the dialog box after the **"Released Position"** based on the valve length size (for the convenience of clamping the valve), enter the device clamping force in the dialog box after the **"Torque"** based on the valve pressure capacity, enter the valve length size in the dialog box after the **"Valve Size"**, and enter the clamping speed of the pressure test bench in the dialog box after the **"Speed"**;



#### WARNING

***The maximum opening length of the valve is 1100mm, the clamping force is 4300Nm, the maximum valve size is 1000mm, the maximum clamping speed is 120mm/min, and the valve opening length value should be greater than the valve size value.***

4.4.2.1.2 After the parameter setting, you can click the **"Release"** button on the screen to open the horizontal valve pressure test table;

4.4.2.1.3 Install an O-ring on the pressure testing end face according to the size of the pressure testing valve;

4.4.2.1.4 Place the valve in the middle of the end face of the pressure test stand, click "**Intensity**" to clamp the valve, and the pressure test stand begins to move;

4.4.2.1.5 When the value of the dialog box does not change after "**Current location**", the valve has been clamped; When the dot after "**Exceed**" turns red, Indicating that the input valve size cannot complete the clamping operation., and the correct valve size needs to be re-entered.



#### **NOTICE**

***When clamping, the valve end face should be flush with the clamping end face of the pressure test bench, otherwise sealing will not be possible. The "stop"***



***button can stop the moving valve pressure test bench end face at any time.***

4.4.2.2 Vertical valve test stand pressure test steps

4.4.2.2.1 Threaded valve:

1) Simply connect and fix the valve directly or using an adapter to the pressure test end face;

4.4.2.2.2 Flange valve:

1) Select a suitable O-ring and place it on the fixture, and clamp the flange valve with claws;

2) Turn the **"Gas Source Switch"** switch arrow to the right towards **"on"**, open the valve clamping cylinder switch, and move the clamping cylinder upwards until the valve is clamped;



#### **NOTICE**

***Before turning on the "Gas Source Switch" switch, be sure to confirm that the jaws have clamped the valve, and the clamping cylinder only serves as an auxiliary clamping function.***

#### 4.4.2.3 Clamping Precautions

- When placing the workpiece, do not press the clamping button to save time and stay away from the clamping position to avoid safety accidents caused by incorrect operation;
- After the experiment is completed, please unload first and then loosen the clamp;

### 4.4.3 Operation Process of Horizontal valve test stand



#### WARNING

- *When conducting hydraulic testing on the valve, it is necessary to first inject water and empty it, and the maximum pressure of low-pressure injection can reach 7Mpa.*
- *The low-pressure pressure gauge must be in a closed state during high-pressure testing.*
- *When the pressure test pressure is higher than 16MPa, the "Low Pressure Switch" low-pressure pressure gauge should be in a closed state.*
- *During unloading operation, the inlet valve "N-end Conversion Valve" or "P-end Conversion Valve" should be in an open state. Otherwise, even if the pressure gauge indicates zero, the pressure in the test piece and connecting pipeline cannot be fully unloaded, which is a very dangerous behavior.*

#### 4.4.3.1 Valve whole chamber pressure test

##### 4.4.3.1.1 Low-pressure water pressure test

(1) Turn the **"Water Gas Conversion Valve"** arrow towards **"Water"**, turn the **"N-end Conversion Valve"** valve arrow towards **"Open"**, turn the **"Bubble"** valve switch towards **"Unload"**, and turn the **"P-end Conversion Valve"** valve towards **"Bubble"**. Open the **"Low Pressure Gauge Switch"** to use the low-pressure gauge;



#### NOTICE

- The **"Bubble"** valve switch is a low-pressure switch that is only used as a switching valve and cannot be used as a high-pressure shut-off valve.

(2) Press down **"Test Start"** to turn on the test switch;

(3) Pull up **"Low Pressure Pump Switch"** open the low pressure water pump drive air switch;

(4) Rotate the **"Low Pressure Pump pressure regulator"** clockwise while observing the liquid discharged from the unloading pipeline. There are no bubbles emerging from the liquid and the exhaust is complete;

(5) Rotate the **"Low Pressure Pump pressure regulator"** counterclockwise until the **"Low Pressure Pump Gauge"** reading is zero;

(6) Turn the **"P-end Conversion Valve"** valve to **"Open"** for pressure testing of the valve;

(7) Continue to rotate the **"Low Pressure Pump pressure regulator"** clockwise and observe the readings of **"Low Pressure Pump Pressure Gauge"** and **"Low Pressure Gauge"**. When the **"Low Pressure Gauge"** reading reaches the pressure test pressure, stop rotating the **"Low Pressure Pump pressure regulator"**;

(8) Press the **"Low Pressure Pump Switch"** to cut off the driving air and conduct a pressure holding test;

(9) After the pressure test is completed, turn the arrow of the **"Water Gas Conversion Valve"** valve towards **"Close"**;



(10) Press the **"Test Stop"** button to relieve pressure;

(11) Rotate the **"Low Pressure Pump pressure regulator"** counterclockwise until it stops rotating, turn the arrows of the **"N-end Conversion Valve"** and **"P-end Conversion Valve"** valves towards **"Close"**, and close the **"Low Pressure Gauge Switch"** valve , to end the pressure test;

#### 4.4.3.1.2 High pressure hydraulic test

(1) Turn the **"Water Gas Conversion Valve"** arrow towards **"Water"**, turn the **"N-end Conversion Valve"** valve arrow towards **"Open"**, turn the **"Bubble"** switch towards **"Unload"**, and turn the **"P-end Conversion Valve"** valve towards **"Bubble"**. Open the **"High Pressure Gauge Switch"** to use the high-pressure gauge;

(2) Press down **"Test Start"** to turn on the test switch;

(3) Pull up the **"Low Pressure Pump Switch"** to turn on the low-pressure water pump driving air switch;

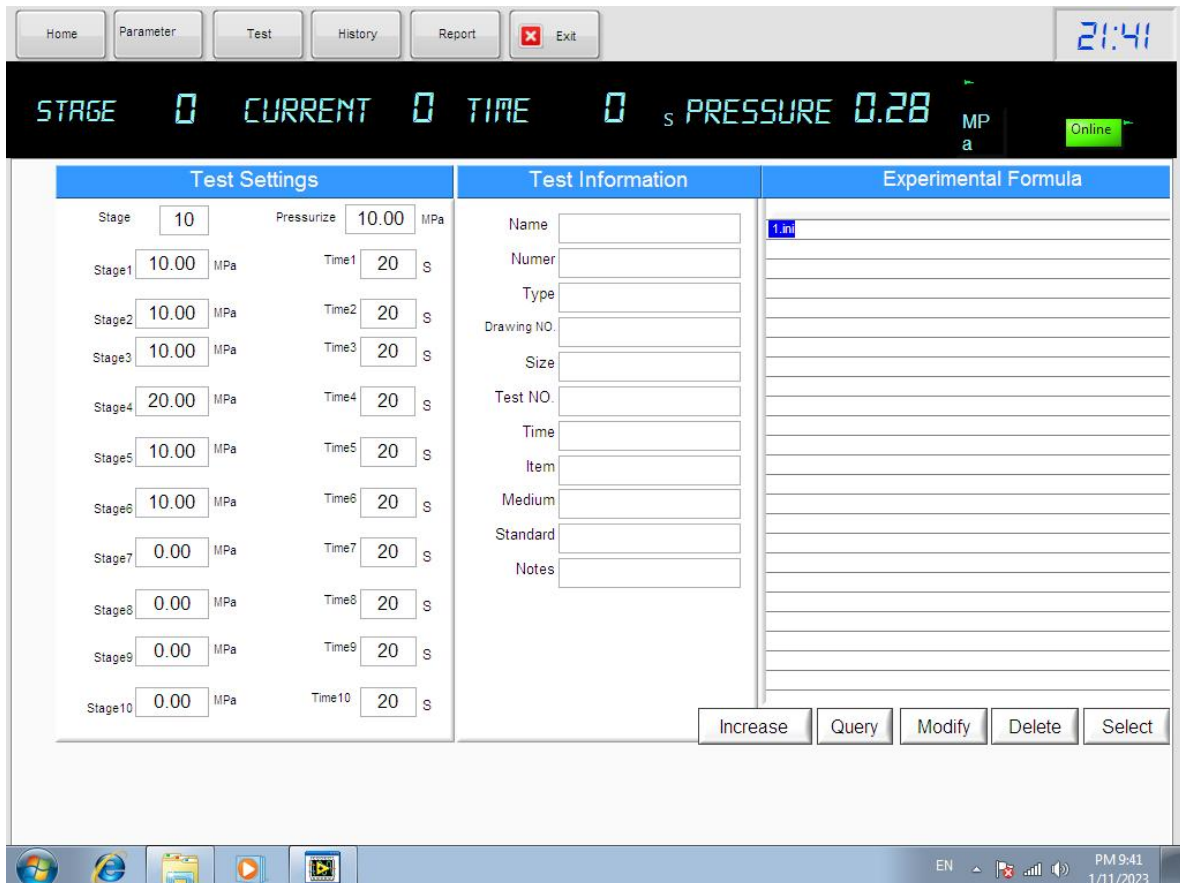
(4) Rotate the **"Low Pressure Pump pressure regulator"** clockwise while observing the liquid discharged from the unloading pipeline. There are no bubbles emerging from the liquid and the exhaust is complete;

(5) Rotate the **"Low Pressure Pump pressure regulator"** counterclockwise until the **"High Pressure Pump Gauge"** reading is zero;

(6) Turn the **"P-end Conversion Valve"** valve to **"Open"** ;

(7) Rotate the **"Low Pressure Pump pressure regulator"** clockwise to apply pressure test in advance until the **"High Pressure Gauge Switch"** reading is 7MPa;

(8) Click **"Test"** on the software interface to switch the PLC interface to the parameter setting interface;



(9) Enter the total number of stages for valve pressure testing in the dialog box behind **"Stage"**, enter the pressure drop alarm value in the dialog box behind **"pressurize"**, and enter the pressure testing pressure and holding time for each stage below;

(10) After setting the parameters, set the test name and other information in **"Test Information"**;

(11) After setting, click **"Increase"** to save the parameters in the directory under **"Experimental Formula"**;

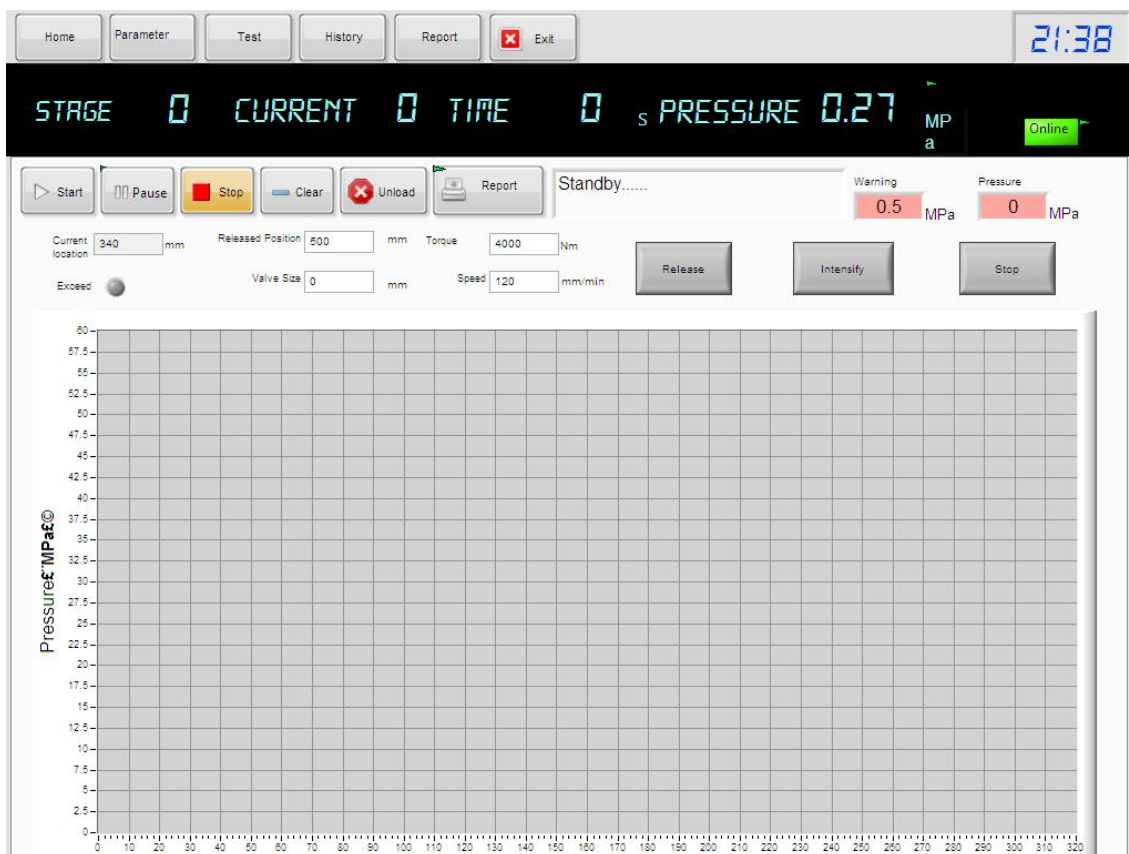
(12) Select a test in the **"Experimental Formula"** directory and click **"select"** to perform stress testing of the test parameters.



## NOTICE

**After selecting the test, you can click "Query" to query the test parameters and make modifications. After modification, clicking "Modify" to modify the parameters will replace the original parameters.**

(13) After selecting the test, click **"Home"** on the software interface to return to the software homepage.



(14) Click on **"Start"** (or press the **"Test Start"** button) and press the **"HP Switch"** button, the device will automatically start pressing, maintaining, and unloading according to the set parameters;



#### NOTICE

*If the real-time pressure displayed on the interface does not change, please repeat [step \(14\)](#) for operation.*

(15) After the system completes automatic pressurization, turn the arrows of the **"Water-Gas Conversion Valve"**, **"N-end Conversion Valve"**, **"P-end Conversion Valve"**, and **"Bubble"** switches to close the **"High Pressure Gauge Switch"** valve and complete the pressure test;



#### NOTICE

*If the system displays any pressure after the valve is closed, you can click the **"Unload"** button on the main interface to unload. The **"Test Stop"** button can stop the pressure test at any time.*

#### 4.4.3.1.3 Nitrogen test pressure



#### WARNING

- *The danger level of gas high-pressure testing is much higher than that of hydraulic testing. It is recommended to conduct it outdoors or in a pit, and take protective measures.*
- *The valve should undergo a hydraulic test before conducting a pneumatic test.*

- *During pneumatic unloading, operators should stay away from the unloading port to prevent high-pressure injuries.*

- (1) Turn the **"Water Gas Conversion Valve"** arrow towards **"N2"** ;
- (2) Turn the arrows of the **"N-end Conversion Valve"** and **"P-end Conversion Valve"** valves towards **"Open"**, and slowly turn the arrows of **"Bubble"** towards **"Bubble"**;
- (3) Turn on the **"High Pressure Gauge Switch"** switch;
- (4) Press down **"Test Start"** to turn on the test switch;
- (5) Pull up the **"Gas Source Switch"** to turn on the nitrogen booster pump switch;
- (6) Rotate the **"N2 Pressure Regulator"** clockwise while observing the readings of **"Drive Air Pressure Gauge"** and **"High Pressure Gauge"** to perform a nitrogen pressure test;



## NOTICE

*The gas pressurization speed is relatively slow. When the pressure calculated by multiplying the driving air gauge by 64 is the pressure value you want to test, stop rotating the **"N2 Pressure Regulator"**. The nitrogen booster pump will pressurize the pressure to the test value. If the value is not reached, continue to rotate the **"N2 Pressure Regulator"** clockwise for pressurization.*

- (7) After the reading of **"High Pressure Gauge"** reaches the test pressure value, immediately press the **"Gas Source Switch"** to cut off the driving air and stop boosting;

- (8) After the test is completed, **slowly** twist the arrow of "**Bubble**" towards "**Unload**";
  
- (9) **Slowly** twist the arrow of the "**P-end Conversion Valve**" valve slightly towards the "**Bubble**" to unload it;
  
- (10) Close "**Water-Gas Conversion Valve**";
  
- (11) Rotate the "**N2 Pressure Regulator**" counterclockwise until it stops moving, turn the "**N-end Conversion Valve**", "**P-end Conversion Valve**", and "**Bubble**" arrows towards "**Close**", close the "**High Pressure Gauge Switch**" valve, and end the pressure test;

#### 4.4.4 Operation Process of Vertical valve test stand



##### NOTICE

*When conducting pressure testing on a vertical valve test stand, please operate the corresponding valve according to the interface connected for pressure testing, and block the high-pressure outlet that is not connected to the control console with a plug. For example, when using the P-end Inlet interface to connect to a vertical valve pressure test bench, use a plug to block the N-end Inlet interface.*

##### 4.4.4.1 Low pressure hydraulic test

- (1) Turn the **"Water Gas Conversion Valve"** arrow towards **"Water"**, turn the **"N-end Conversion Valve"** arrow towards **"Open"**, and open the **"Low Pressure Gauge Switch"** to use a low-pressure gauge;
- (2) Press down **"Test Start"** to turn on the test switch;
- (3) Pull up the **"Low Pressure Pump Switch"** to turn on the low-pressure water pump driving air switch;
- (4) Rotate the **"Low Pressure Pump Pressure Regulator"** clockwise to apply pressure;
- (5) Observe the readings of **"Low Pressure Pump Pressure Gauge"** and **"Low Pressure Gauge"**. When the reading of **"Low Pressure Gauge"** reaches the pressure test pressure, stop rotating the **"Low Pressure Pump Pressure Regulator"**;

- (6) Press the **"Low Pressure Pump Switch"** to cut off the driving air for pressure holding test;
- (7) After the pressure test is completed, turn the arrow of the **"Water Gas Conversion Valve"** valve towards **"Close"** and press the "Test Stop" button to relieve pressure;
- (8) Rotate the **"Low Pressure Pump pressure regulator"** counterclockwise until it stops rotating, turn the **"N-end Conversion Valve"** and **"P-end Conversion Valve"** arrows towards **"Close"**, close the **"Low Pressure Gauge Switch"** valve, and end the pressure test;

#### 4.4.4.2 High pressure hydraulic test

- (1) Turn the **"Water Gas Conversion Valve"** arrow towards **"Water"**;
- (2) Twist the arrows of the **"N-end Conversion Valve"** and **"P-end Conversion Valve"** valves towards **"Open"**;
- (3) Open the **"High Pressure Gauge Switch"** to use a high-pressure gauge;
- (4) Press down **"Test Start"** to turn on the test switch;
- (5) Pull up the **"Low Pressure Pump Switch"** to turn on the low-pressure water pump to drive the air switch;
- (6) Rotate the **"Low Pressure Pump Pressure Regulator"** clockwise to perform a pre pressure test on the valve until the **"High Pressure Gauge"** reading is 7MPa;
- (7) Press the **"Low Pressure Pump Switch"** to turn off the low-pressure water pump drive air switch;



- (8) Select or set test parameters on the **"Test"** interface of the software;
- (9) After selecting the test, click Home on the software interface to return to the software homepage;
- (10) Click on the **"Test"** button on the software homepage (or press down the **"Test Start"** button) and press down the **"HP Switch"** button. The device will automatically start to press, maintaining, and unloading according to the set parameters;
- (11) After the system completes automatic pressure testing, turn the arrows of the **"Water Gas Conversion Valve"**, **"N-end Conversion Valve"**, and **"P-end Conversion Valve"** switches towards **"Close"**, and turn the **"Low Pressure Pump Pressure Regulator"** counterclockwise until it cannot rotate, close **"High pressure Gauge Switch"** valve, ending the pressure testing;

#### 4.4.4.3 Nitrogen test pressure

- (1) Turn the **"Water Gas Conversion Valve"** arrow towards **"N2"**;
- (2) Turn the arrow of the **"N-end Conversion Valve"** and **"P-end Conversion Valve"** valve towards **"Open"**;
- (3) Open the **"High Pressure Gauge Switch"** valve and use a high-pressure pressure gauge;
- (4) Press down **"Test Start"** to turn on the test switch;

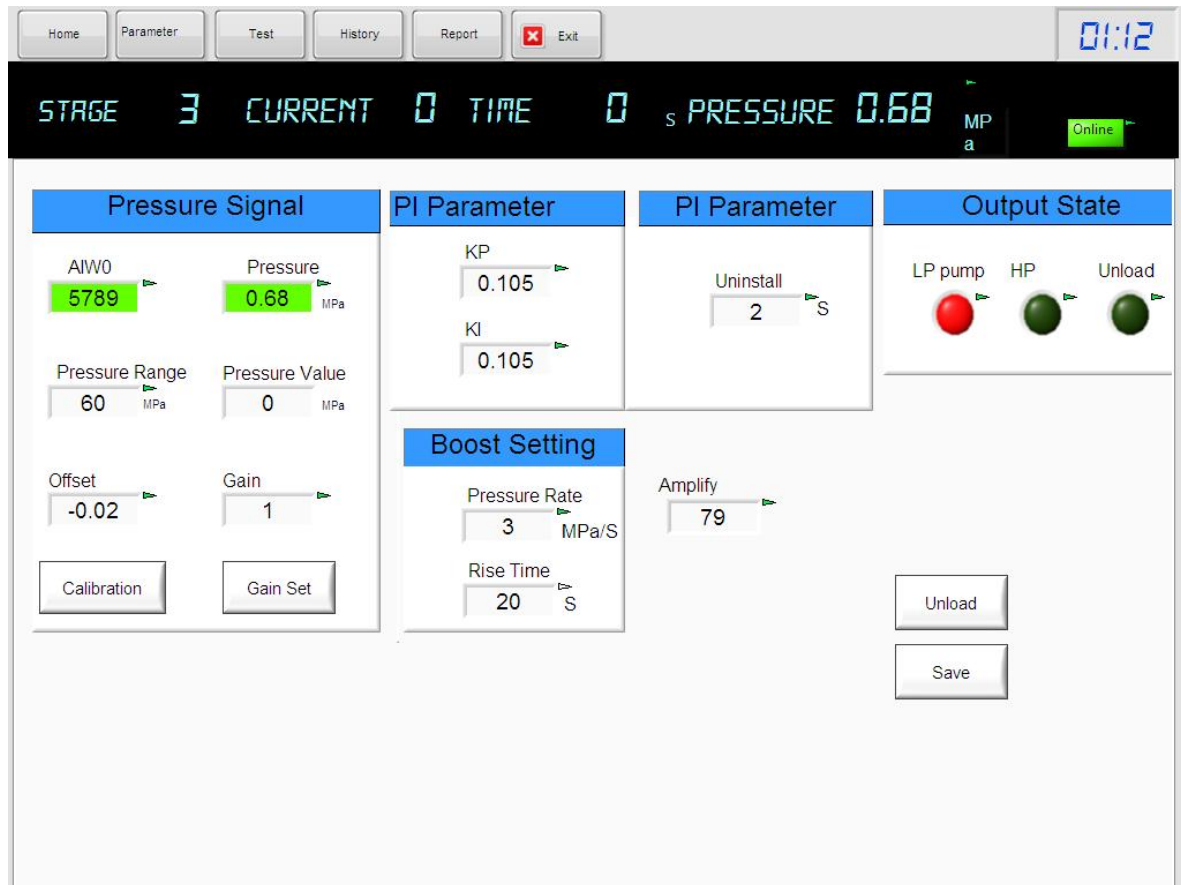
- (5) Pull up the **"Gas Source Switch"** and rotate the **"N2 Pressure Regulator"** clockwise while observing the readings of **"Drive Air Pressure Gauge"** and **"High Pressure Gauge"** for nitrogen pressure testing;



#### **NOTICE**

*The nitrogen booster pump has a pressure ratio of 1:64. When the pressure calculated by multiplying the driving air gauge by 64 is the pressure value you want to test, stop rotating the **"N2 Pressure Regulator"** and the nitrogen booster pump will slowly increase the pressure to the test value.*

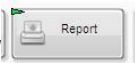
- (6) After the reading of **"High Pressure Gauge"** reaches the pressure test value, press the **"Gas Source Switch"** to cut off the driving air for pressure holding test;
- (7) Click the **"Parameter"** button to switch to the **"Parameter"** interface, change the value (unloading valve opening duration) in the **"Uninstall"** dialog box under **"PI Parameter"** to over 10S, and click the **"Save"** button to save the settings;

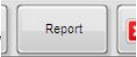


(8) After the pressure test is completed, turn the **"Water Gas Conversion Valve"** arrow towards **"Close"** to close the nitrogen intake, and press the **"Test Stop"** button to relieve pressure;

(9) Rotate the **"N2 Pressure Regulator"** counterclockwise until it stops, and turn the **"N-end Conversion Valve"**, **"P-end Conversion Valve"** arrows towards **"Close"**, close **"High Pressure Gauge Switch"** valve to end the pressure test;

#### 4.4.5 Save Pressure Test Report

4.4.5.1 After completing the pressure test, click the **"Report"**  button on the software homepage to save the pressure test report;

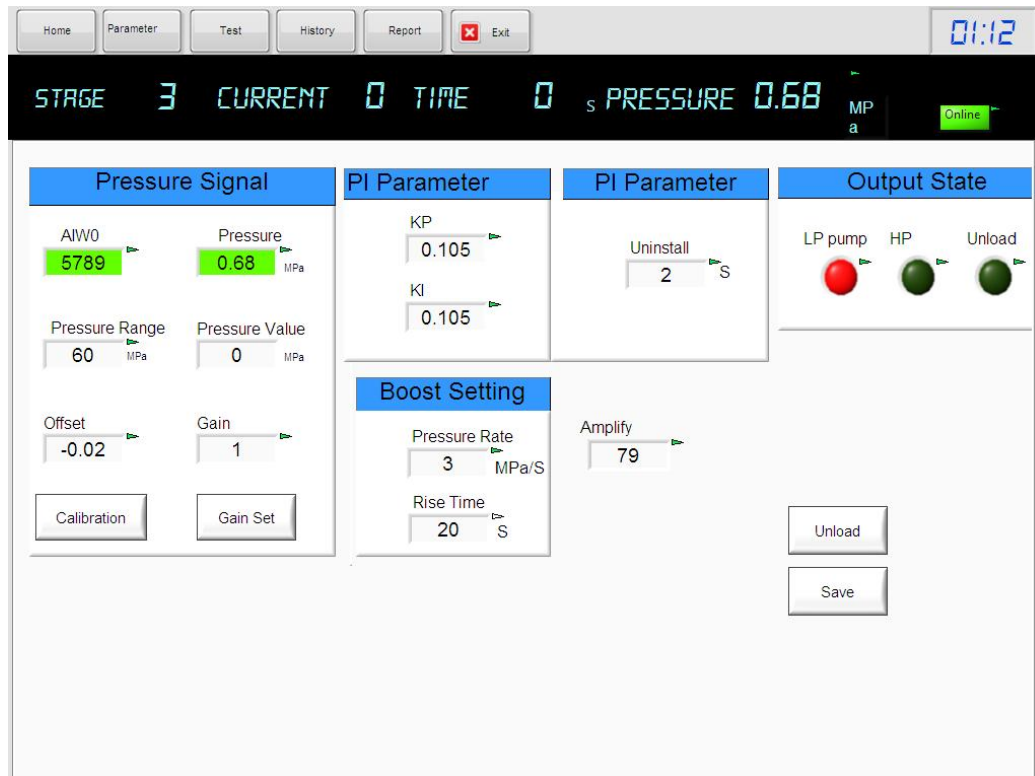
4.4.5.2 Click **"Exit"** to exit the testing software or click the **"Report"**  button in the main menu bar to pop up the report document, which can be edited, saved, and printed;

#### **4.4.6 Remove Pressure Testing Valve**

4.4.6.1 After preparing the valve for lifting, click **"Release"** to remove the valve and complete the pressure test;

## 4. Precautions and Requirements for Equipment

- Pay attention to checking the initial state of the valve at the beginning of the pressure test;
- Pay attention to protective measures for high-pressure testing, and it is recommended to conduct high-pressure gas testing outdoors or in pits;
- During the high-pressure water pressure stage pressure test, if the pressure exceeds the set pressure too much, please immediately press "**Test Stop**" to stop the pressure test, adjust the software interface to the "**Parameter**" interface, reduce the **KP** and **KI** values (0.005 for each test), and then conduct the test;
- If the set stage pressure exceeds the limit and the test is stopped after one stage, it is necessary to increase the **KP** and **KI** values (0.005 for each test) before conducting the test;



- When conducting pressure test, it is necessary to open the corresponding range pressure gauge according to the test pressure, otherwise it may cause damage to the pressure gauge;



## WARNING

***The pressure test range for low-pressure pressure gauges is 0-16Mpa, while the pressure test range for high-pressure pressure gauges is 0-45Mpa.***

- When conducting high-pressure test on the equipment, please stay away from the pressure test bench to prevent high-pressure leakage from causing harm to workers;

- Pay attention to the evacuation operation during high-pressure testing of the equipment, especially for large chamber valves;
- When unloading, operators should stay away from the unloading outlet to avoid high-pressure injuries;
- When unloading gas, the unloading time on the **Parameter** interface needs to be extended, otherwise the pressure will not be fully released. If the pressure cannot be fully unloaded, please manually click "**Unload**" on the "**Home**" interface again to unload;
- After the experiment is completed, please confirm that the system is completely unloaded and there is no pressure before removing the pressure testing valve;

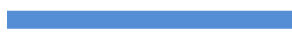
## 5. Repair and Maintenance

- During use, pay attention to observing whether all pressure gauge values are normal. If there is over-pressure or low pressure, adjust to the normal range. If there is no pressure or oil leakage during operation, stop operating and check if the sealing components are damaged;
- Please inject an appropriate amount of lubricating grease at the inlet of the gas-liquid booster pump to avoid sealing or cylinder wear during prolonged shutdown and use;
- The movable part of the pressure testing stand should be regularly lubricated with lubricating grease;

- Check whether the pressure gauge is accurate, sensitive, and easy to use. If the pressure gauge does not return to zero, it should be replaced in a timely manner;
- Long term plugging and unplugging of quick connectors can easily cause damage to the O-ring. If water leakage is found, it should be replaced in a timely manner, and loose screws should be tightened. If necessary, relevant components should be replaced;
- Check if all sealing positions of the workpiece are intact and usable, and if there are any problems, they must be dealt with in a timely manner;
- Do a good job in equipment hygiene to ensure that there is no oil contamination and the equipment is in its original color;



## NOTICE



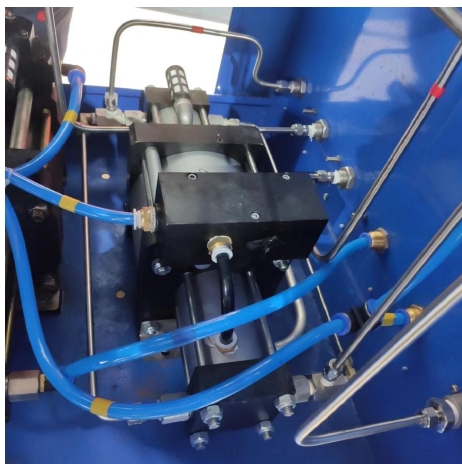
Low Pressure



High Pressure

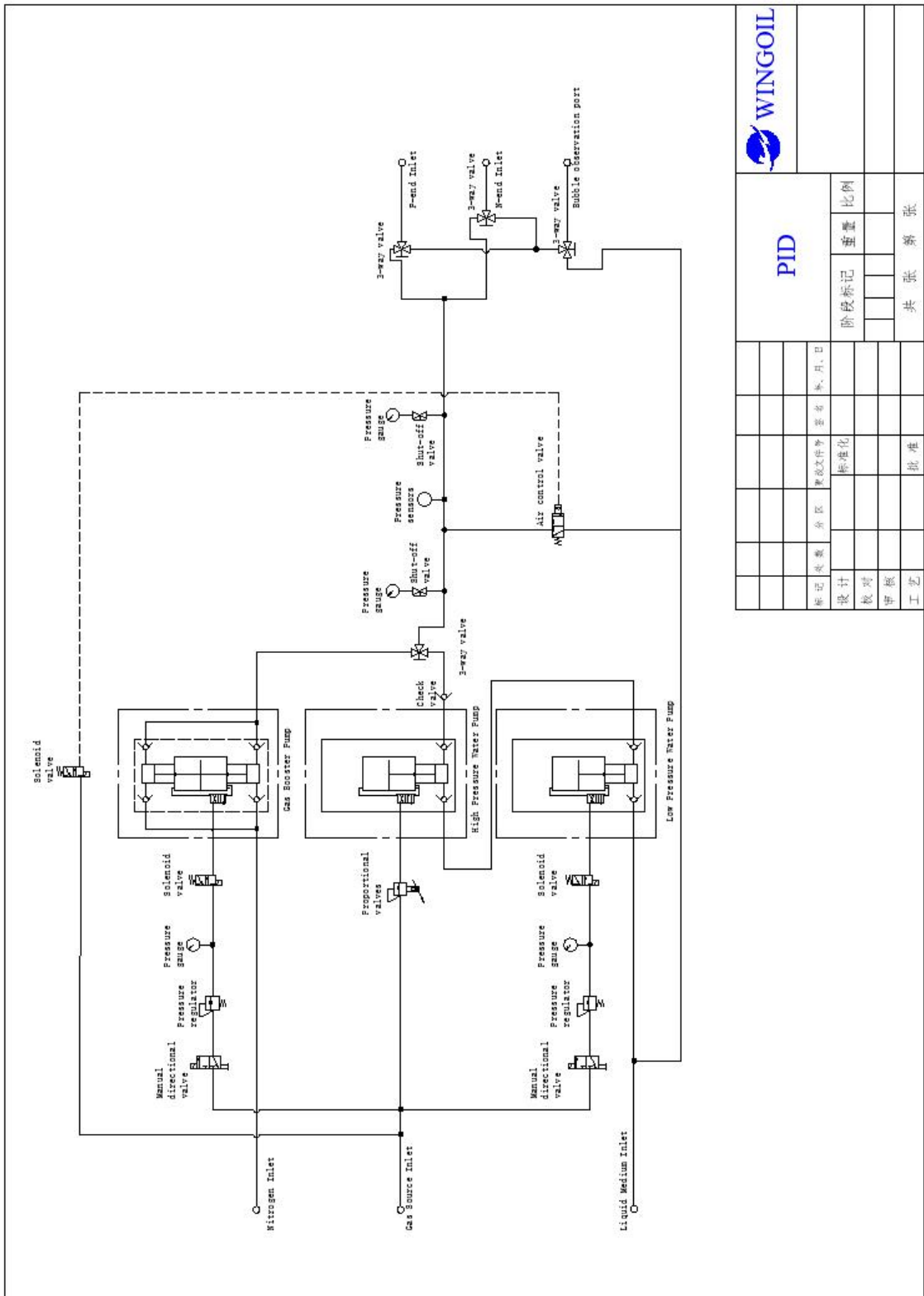


Compressed Air





# 6. Attachment 1



|   |     |            |    |    |  |
|---|-----|------------|----|----|--|
|  |     | <b>PID</b> |    |    |  |
| 阶段标记  | 重量  | 比例         |    |    |  |
| 设计  | 校对  | 审核         | 工艺 | 批准 |  |
| 标识  | 位置  | 日期         | 姓名 | 日期 |  |
| 标准  | 文件号 | 标准         | 批准 |    |  |

# 7.Attachment 2

