

# 210MPa Chemical Injection Surface System Device

## Operation Manual



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### 1. Overview

This set of equipment is mainly used for high-pressure injection of diesel and benzaldehyde. The device is a complete closed-loop system. According to the function, three skids are designed and divided. The main distinctions are as follows:

Model	Name	Main Technical Parameters	Function Brief
WY-210CH-J2	Chemical Reagent Injection Skid	Pressure: 210MPa Flow: 3.38L/min	Self-contained equipment, can only inject chemical reagents into the system
WY-100-J2	Explosion-proof Air Compressor Skid	Pressure: 1MPa Displacement: 2.3m <sup>3</sup> /min	Explosion-proof and energy-saving air compressors
WY-1000L	Chemical Reagent Storage Tank Skid	Volume: 1000L	Liquid storage tank with heating, heat preservation and stirring



The equipment is a high temperature and high pressure injection system, please read this manual carefully before using the equipment. This practical manual mainly focuses on the use of safety and manual operation, and the automatic control is provided by a special manual

for reference.

### 1.1 Safety Warning

- 1) The equipment should be operated by strictly trained personnel according to the process, or under the guidance of professionals;
- 2) Each pipeline interface, especially the high-temperature, high-pressure pipeline and safety valve interface, cannot be disassembled and replaced at will;
- 3) The equipment needs to be routinely maintained and maintained as required;
- 4) Before not using or overhauling the equipment, the source of driving air must be cut off and the load completely unloaded;
- 5) Before not using or repairing the equipment, the system pressure and temperature must be observed;
- 6) The power supply of the equipment must be cut off before it is not applicable or the equipment is overhauled;
- 7) In an emergency, press the "emergency stop switch" directly;



- Do not tighten tubing under pressure.
- Do not disassemble the workpiece under high temperature conditions.
- In case of leakage, perform other operations after the mechanical pressure gauge returns to zero.

### 1.2 System Indicator Light Prompt Description



NOTICE



Equipment Standby



Equipment Running



Equipment Alarming

### 1.3 After-sale technical service

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## 2. Structural Principles and Technical Parameters

### 2.1 Schematic Diagram of the Design Process

The equipment has local and remote control functions, and it is recommended to use remote operation for all temperature and pressure experiments. See Appendix 1 for the equipment schematic diagram.

The 3D structure diagram is as follows:

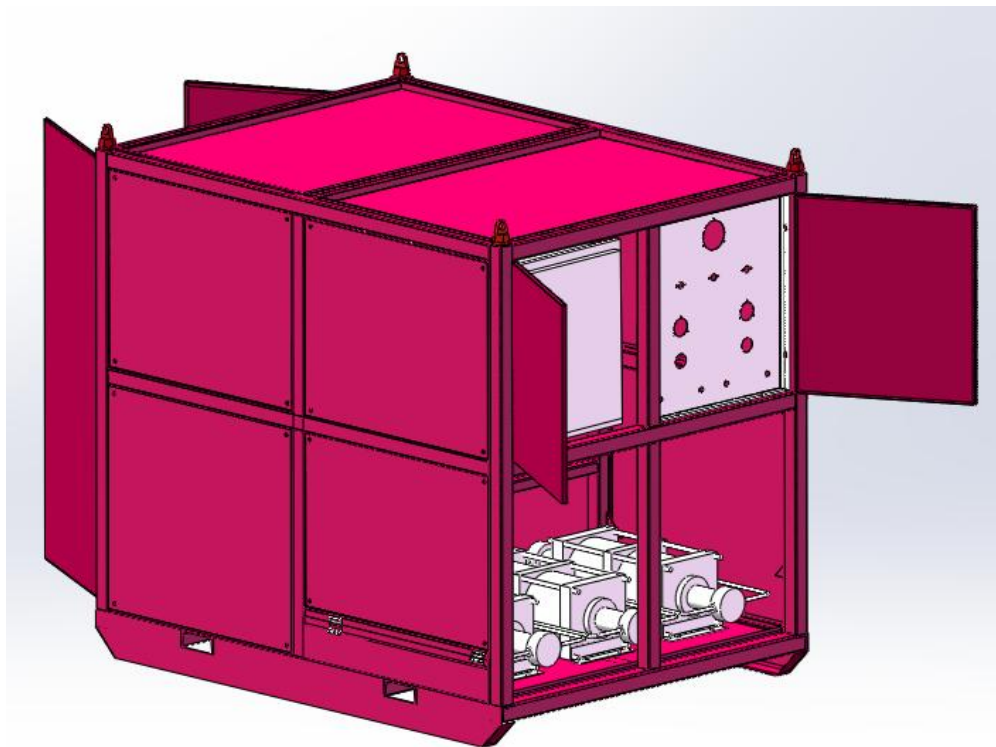


Figure 2.1 Chemical reagent injection skid

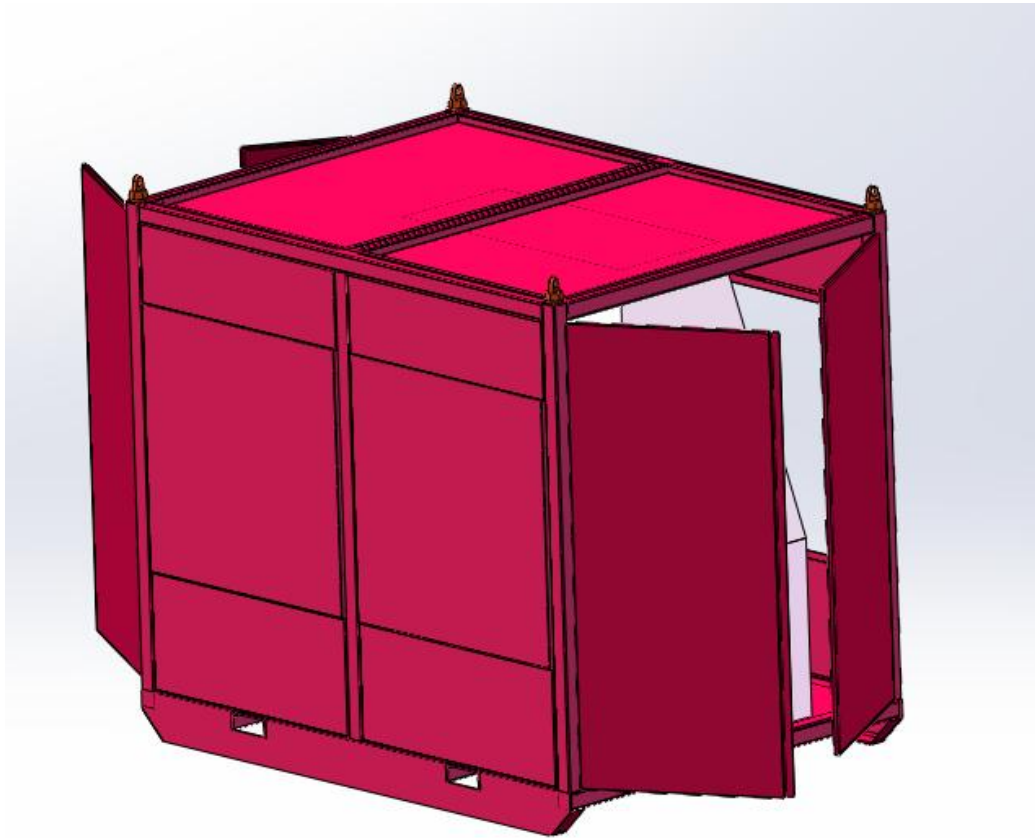


Figure 2.2 Explosion-proof air compressor skid

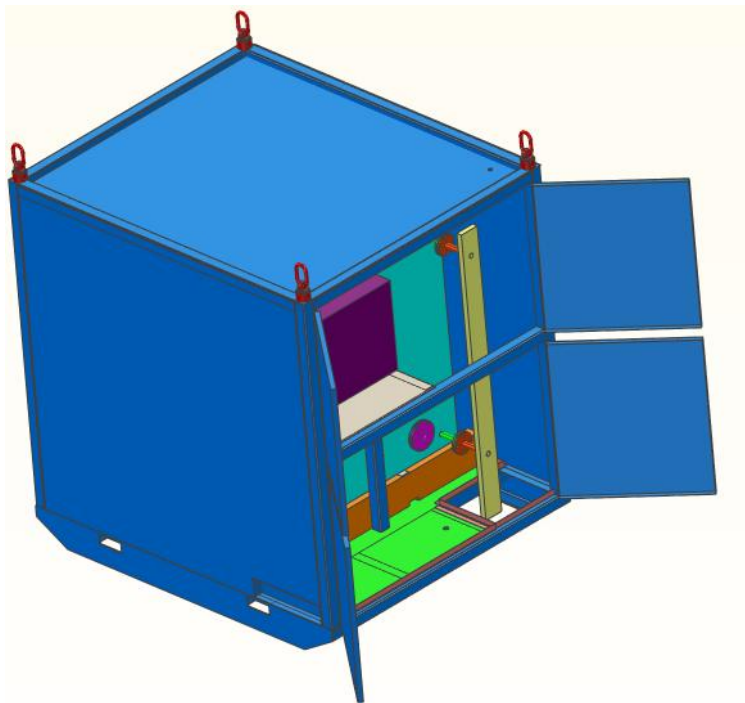


Figure 2.3 Chemical Reagent Storage Tank

## 2.2 Design Structure and Technical Parameters

### 2.2.1 Chemical reagent injection skid

#### ① Overview

The chemical reagent injection skid is the core component of the equipment, mainly including 4 air-driven chemical pumps, manual control panel, explosion-proof electric control cabinet, etc.



Figure 2.4 Chemical reagent injection skid

As shown in Figure 2.4, through the external compressed air, the device can realize wireless adjustment of the output pressure by adjusting the pressure regulating valve on the manual control panel. The precision throttle valve on the control panel can roughly adjust the output flow to meet the requirements of on-site use.

The panel layout is shown in the figure below:



Figure 2.5 Manual operation panel layout

## ② Main technical parameters of chemical reagent injection skid

Design Dimensions: 2000L×1500W×1800H

Working pressure: 210MPa

Storage tank volume: 100L

Storage tank heating power: 2Kw

Vertical load of a single ring: 3.5T

Valve working pressure: 60000psi (410MPa)

GT240 output flow: 3.38L/min

GH240 output flow: 1.32L/min

Power supply: 220V

## ③ Function brief description of main components

1) GT240 gas drive chemical injection pump

- Model: GT240
- Pressure ratio: 1:240
- Drive form: gas drive
- Control mode: manual/automatic

Theoretical output pressure:  $P = P_a \times 240$

P: output pressure

$P_a$ : Compressed air set pressure

For example: when the low-pressure pump compressed air set pressure is 0.6MPa, the output pressure is  $0.6 \times 240$  equal to 144MPa



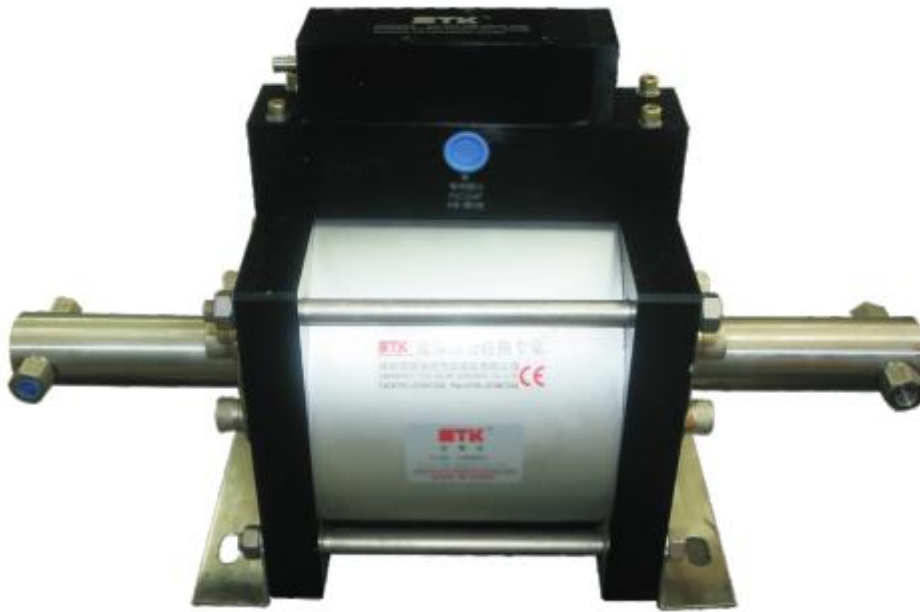


Figure 2.6 GT240 Structure Diagram

2) GH240 gas drive chemical injection pump

- Model: GH240
- Pressure ratio: 1:240
- Drive form: gas drive
- Control mode: manual/automatic

Theoretical output pressure:  $P = P_a \times 240$

P: Output pressure  $P_a$ : Compressed air set pressure

For example: when the low-pressure pump compressed air set pressure is 0.6MPa, the output pressure is  $0.6 \times 240$  equal to 144MPa





Figure 2.7 GH240 Structure Diagram

3) Chemical storage tank

- Material: 316 stainless steel
- Volume: 100L
- Remarks: Equipped with overflow valve, drain valve, liquid level gauge and water injection port

4) High pressure needle valve

- Model: HS60121
- Working pressure: 60000psi (410MPa)
- Size: 1/4
- Control mode: manual

5) Air control valve

- Model: SI60121-NC
- Working pressure: 60000psi (410MPa)
- Size: 1/4
- Control method: pneumatic

6) Precision throttle valve

- Model: HS60121-F
- Working pressure: 60000psi (410MPa)
- Size: 1/4
- Control method: pneumatic

7) Diaphragm pump

- Model: QBY3-15
- Working pressure: 0.5MPa
- Flow rate: 18.9L/min
- Control mode: pneumatic, manual

8) Temperature transmitter

- Model: WRB-207B
- Test range: -20—80°C
- Power supply: 24DC
- Output signal: 4-20mA

9) Pressure transmitter

- Model: PT124B-280-M20
- Test range: 0—350MPa
- Power supply: 24DC
- Output signal: 4-20mA

10) Liquid level temperature transmitter

- Model: PT124B-225-M20
- Test range: 0-500mm
- Power supply: 24DC
- Output signal: 4-20mA

11) Typical gas detector

- Model: BH-60
- Test range: 0-10PPM
- Power supply: 24DC
- Output signal: 4-20mA

12) Combustible gas detector

- Model: GT-B60
- Test range: 3%—100%LEL
- Power supply: 24DC
- Output signal: 4-20mA

## 2.2.2 Explosion-proof air compressor skid

### ① Overview

The explosion-proof air compressor skid is the power unit of the equipment, which provides 1MPa compressed air power for the system through compressed air for the operation of the equipment.



Figure 2.8 Explosion-proof air compressor skid

As shown in Figure 2.4, through the external power supply, the device can set the operating parameters by adjusting the manual control panel. For specific operation methods, please refer to the "Installation and Maintenance Manual".

The operation panel layout is shown in the following figure:



Figure 2.9 Manual operation panel layout

## ② Main technical parameters of explosion-proof air compressor skid

Design Dimensions: 2000L×1500W×1800H

Working pressure: 1MPa  
Air tank volume: 300L  
Total power: 18.5Kw  
Vertical load of a single ring: 3.5T  
Output displacement: 2300L/min  
Power supply: 220V

### ③ Brief description of the functions of main components

#### 1) Explosion-proof air compressor

- Model: EXQ KD-18.5A
- Power: 18.5Kw
- Cooling method: air cooling
- Control mode: manual/automatic



Figure 2.10 Explosion-proof air compressor

#### 2) Air tank

- Model: C-0.3/1.0
- Working pressure: 1MPa
- Volume: 300L
- Product number: LD230102B1-0032



Figure 2.11 Air tank

3) Air reel

- Material: CB10-2-300
- Working pressure: 2MPa
- Length: 10 meters
- Interface size: 1/2NPT

4) Temperature transmitter

- Model: WRB-207B

- Test range: -20—80°C
- Power supply: 24DC
- Output signal: 4-20mA

### 2.2.3 Chemical Reagent Storage Skid

#### ① Overview

The chemical reagent liquid storage skid is the chemical medium storage device of the equipment. The main part of the equipment is a 1000L stainless steel liquid storage tank, which is equipped with anti-wave, heating, stirring and other accessories.



Figure 2.12 Chemical Reagent Storage Skid

As shown in Figure 2.4, through the interface, the chemical medium can be directly replenished to the liquid storage tank, and the diaphragm pump of the chemical reagent injection skid can also replenish the chemical medium in the liquid storage tank to the chemical reagent injection skid.

#### ② Main technical parameters of chemical reagent liquid storage skid

Design Dimensions: 2000L×1500W×1800H

Air storage tank volume: 1000L

Total power: 12Kw

Vertical load of a single ring: 3.5T

Power supply: 220V

### ③ Function brief description of main components

#### 1) Chemical reagent storage tank

- Material: 304 stainless steel
- Volume: 1000L
- Remarks: Equipped with overflow valve, drain valve, liquid level gauge, water injection port, etc.

#### 2) Stirring motor

- Model: YBX3-100L-4
- Power: 2.2Kw
- Speed: 1400R/min
- Agitator impeller outer diameter: 400mm

#### 3) Replica liquid level gauge

- Model: YCSH1217-CFB
- Material: 316
- Center distance: 1 meter
- Output signal: 4-20mA

#### 4) Temperature transmitter

- Model: WRB-207B
- Test range: -20—80°C
- Power supply: 24DC
- Output signal: 4-20mA

## 2.2.4 Measurement and control system

The measurement and control system mainly includes:

- (1) Chemical reagents are injected into the explosion-proof control cabinet and touch screen;
- (2) Explosion-proof air compressor pry explosion-proof control cabinet and explosion-proof motor;
- (3) Chemical reagent storage tank pry explosion-proof control cabinet and explosion-proof motor

For the above parts, refer to the "Electrical Operation Manual".



### 3. Instructions

#### 3.1 Equipment Working Environment

Ambient temperature: -6—+40°C;

Ambient humidity: 0-95% relative humidity

Power supply voltage: 380AC 50Hz

#### 3.2 Design Check and Calculation

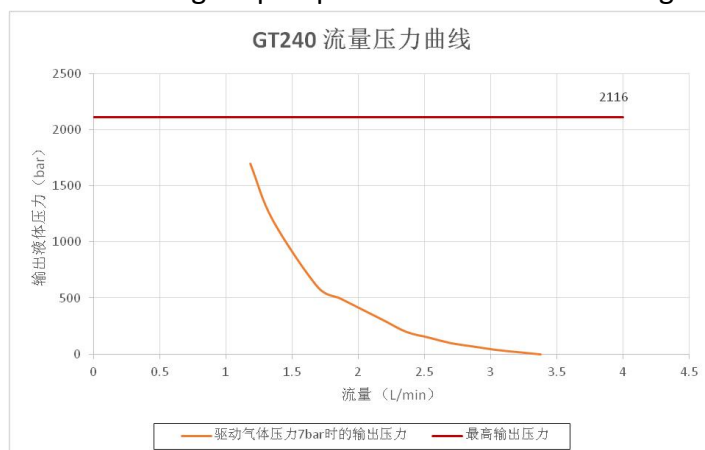
##### 3.2.1 Maximum output pressure check

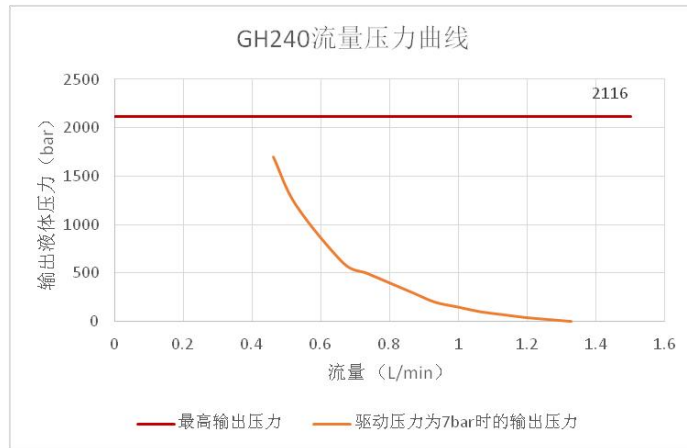
The customer requires the maximum working pressure of the equipment to be 210MPa, and the booster pumps of the GT240 and GH240 gas drive chemical reagent pumps provided are both 1:240, and the output pressure is shown in the following table:

Air Pressure (MPa)	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
GT240 (MPa)	24	48	72	96	120	144	168	192	216	240
GH240 (MPa)	24	48	72	96	120	144	168	192	216	240

##### 3.2.2 Equipment output flow check

The customer expects the output flow of the equipment to be 2.83L/min and 1.16L/min respectively, and the output flow pressure of the provided GT240 and GH240 gas drive chemical reagent pumps is shown in the following table:





### 3.3 On-site Operation



Note: During the use of the equipment, please stay away from the high-pressure outlet

During the use of equipment, pay attention to high temperature injury

#### 3.3.1 On-site operation of explosion-proof air compressors

##### Preparing for Use

- 1) Connect the power cord of the device;
- 2) Check that the outlet ball valve of the explosion-proof air compressor is open;
- 3) Check that the pressure indication of the air storage tank is zero;
- 4) Open the drain valve at the bottom of the gas storage tank to drain the waste water;
- 5) Check the reliability of the connecting hose thread;

##### Device Power on

- 6) Cut into the main power switch;
- 7) Press the "ON" start button, the compressor motor will start automatically, and the running indicator light will be on;
- 8) Observe the change of the pressure indication of the gas cylinder;

##### Equipment Downtime

- 9) Press the "OFF" stop button, and the equipment will stop after an automatic delay of 10S;
- 10) Turn off the main power switch;



- 1) The gas compression type will generate a lot of heat, keep the door of skid open when in use;

2) It is strictly forbidden to use the "emergency stop" button for non-emergency situations;

### 3.3.2 Use of Chemical Storage Tank Skids

There is no special operation for the chemical storage tank skid, and it is a fully automatic control system. Pay attention to observe the chemical reagent level and temperature of the chemical storage tank when using it.



The chemical storage tank is insulated, but still need to pay attention to heat radiation!

### 3.3.3 Manual Operation of Chemical Injection Skids

#### Preparing for Use

- 1) Connect equipment power lines, driving air lines and chemical reagent input and output lines;
- 2) Check the liquid level of the liquid storage skid, at least at 1/3, to avoid air entering the air-driven chemical pump and causing life damage;
- 3) Check that all pressure gauges on the panel are at zero position;
- 4) Check that all valves on the panel are closed (including air shut-off valve and high-pressure shut-off valve);

#### Equipment Chemical Injection Operation (the operation methods of the 4 pumps are the same, and the 1# pump is used as the operation method)

- 5) Fully open the "stop valve" and "precision throttle valve", and keep the "unloading valve" closed
- 6) Open "Ball Valve-1#";
- 7) Slowly adjust the corresponding "driving air pressure regulating valve", and observe the changes in the readings of the "driving air pressure gauge" and the readings of the "high pressure gauge";
- 8) During the normal injection process, the operating noise of the air-driven chemical pump can be heard, and at the same time, the "driving air pressure gauge" and "high pressure gauge" have large amplitudes, and the amplitude tends to be stable, indicating that the pressure area is stable;
- 9) The injection volume needs to be adjusted during the injection process, and the "precision throttle valve" can be adjusted to control the output flow;

#### Replenishing Chemical Reagent During Work

- 10) The automatic program is set, the liquid level in the water tank is at a low level, it can automatically replenish the liquid; at the same time, it can also manually replenish the liquid through the ball valve;

#### Equipment Stops Injecting

11) It is necessary to stop the chemical injection, first close the "ball valve-1#" and adjust the "driving air pressure regulating valve to the minimum";

#### **Equipment Work Completed**

12) After the operation is completed, open the "unloading valve" and observe that the "high pressure gauge" returns to zero;

13) Disassemble all connecting pipelines and cables;

14) Close all valves on the control panel;



1. In order to ensure the service life of the equipment, it is recommended to run and clean the system with clean water after the work is completed!

2. Insulation measures for equipment pipelines still need to pay attention to heat radiation!

### **3.4 Touch Screen Operation**

#### **3.4.1 Device Power**

- 380VAC ±10%
- 50HZ
- 37KW

#### **3.4.2 Page Description**

##### **1. Main interface**

Click button to enter system



##### **2. Menu bar**



- Status Display: Displays the sensor status page
- Supercharge process: display supercharge status display page
- Automatic Control: Automatic Control Page
- Manual Control: Manual Control Page
- IO status: display input and output status
- Parameter setting: set the running parameters
- Alarm information: display alarm status information
- Back to home page: Return to the initial page

### 3. Parameter setting

#### 1) Enter Password

Password is required to set parameters



The password is a dynamic real-time date (for example, the date is June 1, 2023, and the password is 20230601)

#### 2) Parameter Settings

设备	名称	高位	低位	报警值	说明
增压撬	液位	0.0	0.0	0.0	液位低于设定值时报警
	温度	0.0	0.0	0.0	温度高于设定值时报警
搅拌撬	液位	0.0	0.0	0.0	液位低于设定值时报警
	温度	0.0	0.0	0.0	温度高于设定值时报警
压力报警值	可燃气体报警值	硫化氢报警值	泵增压比		
0.0	0.0	0.0	0		

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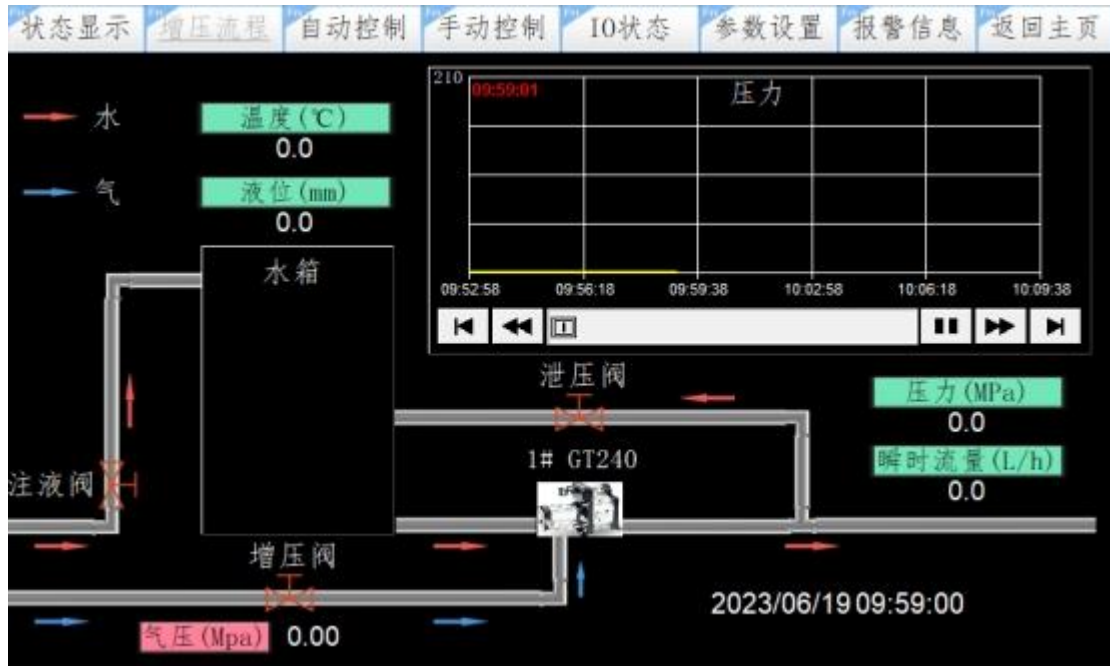
- Liquid level high: The position at which liquid stops filling
- Liquid level low: the position where the liquid starts to inject
- Liquid level alarm value: the liquid exceeds the alarm value to stop the alarm
- Temperature High: The temperature at which the heater stops heating
- Temperature Low: The temperature at which the heater starts heating
- Temperature alarm value: shutdown alarm when the temperature exceeds the alarm value
- Pressure alarm value: shutdown alarm when the pressure exceeds the alarm value
- Combustible gas alarm value: Shutdown alarm when combustible gas exceeds the alarm value
- Hydrogen sulfide alarm value: Shutdown alarm when hydrogen sulfide exceeds the alarm value
- Pump Boost Ratio: The boost ratio of the booster pump

#### 4. Status display



Display real-time data from sensors

#### 5. Supercharging process



Display the pressurization process and real-time pressure curve

## 6. Automatic control



## 7. Manual control





- Boosting: boosting according to the set pressure and the selected pump
- Boost: take the pressure off

### 3.4.3 Automatic Operation Steps

- Set temperature and liquid level high and low
- Enter the automatic operation interface
- Set automatic operating pressure
- Select booster pump
- Switch to automatic mode
- Adjust the proper flow

## 4. Maintenance



- Before maintaining the equipment, the water, electricity and gas circuits should be cut off
- Before maintaining the equipment, please confirm that the temperature and pressure have returned to zero

### 4.1 Maintenance and Maintenance of Long-term Out-of-use Equipment

When the equipment is stopped for a long time, in order to ensure the good performance of the equipment, the following operations should be carried out:

- 1) Disconnect the compressed air pipeline;
- 2) Disconnect the main power supply of the equipment;
- 3) Cut off the chemical reagent supply system of the equipment;
- 4) All external interfaces are sealed;
- 5) Every other month, run the equipment automatically once with clean water;
- 6) Every other month, check whether the electrical circuit is in good condition;
- 7) Regularly check the effective date of the metering components;

## 4.2 Daily Maintenance Work

### 4.2.1 Chemical Reagent Injection Skid

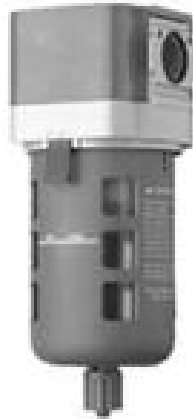
- Check that the terminals of electrical wiring are secure;
- Check that the waterproof and rainproof cover is intact;
- Check that the insulation facilities are in good condition;

#### 1. Maintenance of booster pumps and high-voltage components

The pressurized components and high-voltage components used in the equipment are all high-precision instruments, which require professionals to overhaul and maintain them. When a fault occurs, please contact the relevant personnel of our company in time, and do not dismantle it yourself.

#### 2. Pipeline maintenance

Item	Inspection and Maintenance Cycles
Open the drain outlet of the chemical storage tank and drain the reagent	once a month
Detecting chemical reagent accumulation in automatic drains	once a month
Detect high pressure solenoid valve circuit	once a month
Check the low pressure solenoid valve circuit	once a month
Check the sensor line	once a month
Check the unloading circuit line	once a month
Filter decontamination	once a month



EAF系列过滤器EAF4000

auto drain valve



water filter

#### 4.2.2 Explosion-proof Air Compressor Skid

- Regularly check the cleanliness and quantity of coolant and engine oil;
- Regularly discharge the sewage in the liquid storage tank;
- Regularly check the stability of electrical circuits;
- For more maintenance requirements, refer to the "Installation and Maintenance Manual"

#### 4.2.3 Chemical Reagent Storage Tank Skid

- Regularly check the integrity of the shape and structure of the storage tank;
- Regularly stir the motor to run and vibrate;
- Regularly check the stability of electrical circuits;

**4.2.4 For the maintenance of other components, please refer to the user manual of the components in the attachment**

**Appendix 1 System Schematic**

**Appendix 2 Cable and pipeline connection statistics table**

NO	Name	Outlet	Incoming	Remarks
1	Cable bus	Explosion-proof air compressor skid	External power	
2	Chemical tank skid cable	Chemical tank skid	Chemical Reagent Injection Skid	
3	Chemical reagent injection skid cable	Explosion-proof air compressor skid	Chemical Reagent Injection Skid	
4	Air compressor signal line	Explosion-proof air compressor skid	Chemical Reagent Injection Skid	
5	Chemical reagent tank skid signal line	Chemical tank skid	Chemical Reagent Injection Skid	
6	Air line	Explosion-proof air compressor skid	Chemical Reagent Injection Skid	
7	Chemical reagent injection	Chemical tank skid	Chemical Reagent Injection Skid	





**Appendix 3 Summary table of valve normally open and normally closed**

<b>Chemical Reagent Injection Skid Valve Statistics</b>			
Name	Status	Name	Status
Unloading valve	0	Ball valve 1#	0
Shut-off valve	0	Ball valve 2#	0
Precision Throttle Valve	0	Ball valve 3#	0
Drive Air Regulator	0	Ball valve 4#	0
Blowdown ball valve	0	Manual filling switch	0
Injection Pump Liquid Switch	0	Unloading control valve	0
Pump control valve 1#	0	Pump control valve 2#	0
Pump control valve 3#	0	Pump control valve 4#	0
Pump proportional valve 1-2#	0	Pump proportional valve 3-4#	0
Air safety valve	0	Air switch	1
<b>Explosion-proof air compressor skid</b>			
air safety valve	0	Air switch	1
Drain switch	0		
<b>Chemical tank skid</b>			
Inlet switch	1	Level gauge switch	0
Liquid outlet switch	0	Outfall	0

Note: 1 stands for normally open, 0 stands for normally closed