ZXMD-2000 Intelligent SF6 Density Relay Calibrator

Contents

Ⅰ、Product overview

Is an intelligent SF6 density relay calibrator. The instrument adopts high-precision pressure sensor and high-speed A / D converter, combined with 32-bit high-performance microprocessor, which can verify the performance of various SF6 density relays,accurately measure the pressure value at the current temperature when the signal acts, automatically complete the conversion of standard pressure at any ambient temperature to 20 ℃, and can print and store the test data in real time for reference and automatic identification Don't test for faults in the process. The product is easy to carry,easy to operate, high accuracy, strong stability and good reliability, which embodies the characteristics of "intelligent" instrument.

SF6 switch is a widely used high-voltage electrical appliance in power system. The reliable operation of SF6 switch has become one of the most concerned issues in power supply and consumption departments. SF6 gas density relay is an important component used to monitor the change of SF6 gas density in the operation of SF6 switch. Its performancedirectly affects the operation safety of SF6 switch. The SF6 gas density relay in operation on site often has some problems such as inflexible action and poor contact after a period of time due to its unusual action. Some of them will also have poor temperature compensation performance of the density relay. When the ambient temperature suddenlychanges, the SF6 density relay often misoperates. Therefore, DL / T596-1996 "preventive test code for electric equipment" stipulates that all SF6 switch users shall regularly verify the SF6 gas density relay. From the actual operation, it is very necessary to check the SF6 density relay and pressure gauge regularly.

Ⅱ、Performance characteristics

1. The product adopts 32-bit microprocessor and TI company's high-speed signal processing chip for detection and control, with high integration degree. Mechatronics design, high precision, good repeatability, high reliability.
2. Equipped with a large screen Chinese LCD screen and a rotating mouse (one button flying shuttle) human-machine interface, the operation is simple, the interface is beautiful, all parameters and status are clear at a glance.
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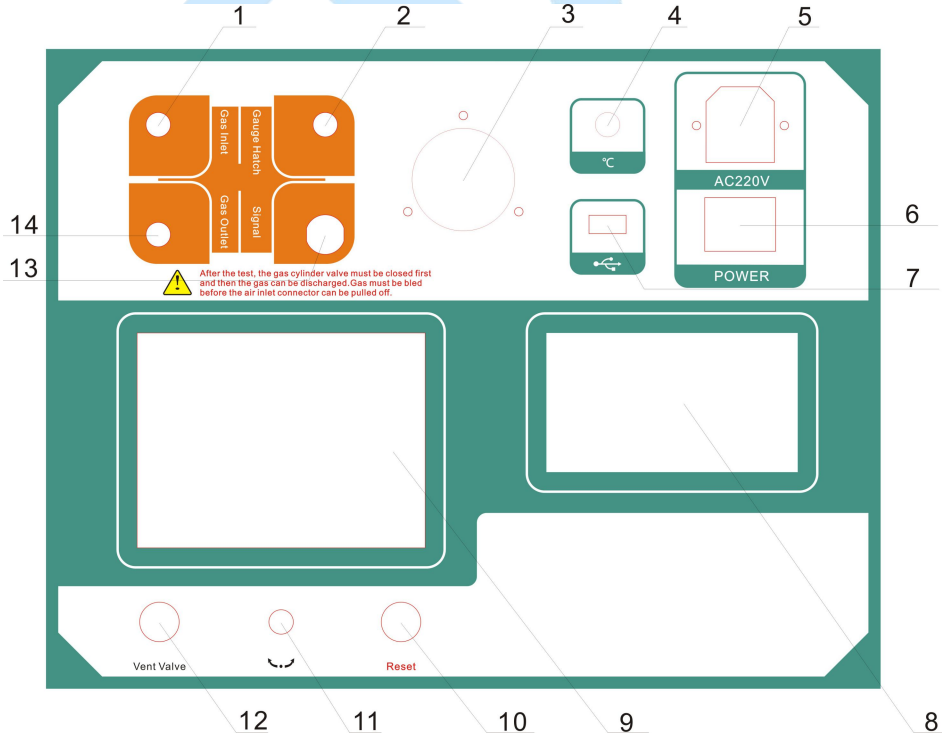
4. Automatic pressure measurement and 20 ℃ value conversion are completed, thus dynamic automatic compensation between pressure and temperature is completed. It also shows the pressure under the measured ambient temperature,the pressure under the ambient temperature at 20 ℃ and the ambient temperature. The problem of field calibration of SF6 gas density relay is solved thoroughly.
5. All the testing process is automatically completed by the instrument without manual intervention, which avoids the tedious manual gas path adjustment operation.
6. All metal quick connector is adopted to effectively avoid the locking phenomenon of plastic connector in low temperature environment.
7. The test results are printed in Chinese character report form, and the test results are analyzed intelligently.
8. It can store 50 groups of test results at the same time, and has the function of power-off data protection. It can query and print the previous test results at any time.
9. In the calibration process, constant temperature chamber is not required, and SF6 gas density relay and pressure gauge can be calibrated within any effective temperature range.
10. Equipped with a variety of models of transition joints, most models of switch density relay can be field verified without disassembly.
11. In the calibration process, the gas consumption is very little, SF6 gas is not wasted, the test cost is low, and there is no pollution to the environment.
12. It has the function of modifying the system clock online.
13. It has the function of modifying system pressure on line and can be corrected on site.
14. The core components are imported components with reliable performance.
15. It can test one set of alarm signals and two sets of locking signals at the same time.
16. This product is a portable tool, easy to use and reliable, is the best choice for SF6 density relay calibration.

Ⅲ、Technical indicators

1. Power: AC220V、50Hz
2. Power consumption: 50W
3. Instrument accuracy: 0.2 Class
4. Pressure resolution: 0.001MPa
5. Pressure calibration range: 0～1MPa

6. Temperature resolution: 0.1°C
7. Environmental scope: -20℃～80℃
8. Ambient humidity: £90%RH
9. Communication mode: USB 2.0
10. Calibration object: single alarm, single latch, single alarm and single latch, single alarm and double latch
11. Display mode: 320 × 240 LCD
12. Operation mode: rotate mouse input
13. Printer: high speed micro printer
14. Printing method: English printing
15. Storage capacity: store 50 sets of test results
16. Dimensions: host: 365×300×220(mm3)
    Accessory: 400×370×200(mm3)
17. SF6 gas density display mode: pressure under the tested environment, equivalent pressure at 20 ℃.
18. Weight:8kg

Ⅳ、Panel structure



1.inlet	2.Calibration port	3.Pressure gauge

4.Temperature sensor	5.Power supply	6.power switch
7.USB	8.printer	9.LCD
10.RESET	11.MOUSE	12.release button
13.Signal interface	14.Outlet	

Ⅴ、Instructions

1. LCD description

The instrument adopts 320 × 240 high-resolution gray backlit LCD, which can display clearly even in strong sunlight. Parameter setting and test results are displayed on LCD screen. All Chinese operation interface, clear graphics, beautiful, easy to operate.

2. Mouse instructions

The function of rotating the mouse is similar to the mouse used on the computer. It has three operations: "left", "right", "click to select". Through these three kinds of operations of the mouse, the functions of moving cursor, data input and operation selection can be realized.

Move cursor: move the cursor by turning the mouse left or right, move the cursor to the option to be selected, and click the knob to select this item.

Data input: when the data needs to be modified or input, move the cursor to the option to modify the data, click the mouse to enter the data modification operation (the cursor is reduced to the modified position), left or right mouse to increase or decrease the position, click the mouse to confirm the modification of the position. Rotate the mouse to enterthe next modification. After the bit by bit modification, the cursor increases to full cursor, that is, to exit the modification of data. At this time, you can move the cursor away by rotating the mouse.

3. Instrument instructions

When verifying the SF6 density relay on site, please use the accessories configured by the instrument to connect the gas circuit and the circuit as shown in Figure 1, The air inlet pipe is connected with the measuring port of the instrument and the gas cylinder,and the air outlet pipe is connected with the air outlet (the non-toxic and harmless compressed gas such as air and nitrogen can be directly discharged into the air without connecting the air outlet),the measuring pipe is connected with the measuring port of the instrument and

connected with the SF6 density relay to be tested through the transition joint (see Appendix 1-14 for the transition joint), and the six core test line is connected with the instrument Corresponding test points on the wiring cabinet.

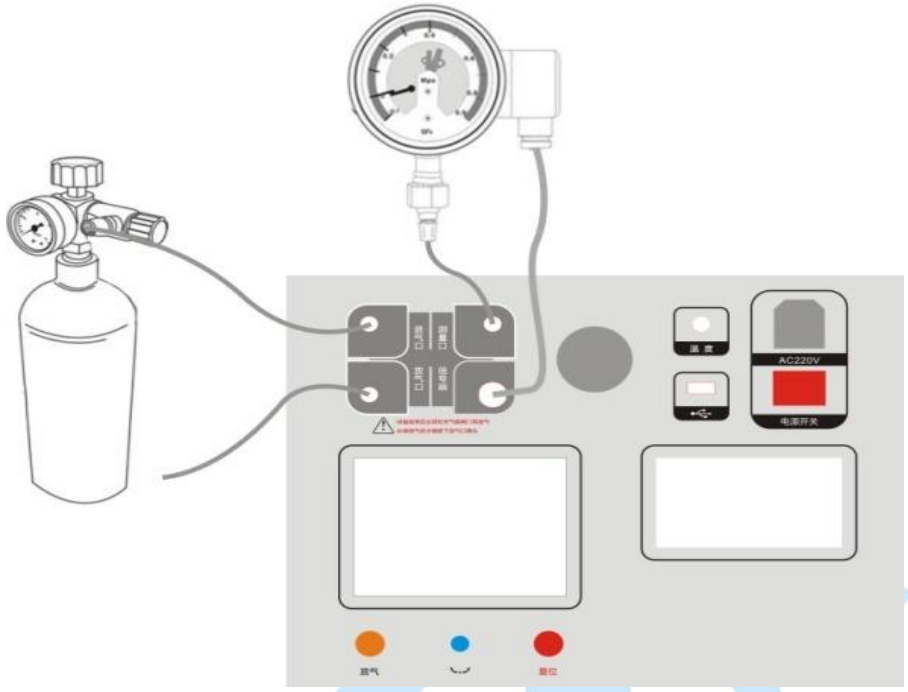


Figure 1

According to the test target, connect one end of the equipped six core test line with the aviation plug-in signal port on the instrument panel, and connect the end with the alligator clamp with the signal socket on the junction cabinet of the density relay according to the test signal. The unused alligator clamp shall be idle and shall not contact with other alligator clamps. When testing a signal (one of single alarm, single lock 1 or single lock 2), only the corresponding test signal shall be received, and "single signal" shall be selected on the operation interface, and the system will automatically identify.

If the pressure gauge calibration operation needs to be performed, it is necessary to connect the pressure gauge to be calibrated with the measuring port on the instrument panel; if the system pressure value correction operation needs to be performed,it is necessary to connect the high-precision pressure gauge calibrated by measurement with the measuring port on the instrument panel as shown in Figure 2.

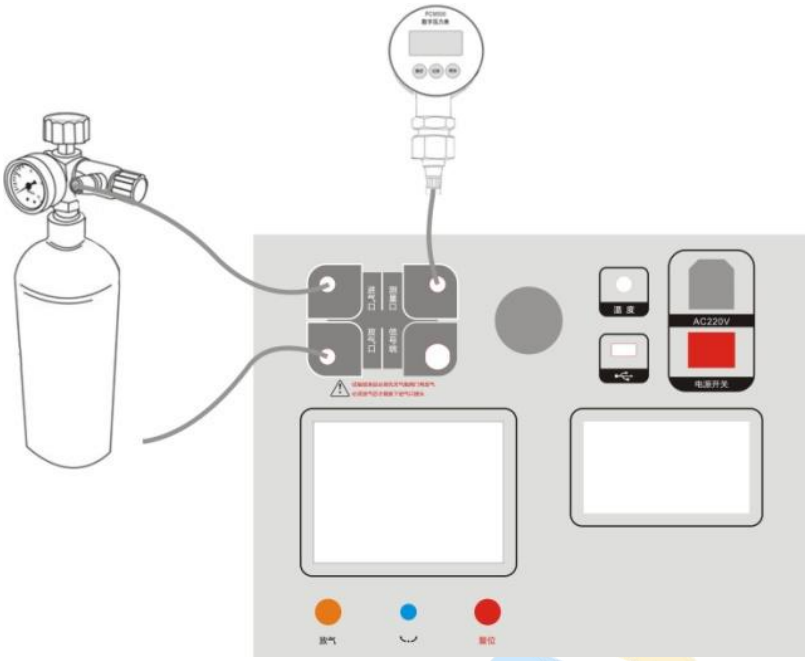


Figure 2

Ⅵ、 Function description

After connecting the gas circuit, you can open the valve on the gas cylinder, turn on the power supply of the instrument, and enter the main interface after system initialization, as shown in Figure 3, which has the functions of " Density relay ", " Normal Pressure ", "20℃ Pressure ", " History Record ", " Date Setting ", " PC Comm.",etc. Rotate the mouse left and right, the cursor can switch freely before each function item, select the function item, and click Select to enter.

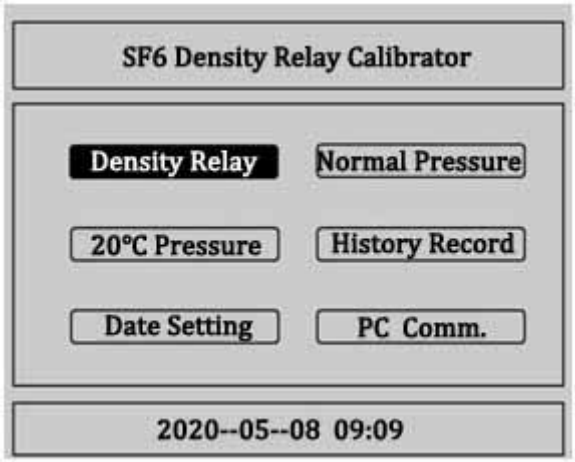


Figure 3

1. Verify SF6 density relay

Basic principle of SF6 density relay calibration: the gas pressure in the closed vessel

changes with the change of temperature, and the relative pressure value of SF6 at 20 ℃ is usually taken as the standard value. In the field calibration,the SF6 pressure value measured at a certain ambient temperature shall be converted to the equivalent pressure value at 20 ℃, so as to judge the performance of the density relay.

Verification of latching reply value: At the ambient temperature, when the SF6 density relay is at zero pressure, slowly inflate the SF6 density relay at a certain speed. When the locking relay of the SF6 density relay acts, record the pressure value under the current ambient temperature, and convert it into the equivalent pressure value at 20 ℃. The equivalent pressure value at 20 ℃ is the locking recovery value of the SF6 density relay.

Verification of alarm reply value: Continue to slowly inflate the SF6 density relay at a certain speed. When the alarm relay of the density relay acts, record the pressure value under the current ambient temperature, and convert it into the equivalent pressure value at 20 ℃. The equivalent pressure value at 20 ℃ is the alarm reply value of the SF6 density relay.

Alarm value verification: Under the ambient temperature, when the pressure in SF6 density relay is greater than the alarm return value, slowly deflate at a certain speed. When the alarm relay of SF6 density relay acts, record the pressure value under the current ambient temperature, and convert it into the equivalent pressure value at 20 ℃. The equivalent pressure value at 20 ℃ is the alarm value of SF6 density relay.

Verification of blocking value: Continue to slowly deflate the SF6 density relay at a certain speed. When the locking relay of the SF6 density relay acts, record the pressure value under the current ambient temperature, and convert it to the equivalent pressure value at 20 ℃. The equivalent pressure value at 20 ℃ is the locking value of the SF6 density relay.

In the main interface, select the "density relay verification" item with the cursor, and click "select" to enter the density relay verification program, as shown in Figure 4:

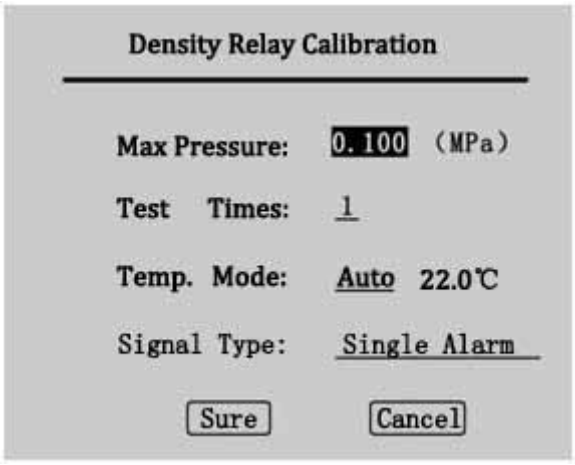


Figure 4

This is the parameter setting interface of SF6 density relay verification.In this interface, four parameters can be set, such as upper limit pressure, detection times, temperature acquisition, signal type, etc.

"Upper limit pressure" refers to the switching pressure value from air inlet to air outlet when testing the density relay. "Click to select" will display the decile, percentile and thousandth of the selected value in reverse order. After selecting one position, rotate the mouse left and right to change from 0 to 9. The setting range of pressure value is 0.001mpa to 0.999mpa, and the default value is 0.1MPa.

"Detection times" is used to set the cycle times of inflation and deflation. Click "select" to select between 1, 2 and 3. The default value is 1.

"Temperature mode" is used to select the temperature acquisition mode of the system. There are two options: "system" and "input"."System" refers to the sensor provided by the system to sense the ambient temperature; "input" refers to the internal temperature of the density relay tested by the user with an infrared thermometer, and then manually input.The default is system acquisition. When the cursor moves to temperature acquisition, click Select to switch between the system and input. When it is input, the cursor will select the entered temperature value, and then rotate the mouse left and right to set the temperature value.

"Signal type" is used to select the signal type for test. There are three options, namely "single signal", "single lock" and "double lock", and "click to select" to switch back and forth. The three options are described in detail below.

Single signal: When selecting a single signal, only one test signal can be connected to the instrument, and either single alarm, single lock 1 or single lock 2 can be selected, which is determined by the physical connection and automatically recognized by the system.

Single block: When single locking is selected, the system has two test signals connected to the instrument, among which there must be a single alarm, and either single locking 1 or single locking 2 can be selected. At this time, the system tests two signals at the same time.

Double locking: When double locking is selected, three signals must be connected to the system at the same time, and the system tests three signals at the same time.

Click "OK" to enter the density relay test interface.

Click "return" to return to the previous interface.

The test interface of density relay is shown in Figure 5. There are six groups of values on the interface, including alarm reply value, alarm value, lock reply value 1, lock reply value 1, lock reply value 2 and lock value 2. According to the set test times and signal type test results, they will be displayed correspondingly. PT is the normal temperature pressure value and P20 is the equivalent pressure value converted to 20 ℃.

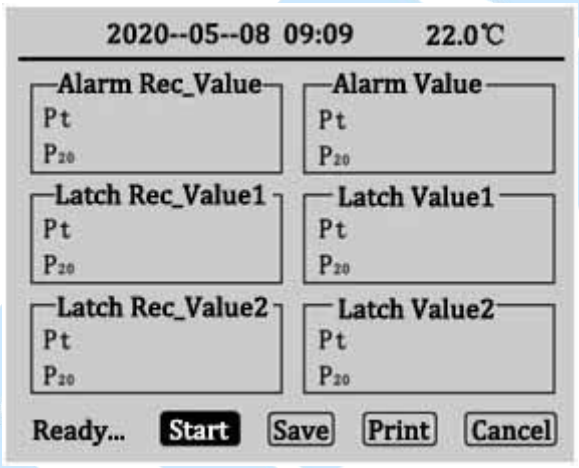


Figure 5

After confirming that the external air circuit is ready, click "start", and the system will start testing according to the previously set parameters.During the detection process, there will be a sound of opening or closing the solenoid valve. When the pressure is increased to the preset upper limit pressure value, there will be a short and rapid air release sound on the vent pipe when the pressure is reduced. The corresponding test results will be successively displayed on the screen. At the same time, the status bar at the lower left corner of the screen will prompt the detection times. The schematic diagram of pressure increase and pressure decrease is shown in Figure 6 and Figure 7:

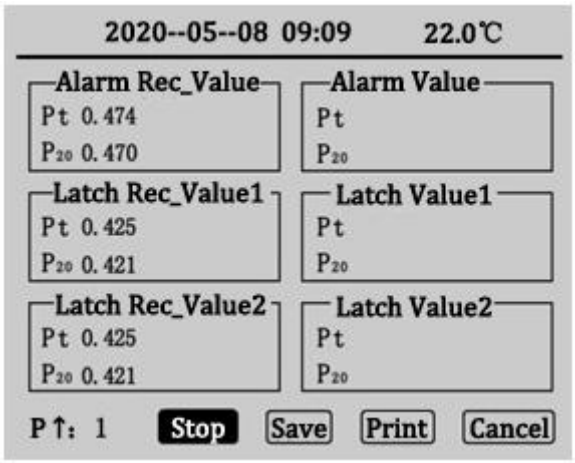


Figure 6

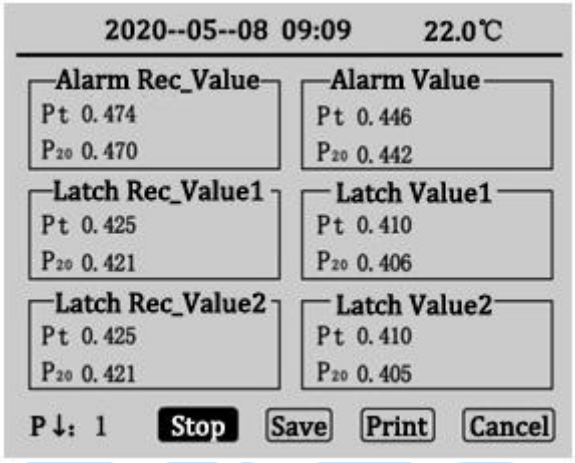


Figure 7

At this time, click "stop" to close the air valve and stop detection. If there is no value display when stopping, click "start" to continue detection. Otherwise, deflate first and then click "start".If there is a problem in the detection, the system will display "device failure". At this time, the user should check whether the connection of the line and the air circuit and the selection of "signal type" are correct.After the test is completed, the status bar will show the test completed, as shown in Figure 8.

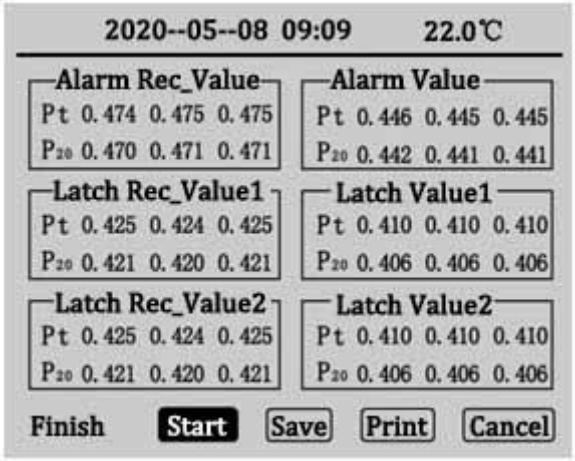


Figure 8

Figure 8 shows the test results of three times, "signal type" is double locking. Click "start" to clear the displayed value and detect again. Click "save" and "print" to save and print the test results.Click "return" to return to the density relay parameter setting interface.

2. Calibration of normal temperature pressure gauge

On the main interface, select "normal temperature pressure gauge calibration" and click "select" to enter the normal temperature pressure gauge calibration program, as shown in Figure 9.

Figure 9 is the parameter setting interface of normal temperature pressure gauge calibration. Two parameters, temperature acquisition and pressure target value, can be set by operating the rotating mouse.

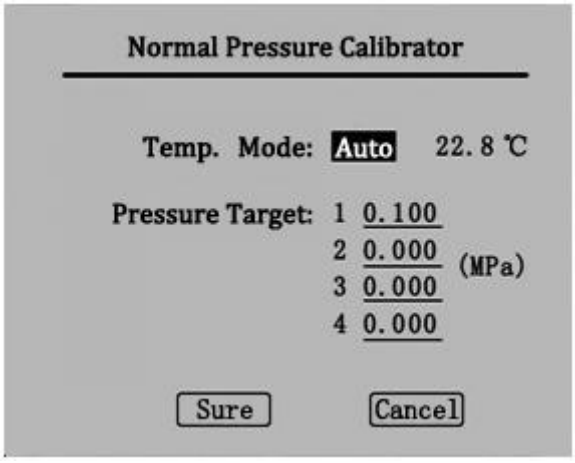


Figure 9

The setting of "temperature acquisition" is the same as the setting in "density relay verification". The "pressure target value" is the preset pressure test point, which can be set up to four groups at most. When setting, it should be set from small to large in order. If there

is a mistake in setting, click "OK" and the following prompt will appear, as shown in Figure 10:

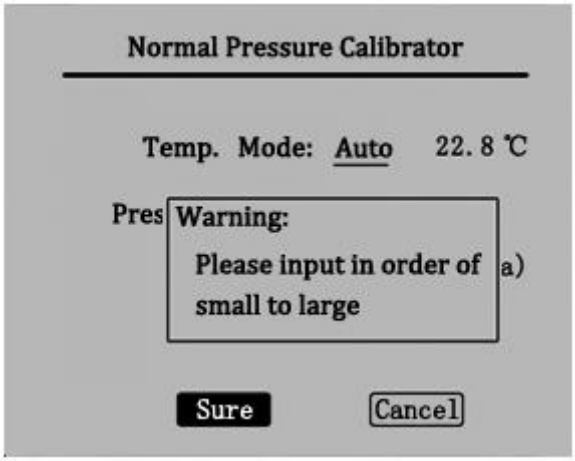


Figure 10

After setting the pressure target value correctly, click "OK" to enter the normal temperature pressure gauge calibration interface, and click "return" to enter the main interface.

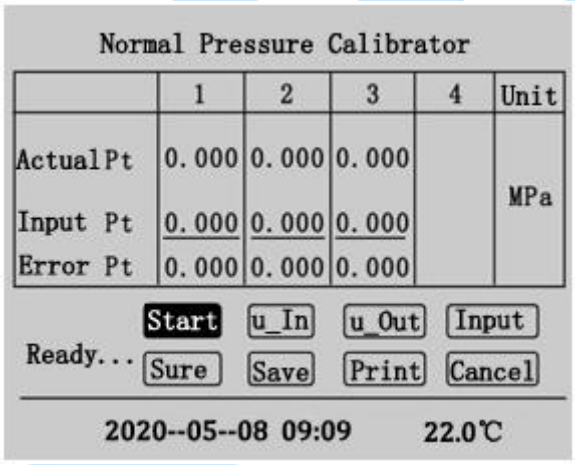


Figure 11

Figure 11 is the test interface for verification of normal temperature pressure gauge. If several groups of test points are preset in the parameter setting interface, several groups of default 0.000 values will appear in columns 1, 2, 3 and 4 of the interface (Figure 11 preset three groups of test points, the first group is 0.2MPa)."Start" refers to automatic inflation and pressure rise to the preset point, "micro charging" and "micro discharging" refers to manual inflation and pressure rise, "input" refers to manual input of the displayed value of the pressure gauge to be tested, "confirm" refers to the completion of a group of test points, calculation and display of the error value, which can be saved and printed after the completion of the test.

Click "start" to start detection. When the current value Pt in the first column will rise to the preset value of the first set of test points 0.200mpa, it will stop as shown in Figure 12. In the process of inflation, the status bar will prompt "the first test". When the preset pressure value is reached, it will display "detection completed".

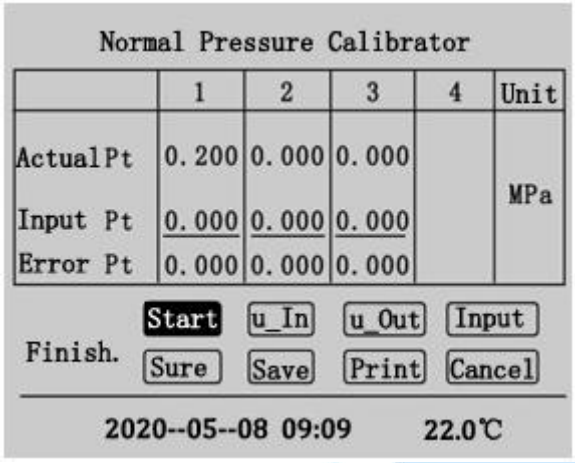


Figure 12

Move the cursor to "input" in Figure 12, and click the "select" cursor to move to the input value in the first column, as shown in Figure 13:

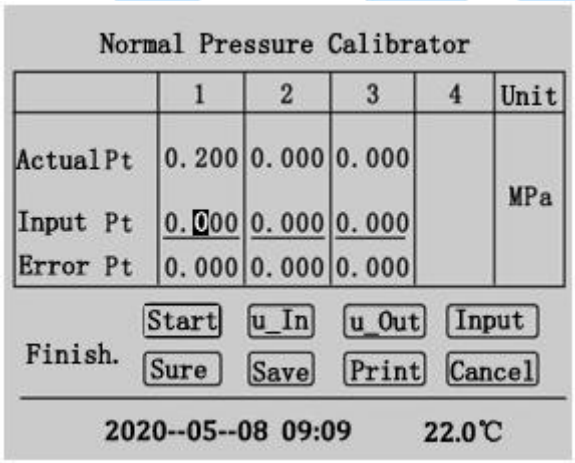


Figure 13

Rotate the mouse left and right to modify the value, input the displayed value of the pressure gauge to be tested, then "click the selected" cursor to return to "input", click "OK" to complete the first test, as shown in Figure 14:

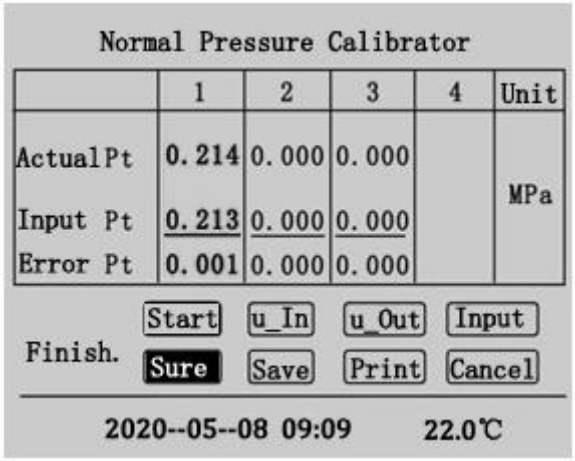


Figure 14

Click "start" to start the second test. The operation process is the same as the first test. The result after the completion of the three preset tests is shown in Figure 15.

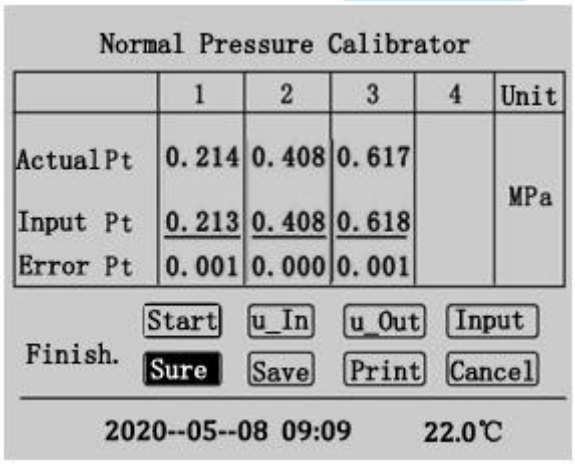


Figure 15

At this time, you can click "save" and "print" test records, and click "return" to return to the test interface.

3. Calibration of 20 degree pressure gauge

On the main interface, select "20 degree pressure gauge calibration" and click "select" to enter the 20 degree pressure gauge calibration program.The calibration process of 20 degree pressure gauge is exactly the same as that of normal temperature pressure gauge, but there are some differences on the interface.

20The parameter setting interface of degree pressure gauge calibration is the same as that of normal temperature pressure gauge, but the title of the interface is 20 degree pressure gauge calibration. The test interface shows that the test result is different from that of normal temperature pressure gauge. The equivalent pressure value at 20 ℃ is also

displayed on the current value item, as shown in Figure 16.

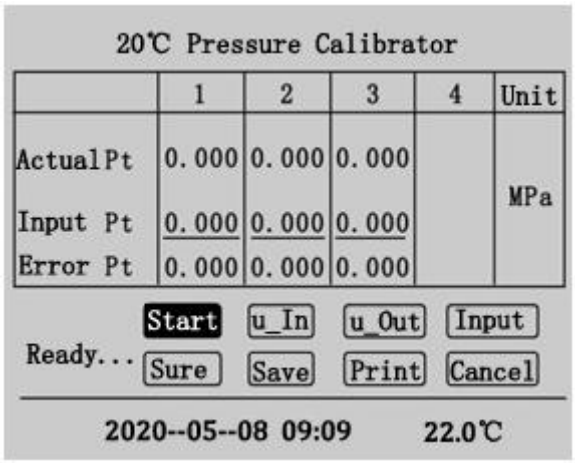


Figure 16

4. Browsing historical data

On the main interface, select "historical data browsing" and click "select" to enter the historical data browsing interface, as shown in Figure 17.

Figure 17

Select "density relay verification test record" and click to enter the interface shown in Figure 18.

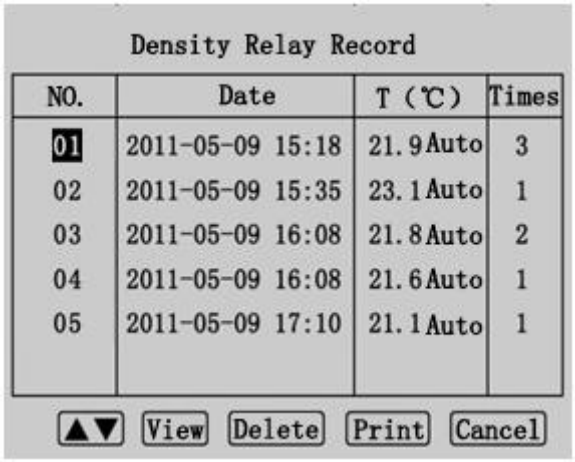


Figure 18

Rotate left and right to select the number of groups, and then "click to select" to enter figure 19.

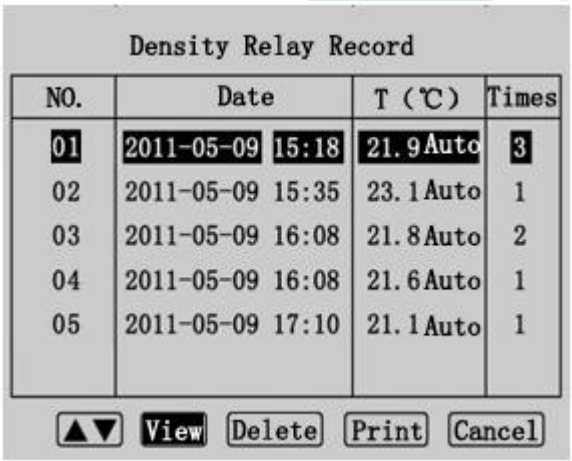


Figure 19

In this interface, you can select to view, delete and print historical data by turning the mouse left and right. Click "▲▼" to return to figure 18, click "return" to return to figure 17, and click "view" to enter Figure 20.

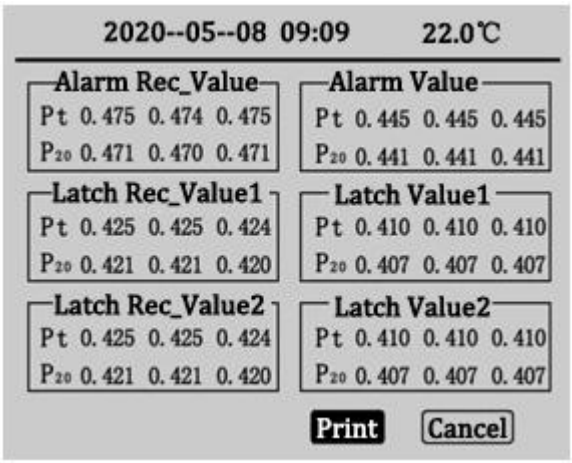


Figure 20

This interface is for detailed historical measurement data. Click "print" to print the current historical data, and click "return" to return to figure 18.

In Figure 17, you can select to view the calibration record of normal temperature pressure gauge and 20 readings of pressure gauge. The interface and operation process are the same as the calibration history of density relay.

5. System clock adjustment

In the main interface, select "system clock adjustment" with the cursor, and click "select" to enter the system clock setting program, as shown in Figure 21:

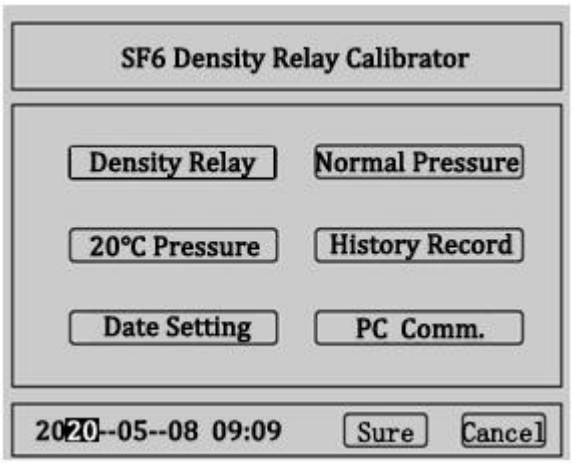


Figure 21

The system time can be set in this interface, and the left and right mouse cursors can move on the numbers of mm / DD / yyyy. After clicking "select", the left and right mouse can be rotated to modify the numbers, set the time, click "OK" to set the time successfully, and click "Cancel" to return to the main interface.

6. Computer communication

Select the "computer communication" item in the main interface and click "select" to enter the computer communication interface, as shown in Figure 22:

Figure 22

Ⅶ、End of work

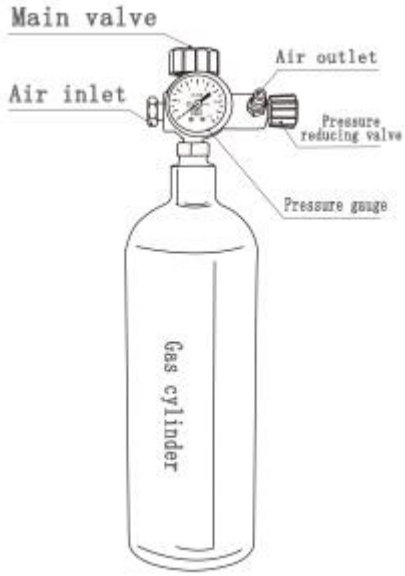
1. Close all valves on the cylinder.
2. Press the "bleed" button on the panel to discharge the residual gas in the pipeline.

Note: do not pull off the air inlet plug without venting

3. Turn off the power.
4. Pull out the air pipe.
5. Unplug the signal and power cables.

Ⅷ、Precautions

1. When verifying the SF6 gas density relay on site, disconnect the power supply connected with the density relay to avoid damaging the calibrator.
2. Before going to the site, bring the tool box, check the nitrogen gas storage capacity of the small gas cylinder in the tool box, and bring all the transition joints and tools for the switch.
3. The corresponding alarm signal line and locking signal line on the terminal strip shall be disconnected from the terminal strip to prevent the secondary circuit and the signal line in the secondary circuit from forming a circuit and affecting the test.
4. The calibrated density relay cannot be laid flat and placed vertically, otherwise the calibration will be inaccurate.
5. The density relay shall not vibrate too much in the process of verification.
6. When using the gas cylinder, follow the instructions below.



Ⅸ、Custody and transportation

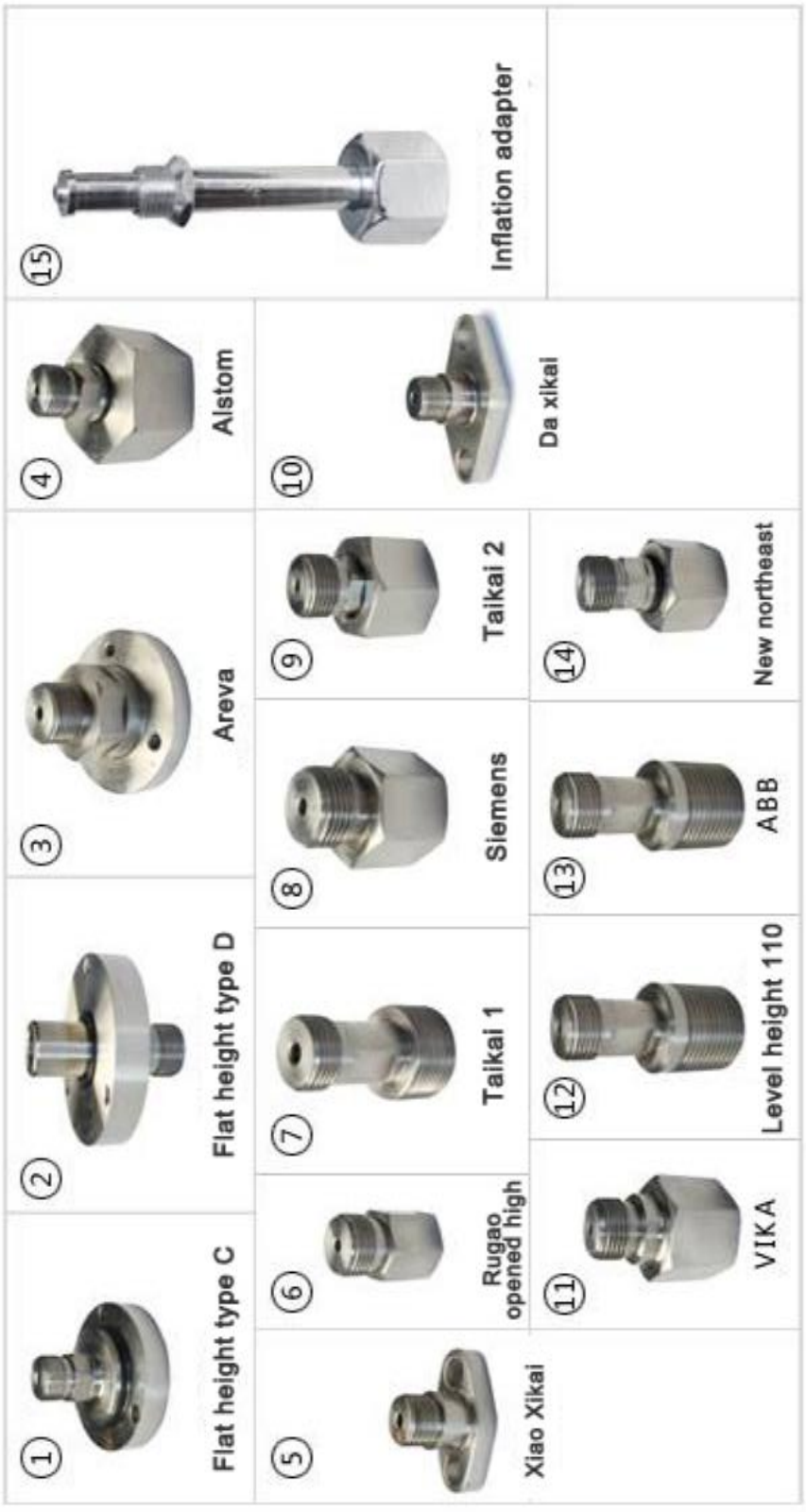
1. The calibration device belongs to the precision electronic product, which should be placed in the temperature of - 30 ~ 70 ℃, the relative humidity is not more than 90%, and the air does not contain enough gas to cause corrosion.
2. During the transportation of calibrator, avoid violent vibration and impact, and prevent rain and snow from soaking.

Ⅹ、Packing List

No.	Name	Quantity
1	host	1
2	Power cord	1
3	High-pressure cylinders	1
4	Intake pipe (180cm)	1
5	Measuring gas pipe (180cm)	1
6	Vent pipe (120cm)	1
7	Transition joint (no.1-14)	1
8	Inflation adapter (No.16)	1
9	6Core test line	1
10	Printing paper	2
11	PTFE TAPE	2
12	2A fuse	3
13	manual	1

14	Test report	1
15	Certificate / warranty card	1

Appendix I Packing diagram of SF6 density relay transition connector



Appendix II schematic diagram of cylinder inflation connection

As shown in the figure above: turn it off as indicated by the arrow

As shown in the figure above: install the inflation connecting rod in the accessory box as shown in the figure

As shown in the figure above: connect the other end of the connecting rod to the cylinder Precautions for cylinder inflation:

Nitrogen filling: 5MPa for cylinder pressure gauge.

SF6 gas filling: the cylinder pressure gauge pointer is stable, and the connecting rod is charged if there is no gas velocity sound.