

FIT-550

Filter Integrity Tester

MANUAL

Notes

1. Before starting the machine, please read the user manual carefully to prevent accidental injury to the operator or damage to the instrument.
2. If the fuse blows when the instrument is powered on, please replace the fuse under the guidance of the manufacturer and use the same specifications to avoid short circuit or damage to the instrument.
3. No one other than our company's maintenance personnel or authorized professionals shall disassemble the components and circuit boards inside the chassis at will, otherwise the consequences of damage to the instrument will be at their own risk.
4. Ensure that the gas source is dry and free of impurities. The compressed gas entering the instrument input front end needs to be connected to a pressure reducing valve and a drying tube.
5. Ensure that the gas source pressure is controlled within the tolerance range of the instrument.
6. This product requires first-level safety protection and the power supply must be reliably grounded, otherwise it may cause electric shock accidents or damage the instrument.

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FIT-550 filter integrity tester is suitable for testing the integrity of filters to determine whether the filtration accuracy of the selected filter material meets the requirements, whether the filter material is damaged, and whether the sealing of the filter is intact, so as to ensure that the filter can operate normally as required.

FIT-550 is a new generation of automatic filter integrity tester controlled by a microcomputer. It can directly detect the bubble point and pressure decay value of the filter element and filter membrane, and can also indirectly detect the diffusion flow and water intrusion value. The instrument combines advanced test circuits and precision The algorithm software automatically tests the integrity of the filter and has the characteristics of high test accuracy, good reproducibility, simple and convenient operation, etc.

FIT-550 The tester adopts 10.4" backlit digital LCD display; Chinese menu and prompts, real-time display of test data The test results and test curves can be printed to monitor the entire test process and help analyze the performance of the filter membrane and filtration system. The large internal storage space can store 50 sets of test results and 50 sets of test parameters. The test process is only carried out upstream of the filter, without contaminating the downstream of the filter, and is particularly suitable for the testing of sterilizing filters.

This tester can be widely used in medicine, bioengineering, food and beverage, microelectronics and other industries. It is also a routine instrument for filter manufacturers to test filters.

1 Test Principle

1.1 Bubble point method

When the porous membrane material is completely wetted by a suitable wetting liquid, due to the surface tension of the liquid and the corresponding capillary tension, The infiltration liquid fills the membrane pores and stays in the pores. When a gas pressure difference is applied on both sides of the filter

material, the liquid in the pores must be pushed out to overcome the capillary pressure. In order to drive out bubbles, the pressure difference of the gas must increase to a certain value ΔP , which is called the bubble point, and its calculation formula is shown in Formula 1. Formula 1 shows that the smaller the pore size, the higher the bubble point, so the bubble point can be used to test the performance of the filter.

$$\Delta P = K4\sigma \cos\theta / D$$

(Formula 1)

in: ΔP — pressure difference (dyne / cm²), bubble point value

σ — Surface tension of the wetting fluid (dyne / cm)

θ — Contact angle between filter membrane and infiltration liquid

D— aperture diameter (cm)

K— pore shape factor (because the holes on the real filter membrane are not cylindrical)

1.2 Pressure-maintaining method (pressure decay)

After the filter material is soaked with liquid (wetting liquid), a gas pressure difference is applied on both sides of the filter material, and a closed gas is formed upstream of the filter material. The pressure difference value added is slightly smaller than the bubble point of the filter material (generally set at 80% of the bubble point). At this time, the gas cannot flow directly in the pores of the filter material, but the gas molecules can diffuse to the downstream through the liquid in the pores. The resulting gas flow is called diffusion flow. Due to the diffusion of gas, the pressure upstream of the filter material will decay. The decay value is in correspondence with the filtration performance of the filter material. Therefore, the performance of the filter can be judged by measuring the pressure decay value within a certain period of time.

1.3 Diffusion flow

There is the following corresponding relationship between diffusion flow and

pressure decay value:

$$D = \Delta PV / T \text{ Pa}$$

(Formula 2)

Where: D— Diffusion flow value (ml / min)

ΔP — pressure decay value (mbar)

V— Upstream volume (ml)

T— Test time (min)

Pa— atmospheric pressure (1013 mbar)

After measuring the pressure decay value over a period of time and then measuring the upstream closed volume, the diffusion flow value can be calculated using the above formula.

1.4 Water intrusion pressure maintenance method

This method is designed for testing hydrophobic cartridge filters. Wetting the filter with alcohol. Since the use of alcohols raises safety issues due to health and flammability, the use of water immersion testing only uses deionized water / water for injection (DI/WFI) grade water and the filter membrane is not soaked, which means that this is an attractive test method in principle.

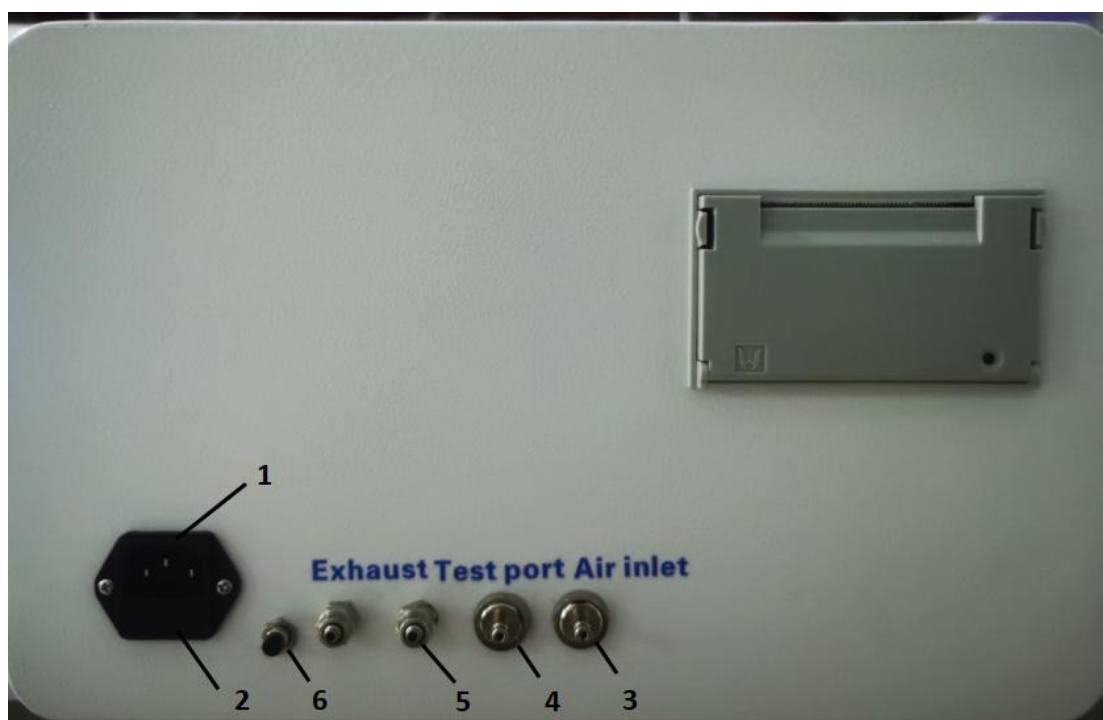
The principle of water intrusion pressure-maintaining method is to apply water pressure to the dry and clean hydrophobic membrane. The surface tension and capillary tension make the water Rejection, when the pressure is gradually increased to a certain value, water is pressed through the largest hole on the membrane. This pressure value is called water intrusion pressure. When the added water pressure is slightly lower than the water intrusion pressure value, and the upstream volume is isolated and maintained for a certain period of time to stabilize the system, then the pressure decay value is measured. By comparing the measured value with the specified value, the integrity of the filter can be judged. This method is called water intrusion pressure holding method.

The water intrusion pressure value is related to the pore size of the membrane, the hydrophobicity of the membrane, the purity of the water, the temperature of the water, the cleanliness of the membrane, the dryness of the membrane, etc. There are many influencing factors. In practice, it is very difficult to achieve the reproducibility of this test. Therefore, this method can be

used for filtration A rough inspection of the filter. If the water intrusion pressure holding method passes, the filter can be used. If it fails, further verification is performed using the diffusion flow or pressure holding method.

2 Instrument Panel Introduction

2.1 Backpanel Introduction



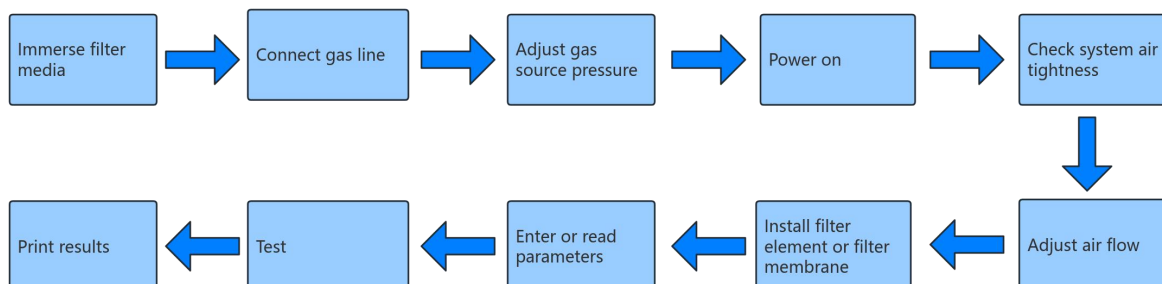
- 1 . Power socket, providing 220V AC power.
- 2 . Fuse.
- 3 .Inlet pipe connector.
- 4 . Outlet pipe connector.
- 5 . Exhaust port
- 6. Reset switch, control the switching between the screen PC and the program

3. Test Preparation

3.1 Operation steps

Before using the instrument for the first time, please read this guide carefully

to understand the basic principles and the functions and operation methods of each component and menu. Then follow the steps below to operate step by step.



3.2 Preparation

1. Place the instrument on a stable and clean workbench.
2. Prepare 220V, 50Hz AC power supply.
3. Prepare dry and clean air or nitrogen as the gas source.
4. If flammable liquid is used as the infiltration liquid, the test site must be kept ventilated.

Notice	1. The tester contains precision electronic components. Try to keep the storage and testing environment clean. Too much dust will affect the service life of the instrument. 2. Avoid using the instrument in places with high temperature or condensation. When moving the instrument from a place with a large temperature difference, wait until the condensation in the instrument disappears before powering on.
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3.3 Wetting filter material

Before testing the filter element or membrane, it must be completely soaked with a suitable soaking liquid before subsequent operations can be performed. Users can choose one of the following two methods based on the actual situation on site.

1. Rinse and infiltrate

1) Prepare a suitable clean infiltration liquid, hydrophilic filter material (such as polyethersulfone membrane, nylon membrane, mixed cellulose membrane, etc.) Use pure water, and alcohols (ethanol, isopropanol, etc.) can be used for hydrophobic filter materials (such as polytetrafluoroethylene membranes). After the integrity data is tested against the integrity data of the process solution, the process solution can also be used to wet the filter. For filter materials that can be tested for integrity, the filter manufacturer will provide integrity test data and conditions. If you have any questions, please consult our company or the supplier of the filter element or membrane.

2) After installing the filter membrane or filter element into the housing (tweezers or gloves must be used when installing the membrane to prevent grease on the hands from affecting the wetting performance of the filter membrane), fill it with wetting liquid and allow it to flow. When filling the liquid, ensure that all the gas in the housing is discharged from the exhaust valve.

3) Refer to the following table for the amount of wetting liquid to flush the filter membrane or filter element

Filter membrane		Filter membrane
φ50 mm , 10 ml	150mm , 100ml	10L/MIN · 10" filter flow Rinse for 5 minutes .
φ100 mm , 50 ml	200mm , 300ml	
φ300 mm , 500 ml		

4) After flushing, drain the remaining wetting liquid in the filter housing through the drain valve.

2. Soaking

1) Same as above 1).

2) Pour the infiltration solution into a suitable container.

3) Place the filter membrane or filter element into the above container and immerse it completely.

4) Keep the immersion time for more than 10 minutes, turning it over several times during the process.

5) After the infiltration is completed, take out the filter membrane or filter element from the container, drain off the excess infiltration liquid, and install the

filter membrane or filter element into the filter housing.

6) When soaking the filter membrane or filter element with water, it is better to use warm water at 40 °C -50 °C , but it must be cooled to room temperature with room temperature water before testing after soaking to avoid test errors.

3.4 Gas connection

1. Connect the gas path as required according to Figure 3-1 or Figure 3-2 , and install the soaked filter membrane or filter element into the filter disc or filter respectively.

2. When conducting bubble point and pressure holding tests, according to the connection in Figure 3-1, valves V1 , V2 , V4 and V5 need to be closed , and valve V3 needs to be opened ; according to the connection in Figure 3-2, valves V2 , V4 and V5 need to be closed , and valves V1 and V3 need to be opened .

3. Adjust the gas source pressure to 0.15-0.25MPa higher than the actual bubble point and to be basically stable. If water is used as the infiltration liquid, it should generally be adjusted to 0.6MPa , and if alcohol is used as the infiltration liquid, it should generally be adjusted to 0.3-0.4MPa .

4. Adjust the airflow adjustment knob on the rear panel to the appropriate position (see page 18 for detailed operation methods). It is adjusted to the 1-core pleated cartridge filter position at the factory. If the filter to be tested is a 1-core pleated cartridge filter, there is no need to adjust the airflow adjustment valve.

5. Before testing (especially before the first test), the air tightness test of the filter housing must be carried out first. When testing the air tightness of the filter housing, the filter membrane or filter element cannot be installed in the filter plate or filter housing. When connecting according to Figure 3-1 for air tightness testing, close all valves. When connecting according to Figure 3-2

for air tightness testing, only open valve V1 and close other valves. You can follow the air tightness test method described in the practical application of manual testing on page 17 or the air tightness test method described on page 17. The former method is more intuitive.

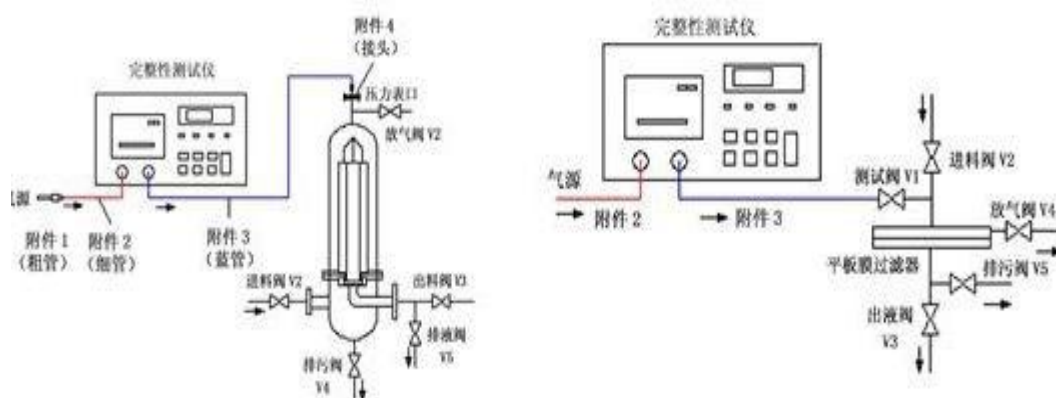


Figure 3-1 Cartridge filter integrity test gas circuit connection diagram

Figure 3-2 Diaphragm filter integrity test gas circuit connection diagram

Note	1.The object of integrity test is the entire filtration system, so filter housings and valves with good airtightness should be selected in the gas circuit. Even a tiny leak anywhere in the system will affect the test results or even cause the test to fail. 2.The tester's air outlet pipe (blue pipe) must be connected to the top of the filter to prevent the liquid in the filter from flowing into the instrument when the air is released, thus shortening the instrument's service life. 3. Because temperature changes have a great influence on test accuracy, the temperature of the filter element and the test gas must be consistent with the ambient temperature during the test, and the room temperature must be kept constant during the test.
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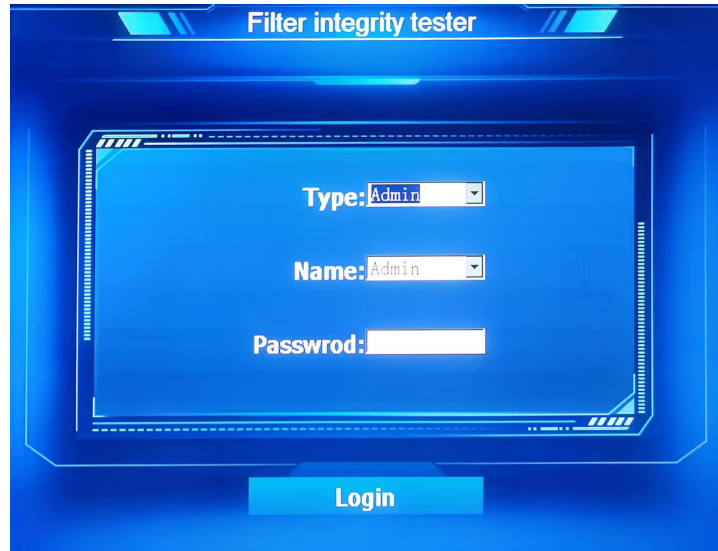
4. Instrument Operation

4.1 Menu Function Introduction

In order to make it easier for testers to operate, this instrument is designed with a English menu interface and status prompt bar. The following introduces each menu. Single cascade relationship and function

4.2 Booting

1. Insert the instrument power plug into a 220V , 50Hz AC three-core socket.
2. Turn on the power switch on the rear panel of the instrument, connect the power of the instrument, and enter the login interface;

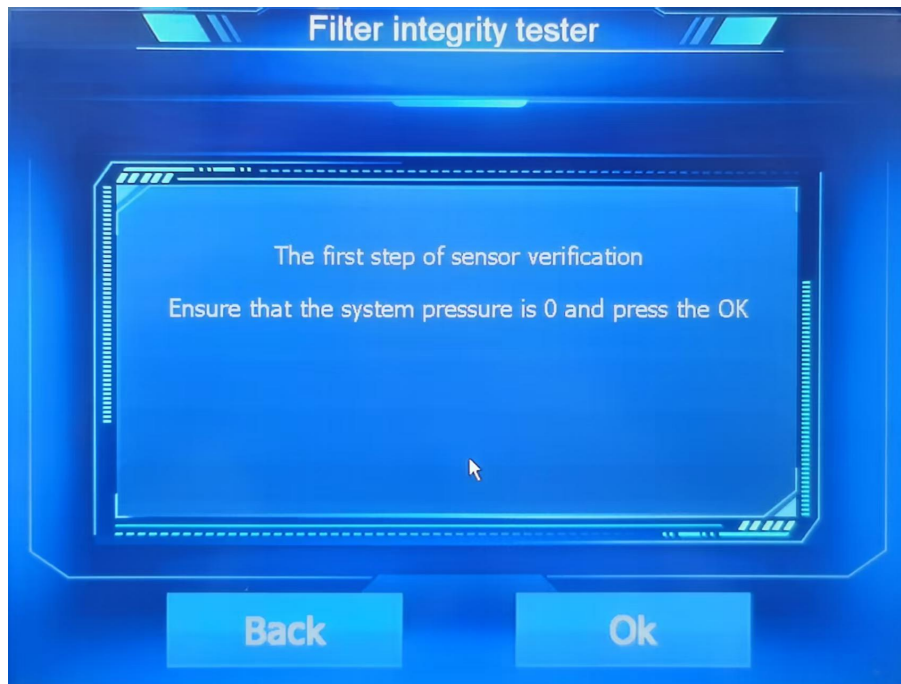


3. select the corresponding account to log in, and enter the main startup interface; click the test option to enter the test interface:



4.3 Calibrating the sensor

Sensor calibration step 1: Make sure the system pressure is 0 and press the **OK** key to continue



Sensor calibration step 2: the system automatically pressurizes.



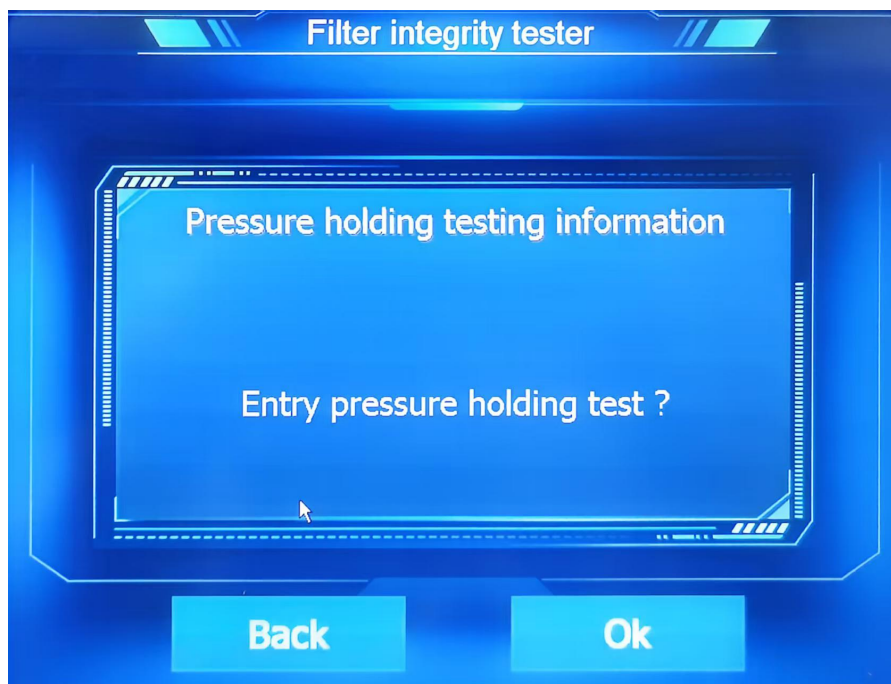
After pressurization is successful, press the **OK** button to continue.

Sensor calibration step 3: Enter the current pressure value and press the **OK** key to continue

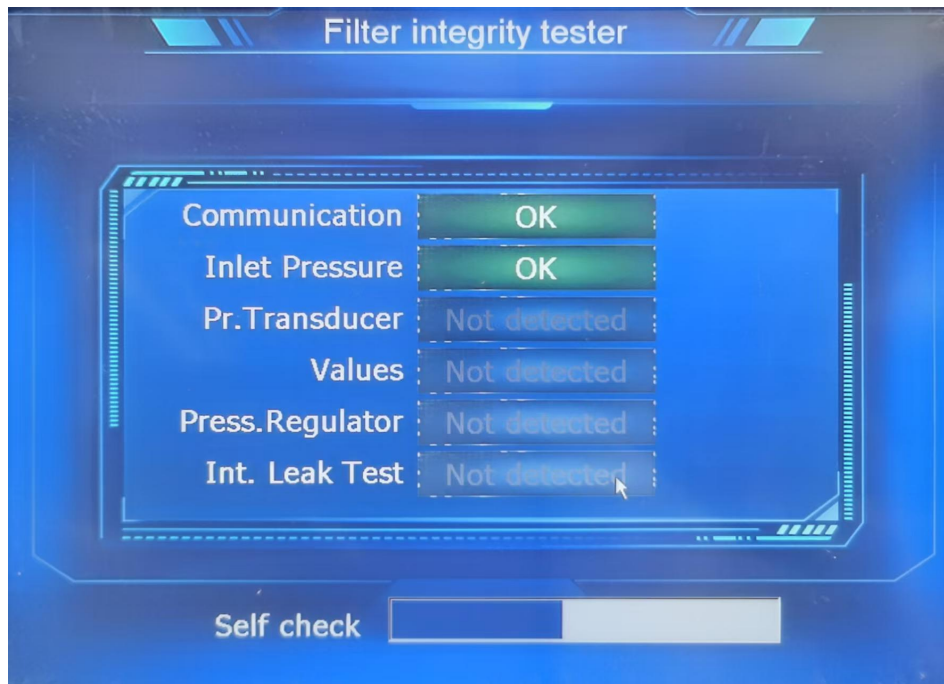


4.4 System Self-Check

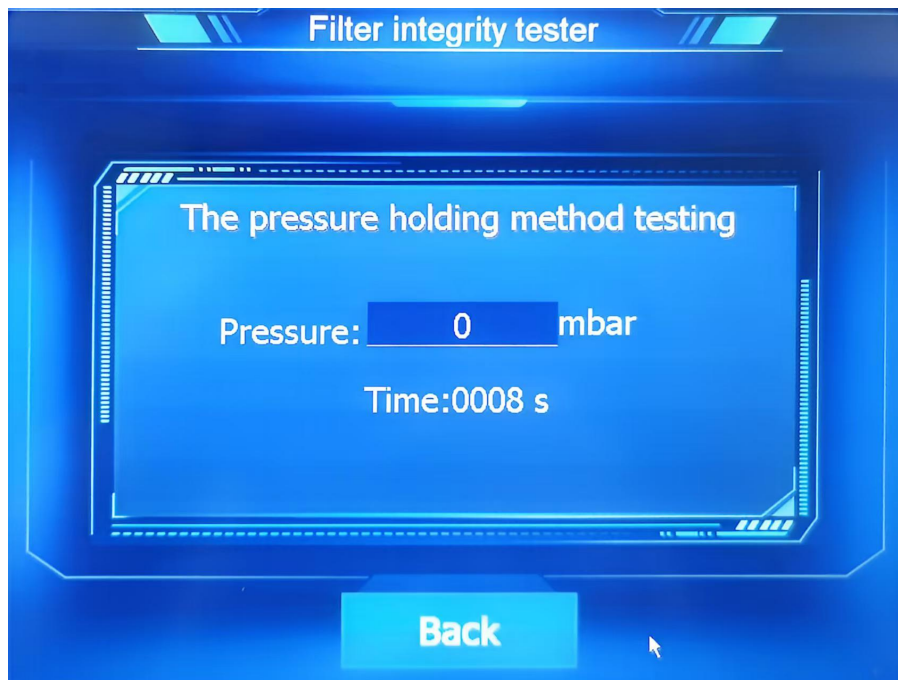
Click on the system self-test and press the **OK** button to perform the self-test.



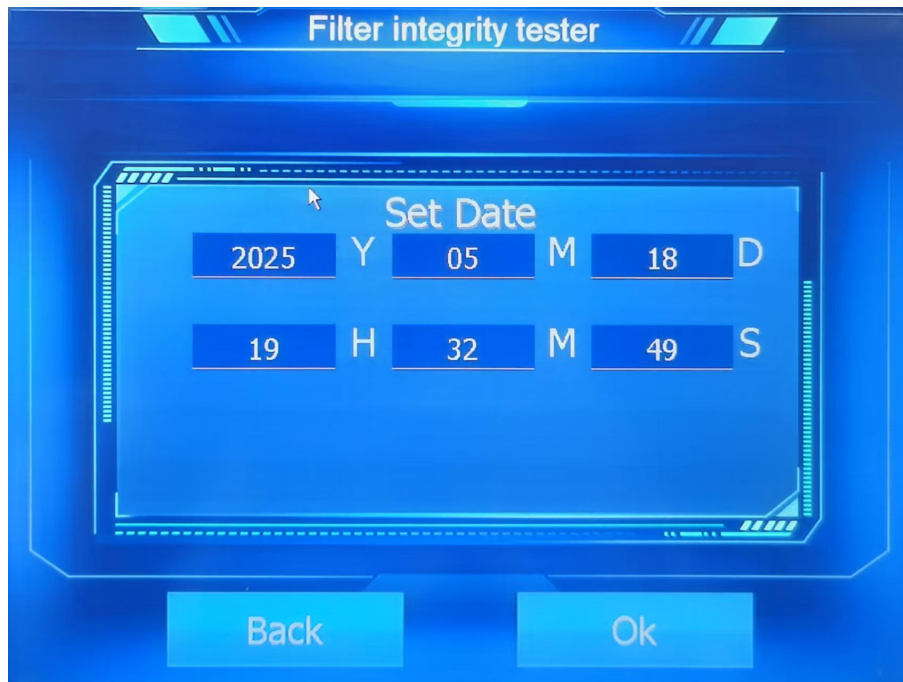
The system is self-checking.



After success, press the **back** key to return to the previous menu.



4.5 Date and time calibration



Select the Calibrate Clock function in the Tools menu to calibrate the time. The clock has been calibrated at the factory. Press the **OK** key after the calibration is completed.

4.6 Basic Bubble Point Test

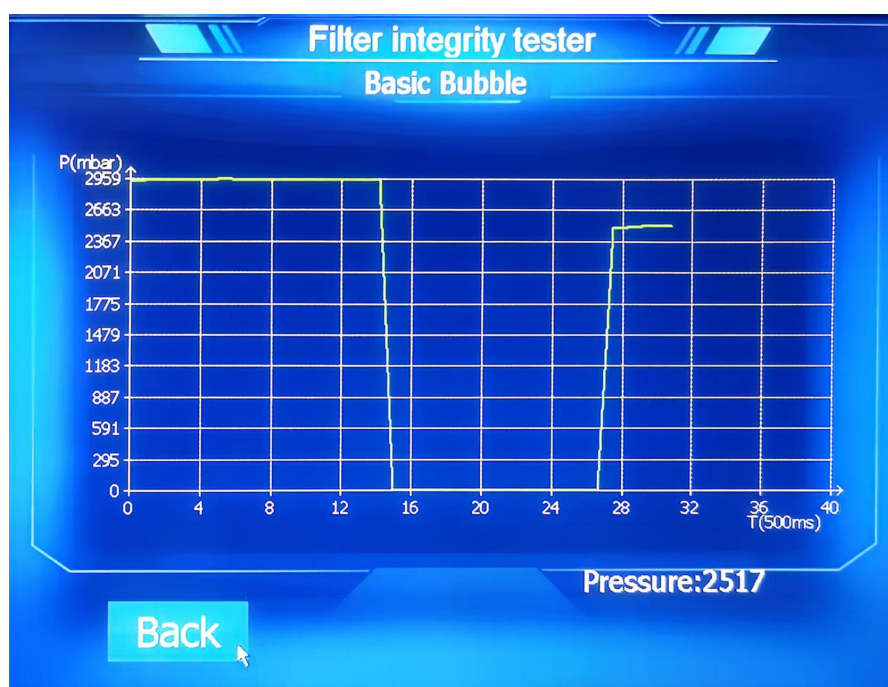
As shown in the figure, set the corresponding parameters at the corresponding positions, enter the test number, select the filter material, filter specification, wetting liquid, filter pore size and filter size; set the starting pressure and minimum bubbling point; enter the operator, click OK to conduct the test. The test is automatically conducted without manual intervention and the test results and conclusions are given.

Set the minimum bubble point and press the **OK** key to test.

Filter integrity tester
Basic Bubble Point

Batch number:00000000	Product name:00000000
Filter Sr.NO:00000000	Filter material:PES
Filter specs:1core	Immersion:Water
Filter aperture:0.05um	Filter size:2.5inches
Start pressure:0000 mbar	Test pressure:0000 mbar
Sr.NO:0000	Model:0000
Filling line:0000	Filter type:Capsule
Catalogue num:0000	Operator:Admin

Ok **Back**



4.7 Diffusion flow test

As shown in the figure, set the corresponding parameters at the corresponding positions, enter the test number, select the filter material, filter

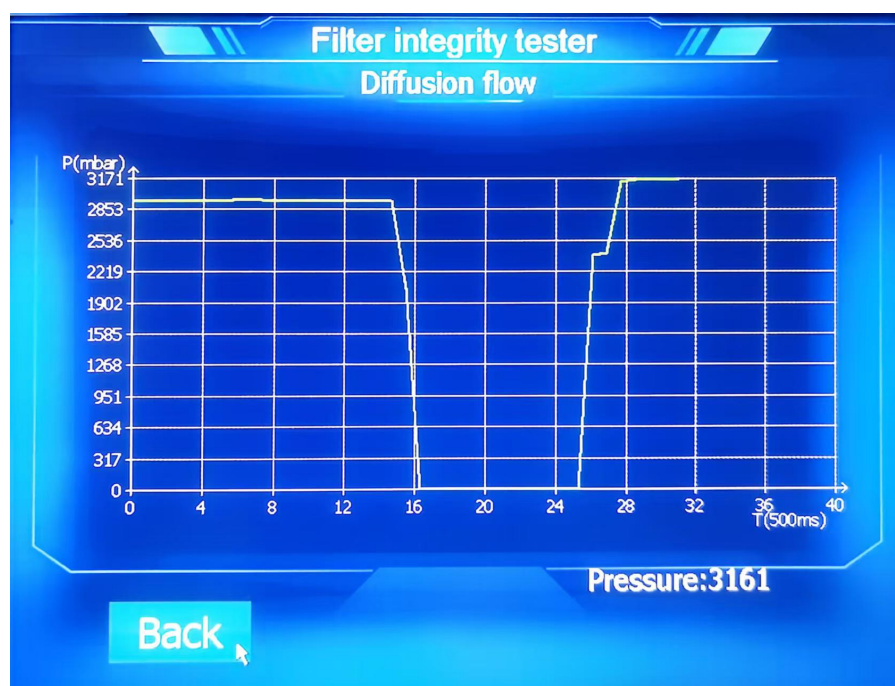
specification, wetting liquid, filter pore size and filter size; set the starting pressure and maximum flow rate; enter the operator, click OK to conduct the test, and the test will be automatically conducted without manual intervention and the test results and conclusions will be given.

Set the maximum diffusion flow and press the **OK** key to test.

Filter integrity tester
Diffusion flow

Batch number:000000000000	Product name:000000000000
Filter Sr.NO:000000000000	Filter material:PES
Filter specs:1core	Immersion:Water
Filter aperture:0.05um	Filter size:2.5inches
Start pressure:3000 mbar	Max flow:001.000 ml/min
Sr.NO:0000	Model:0000
Filling line:0000	Filter type:Capsule
Catalogue num:0000	Operator:Admin

Ok **Back**



4.8 Water intrusion test

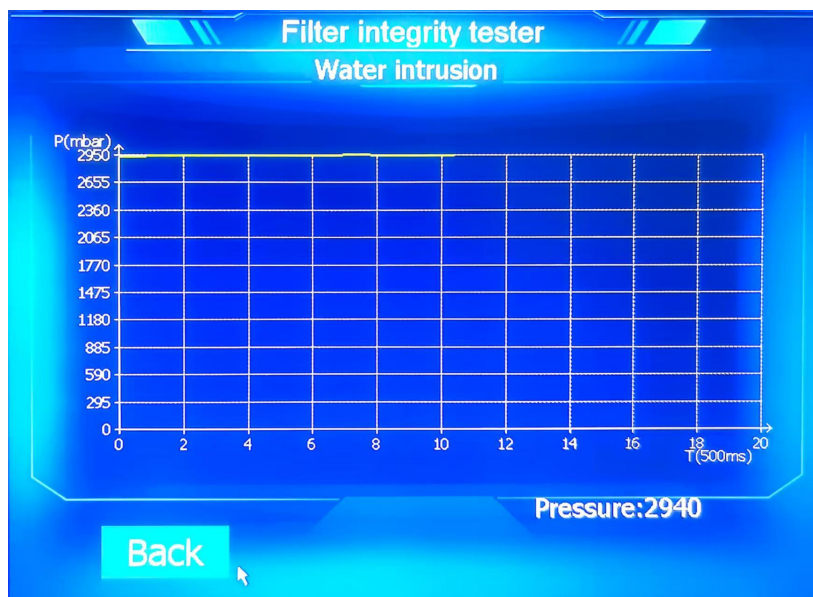
As shown in the figure, set the corresponding parameters at the corresponding positions, enter the test number, select the filter material, filter specification, wetting liquid, filter pore size and filter size; set the starting pressure and maximum flow rate; enter the operator, click OK to conduct the test, and the test will be automatically conducted without manual intervention and the test results and conclusions will be given.

Set the maximum diffusion flow and press the **OK** key to test Water intrusion flow .

Filter integrity tester
Water intrusion

Batch number:000000000000	Product name:000000000000
Filter Sr.NO:000000000000	Filter material:PES
Filter specs:1core	Immersion:Water
Filter aperture:0.05um	Filter size:2.5inches
Start pressure:3000 mbar	Max flow:002.000 ml/min
Sr.NO:0000	Model:0000
Filling line:0000	Filter type:0000
Catalogue num:0000	Operator:Admin

Ok Back



Test Results:

The screenshot shows a blue-themed interface for a 'Filter integrity tester' displaying 'Water intrusion' test results. The screen is divided into two columns of text. The left column contains: Number: 000000000000, Filter number: 000000000000, Specs: 1core, Aperture: 0.05um, Pressure: 3000mbar, Test traffic: 0.004ml/min, Sr.NO: 0000, Filter type: 0000, Filling line: 0000, and Operator: Admin. The right column contains: Product: 000000000000, Material: PES, Immersion: Water, Size: 2.5inches, Max flow: 001.000ml/min, Result: Pass, Model: 0000, Catalogue num: 0000, and Time: 19/05/2025 11:12:52. At the bottom, there are three buttons: 'Curve', 'Print', and 'Back'.

Filter integrity tester	
Water intrusion	
Number: 000000000000	Product: 000000000000
Filter number: 000000000000	Material: PES
Specs: 1core	Immersion: Water
Aperture: 0.05um	Size: 2.5inches
Pressure: 3000mbar	Max flow: 001.000ml/min
Test traffic: 0.004ml/min	Result: Pass
Sr.NO: 0000	Model: 0000
Filter type: 0000	Catalogue num: 0000
Filling line: 0000	
Operator: Admin	Time: 19/05/2025 11:12:52

Curve Print Back

Click "Curve" to view the curve graph.

Click "Print", you can choose to print content: only print results, only print curves, or print all.

The screenshot shows a blue-themed interface for a 'Filter integrity tester' displaying a 'Print Select' screen. The screen has a central title 'Print Select' and three buttons stacked vertically: 'Text', 'Curve', and 'All'. A mouse cursor is visible at the bottom of the screen.

Filter integrity tester

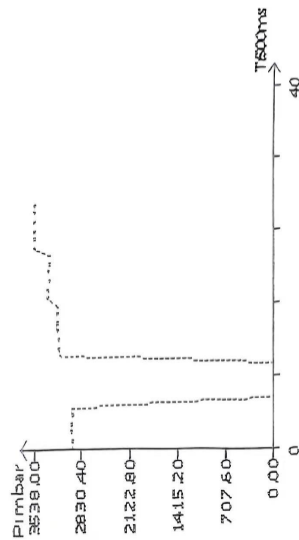
Print Select

Text

Curve

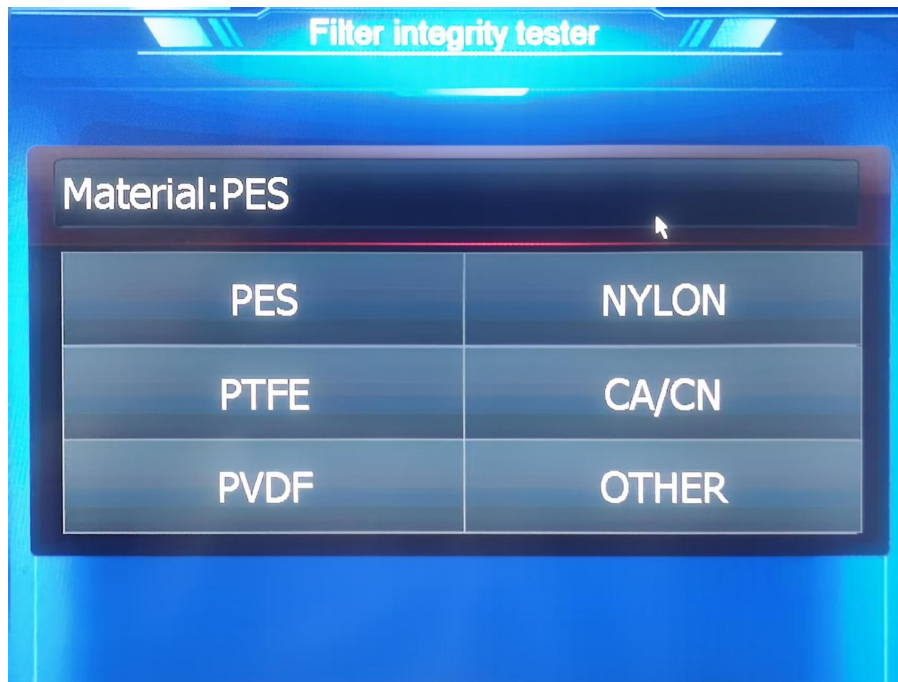
All

Print results:



```
*****
Filter Integrity Tester
Model:FIT-550
Sr.NO:BA3030
Test:Basic Bubble Point
Recipe:First,First
*****
Product Info
Batch No:55555555555555555555
Filling line:0000
Product:000000000000
*****
Filter Info
Filter Catalogue num:0000
Filter Material:NYLON
Filter type:0000
Filter number:000000000000
Filter Aperture:0.65um
Filter Immersion:Ethanol
Filter Specs:3core
Filter Size:40inches
*****
Min bubble:3400mbar
Bubble:3523mbar
Result:Pass
Operator:2
Reviewer:
*****
Test time:16/05/2025 10:50:40
*****
```

4.9 Set filter material



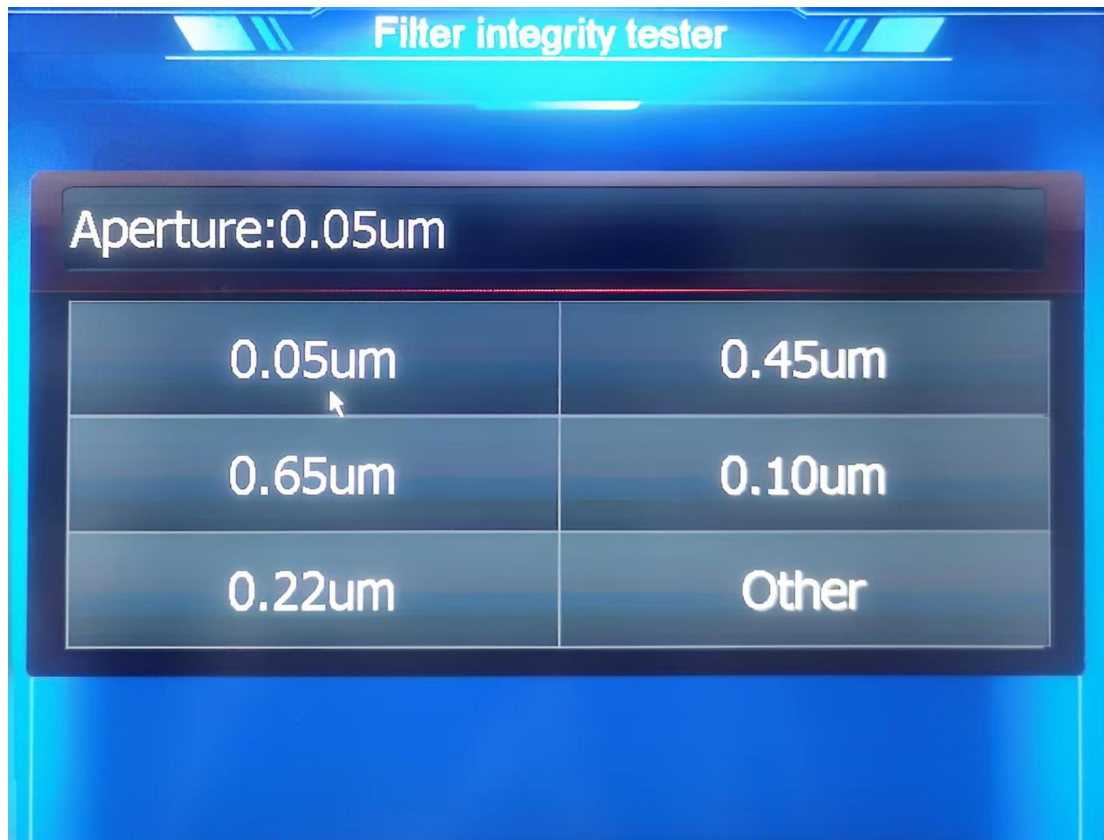
Six filter materials are available for selection.

4.10 Set filter material specifications



Six filter material specifications, select as needed.

4.11 Setting the filter material aperture



Five filter media pore sizes for selection.

5. Maintenance

1. The instrument should be stored in a clean, dry, room temperature, vibration-free place. High temperature, humidity, and dust will cause corrosion of electronic circuits and aging of electronic components, affecting the normal operation of the instrument and shortening its service life.

2. Test pipes, connectors, etc. should be stored in clean plastic bags when not in use to avoid contamination.

3. Do not try to disassemble the instrument. Handling of the instrument by non-professionals may damage the instrument.

4. Do not use strong chemicals, detergents or cleaning agents to clean the instrument. Wipe the case with a soft cloth dipped in a little neutral soapy water.

6. Random Accessories

1. Power cord 1
2. Operation manual 1 copy
3. 1 roll of printing paper
4. Trachea length

7. Solutions to Common Problems

- 1、The test cannot be performed normally or the operation is disordered

Possible causes:

- (1) Program operation disorder
- (2) Touch screen malfunction

Solution:

- (1) Restart the machine
- (2) Contact the manufacturer for repairs

- 2、Self-test failed

Possible causes:

- (1) The instrument circuit is faulty
- (2) Gas connection error

Solution:

Contact the manufacturer.

- 3、The test is interrupted and the screen does not display

Possible causes:

Sudden changes in air pressure cause frequent switching of the control air path

Solution:

Contact the manufacturer