



Air Permeability Tester

FM-APR-A100

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1. Safety Measures

Safety Mark

The below mark is mainly to prevent any unexpected accidents and dangers, protect the operator and instruments, and ensure accurate test results.

Symbol	Meaning
Danger 	This mark indicates if don't obey the rule, the operator is possibly to get injured.
Warning 	Indicates if don't obey the rule, the instrument is possible to be damaged.
Note 	This mark indicates it's possible to affect testing results and quality
[Remark] 	This mark indicates the assistant explanation during the operation.

The below mark indicates a Note and Warning while using this machine.

Symbol	Meaning	Description
	Warning	Indicate in the place where is necessary to refer to the instruction manual.
	Dangerous Voltage	Indicate the high voltage danger.
	Ground Protection	Indicate the grounding end onto the instrument.

2. Introduction

Air Permeability Tester FM-APR-A100 features a pressure difference range of 1 to 4000 Pa for precise air permeability measurements. The high-precision pressure sensor ensures reliable performance. It has an interchangeable nozzle system that adapts to different requirements. Our tester has monitored processes with real-time data visualization, providing instant feedback and insights.

3. Features

- ✓ Manual clamp mechanism
- ✓ Replaceable nozzle system
- ✓ Microprocessor test display
- ✓ Computer port connectivity
- ✓ Continuous test functionality

4. Specifications

Model No	FM-APR-A100
Pressure Difference Range	1 to 4000 Pa
Permeability Range	0.1 to 12000 mm/s
Room Temperature Control Range	10°C to 35°C
Relative Humidity	≤ 80 %
Measuring Error	≤±2 %
Fabric Thickness	≤12 mm
Testing Area	5 cm ² , 20 cm ² , 50 cm ² , 100 cm ² Φ50 mm (≈19.6 cm ²), Φ70 mm (≈38.5 cm ²)
Nozzle Parameters	11 pcs (Φ 0.8 to Φ 20)
Power Supply	AC 220 V 50/60 Hz, 2 kW
Dimensions (L × W × H)	700 × 520 × 1100 mm
Packaging Dimensions (L × W × H)	780 × 580 × 1250 mm
Weight	93 kg
Gross Weight	120 kg

5. Applications

Air Permeability Tester FM-APR-A100 is a precision instrument designed to measure the airflow through various materials such as textiles, paper, and nonwovens, ensuring quality and performance standards. It is used in industries like textiles, filtration, and construction.

6. Instrument Introduction

Product Structure Diagram



Figure-1

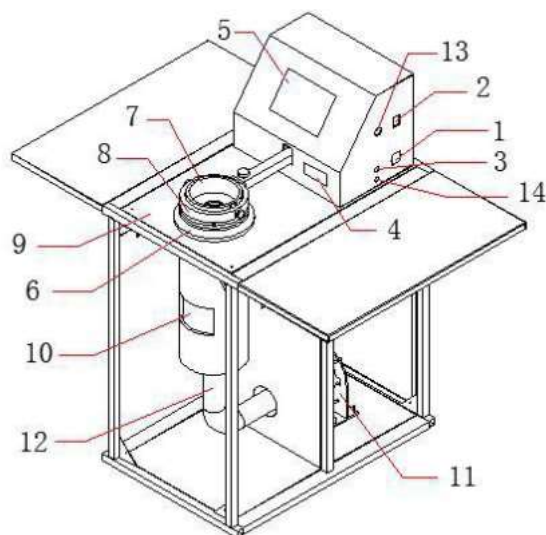


Figure-2

- | | |
|---|---|
| 1) Power Plug | 8) Straight Pressure ring of the sample |
| 2) Power switch | 9) Sample tube |
| 3) Serial excuse | 10) Flow device door |
| 4) Micro Printer | 11) Suction fan |
| 5) Display and Operation Panel | 12) Feedback adjustment device |
| 6) Sample fixture | 13) Emergency stop switch |
| 7) Lower Pressure handle of the fixture | 14) Air source interface |

Main Components

The external structure of the instrument is composed of a bracket, a sample fastening device, a flow device, and a display panel. The internal structure of the instrument is composed of a pressure sensor, CPU data processor, suction fan, and feedback.

Key function Description



Figure-3

[Power switch H] is the general power switch of the instrument. When the button light is on, it will be on. When the button light is off, it will be off. [emergency stops switch A] can effectively and quickly interrupt the power supply of the equipment. Press to power off and turn to the right to restore normal power.

7. Installation

7.1 Working Environment and Conditions

This unit is intended to be used in a residential, commercial, and light industrial environment as laid down in BSEN 50081-1 and BSEN 50082-1.

- Room temperature control range: 10°C ~ 35°C 2.
- Relative humidity $\leq 80\%$.
- There is no vibration, corrosive medium, or strong electromagnetic interference in the Surrounding environment.
- Power supply: AC220V $\pm 10\%$ 50Hz.
- Grounding requirements: grounding resistance less than 5 Ω .

7.2 Safe Handling and Unpacking Guidelines

When unpacking or moving this unit extreme care is required, owing to its physical construction and weight. It is recommended that accepted lifting and carrying procedures are employed and that personnel wear the appropriate protective equipment e.g. safety shoes. If the unit is to be moved an appreciable distance/height it is recommended that it is moved via a suitable vehicle.

8. Working

8.1 Test Principle

Method and parameters by the regulation, the sample clamping on fabric permeability instrument air inlet, and then adjust the fan speed, make the fabric on both sides meet the pressure difference, according to the nozzle aperture and two side pressure difference size to determine the permeability rate of breathable fabric rate refers to: fabric on both sides under the rules of pressure difference, per unit time, vertical through the fabric of gas flow rate per unit area, the unit (mm/s), and the fabric in the presence of pressure difference on both sides, through the performance of the air, which is called air permeability.

8.2 Working Principle of the Instrument

The test parameters were input into the CPU data processing center by the control button. When the instrument was working, the suction fan was adjusted by the CPU through the feedback adjustment device to control the air suction volume. The pressure difference between the front chamber and the rear chamber was P_1 and P_2 , which changed with the air suction volume. Among them, p_1-p_2 is the pressure difference ΔP , and p_0-p_1 is the pressure difference ΔP_0 on both sides of the fabric (that is, the constant pressure value), during the test, ΔP_0 , ΔP by the sensor will be converted into a digital signal input CPU, through the feedback adjustment device to change the air intake, so that ΔP_0 reach the specified value (generally 50Pa;100 pa;200 pa;500Pa), and the differential pressure between the two rooms ΔP read into the CPU, by the built-in program automatically converted to the fabric's air permeability R (mm/s), and on the air permeability display screen. After completing the required test, the printer can be connected to print the test report, which includes the test value, average value, mean-variance, CV value, 95% confidence interval of each group, etc.

9. Operation

9.1 Check Before Starting

- Check whether the power plug of the host is firmly inserted.
- Check whether the air supply pipe is firmly inserted.
- Check whether all nozzles and sample area plates are complete.
- Check whether the air pressure of the air pump is between 0.4 and 0.7mpa.

9.2 Checking after starting

- Turn on the host power.
- Check whether the sample holder is in the rising position, otherwise check the air source.
- Check whether the color touch screen is displayed normally, otherwise check whether the line is loose.
- Check whether the samples on the fixture inside the current sample rack are consistent with the required test samples, and if not, replace them.
- Select and install sample areas according to requirements.
- After selecting the nozzle for installation, close the door of the feedback adjustment device.
- If the above conditions are normal, the test can be started.

9.3 Test Operation

The display panel is a color touch screen. The functions of each button and display screen are as follows:

9.3.1 Welcome Interface

Display company LOGO, instrument name, and model.



Figure-4

The five buttons [home page] [setting] [work] [correction] [query] are used to switch each interface, 【English】【 Chinese 】 switchable interface in Chinese and English.

9.3.2 Setting Interface

In this interface, set the required parameters: Sample constant value circle, unit of air permeability, sample pressure difference, and nozzle number.

As well as the number of test samples, press the "ok" button to automatically switch to the work interface after setting.

[Sample area]: There are 6 working areas to choose from. Click the corresponding area button directly.

[Unit of air permeability]: There are 7 units to choose from. Click the corresponding unit button directly.

[Sample pressure difference]: Click the sample pressure difference input box to input the required set value.

[Nozzle number]: Click the input box of nozzle number to input the desired nozzle number, 0-10.

[Test sample times]: According to the requirements of the experiment, the number of test sample times can be input 1-20 times.

Click the lower right corner [▶] to save the set parameters and automatically enter the working interface.

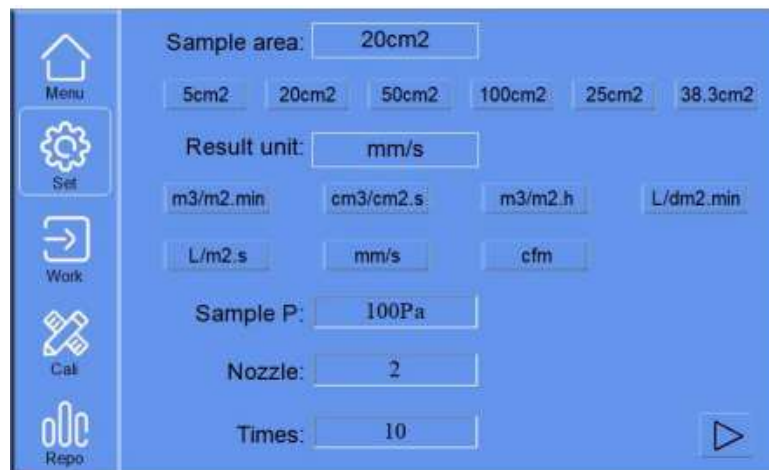
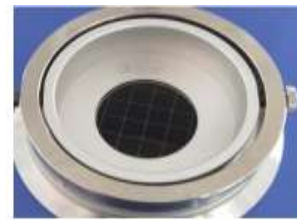


Figure-5

9.3.3 Work Interface



Nozzle



Sample area plate



Feedback gate



Sample bed base

Figure-6

First, according to the setting parameters, open the feedback device door, load the set nozzle number, and then close the feedback device door. Next, put the corresponding sample area plate into the base of the sample table.

Key functions:

【 start 】 : Start the experiment.

【 Stop 】 : To stop an experiment.

【 Reset 】 : Reset when the pressure value fluctuates greatly.

【 Delete 】 : Delete when the experimental data results are different from each other.



【  】 : Used to create a new test group.



Figure-7

- Before starting the experiment, check that the pressure difference between the nozzle and the sample is within the range of ± 0.5 Pa. If it exceeds this range, reset the sensor. To reset, ensure the sensor is in standby mode (with no airflow in the instrument), and press the reset button.
- Next, place the sample and press the start button. The fixture will automatically apply pressure to begin the experiment. If you wish to interrupt the experiment at any time, press the stop button.
- At the end of the experiment, you can choose to delete the data based on the results. If the experimental data is poor or the difference is too large, press the delete button to remove the data. Otherwise, the data will be saved automatically.
- To create a new data group, press the button located at the upper right corner of the interface.

9.3.4 Calibration Interface



Figure-8



Figure-9

- To enter the calibration interface, you must enter the correct password before entering the calibration interface for sensor calibration.
- Click the set pressure difference value, enter the value setting box, set the appropriate sample pressure difference value, and press the standard. When the key is fixed, the differential pressure sensor of the sample is calibrated.
- Similarly, calibrate the nozzle differential pressure sensor. The reset function is the same as that of the work interface.

9.3.5 Query Interface



Figure-10

9.4 Nozzle Calibration

No	Pore Plate	Set the Differential	Reduced Value mm/s
0	Φ2	100pa	7.64
1	Φ2	100pa	7.64
2	Φ7.8	29pa	53.5
3	Φ7.8	127pa	114.5
4	Φ7.8	127pa	114.5
5	Φ21.6	40pa	469
6	Φ21.6	127pa	855
7	Φ21.6	127pa	855
8	5 cm ²	127pa	1150
9	5 cm ²	400pa	2053
10	20 cm ²	80pa	4280

1) Calibration coefficient method: Take nozzle no.3 as an example, enter the setting interface, set the area 38.3cm², nozzle no.3, and set the pressure difference of 127. Enter the calibration interface and enter a password. Set the nozzle number point to 3 and the calibration coefficient of the nozzle to 0. Enter the working interface, change the no.3 nozzle, put the 38.3 orifice plate at the bottom first, then put the correction orifice plate at 7.8, open the actual value A obtained from the experiment, and calculate the ratio of 114.5.

For example, if the actual value A=170, the correction coefficient should be - $(170-114.5) / 170 * 100 = -32.64\%$ The actual value A=105, then the correction coefficient should be + $(114.5-105) / 105 * 100 = +9.045\%$.

2) Sealing test: Set the sample pressure difference of 1000pa, no. 3 nozzle, and use the non-perforated plate to complete the test. The nozzle pressure difference must be less than 20pa before it is airtight, otherwise the sealing property of the test instrument will be tested.

9.5 Software Operations

See the Software operation manual for details.

10. Maintenance

- Keep the equipment and control system clean and sanitary regularly.
- Prevent high temperature, excessive humidity, dust, corrosive medium, and water from entering the machine or the control system.
- Check regularly to maintain the integrity of parts and components.
- Pay attention to rust-prone parts and apply anti-rust oil.
- The pressure indication value of the instrument has been calibrated before it leaves the factory. Non-professional verification and maintenance personnel shall not calibrate arbitrarily, otherwise, the force measurement of the instrument will be inaccurate.
- Check the instrument regularly to ensure the accuracy of the measured value.
- Non-professional maintenance and verification personnel are not allowed to disassemble and move the instrument. After each disassembly and repair, the measuring performance must be verified to avoid misalignment of the instrument.

11. Troubleshooting

- 1) **No pulsation or excessive pressure of nozzle pressure difference or sample pressure difference:**
 - Check whether the motherboard sensor is loose, if it is loose, kindly put it firmly.
 - If the instrument is not reset after starting, kindly click the reset button on the work interface.
- 2) **No obvious upward trend was observed in the pressure value during the experiment**
 - Whether the trachea is firmly inserted before connecting the sensor with the feedback device.
 - Check whether the motherboard sensor is loose, if it is loose, kindly put it firmly.
 - Check whether the feedback device door is closed.
- 3) **When the instrument experiment is started, the clamping device is not pressed down, or the downward pressure is not enough:**
 - Check whether the air source interface air pipe has been connected.
 - Check air pump air pressure between 0.4 ~ 0.7MPa.

12. Accessories

Accessories	Quantity
Power Line	1 pc
Nozzle (Φ 0.8 ~ Φ 20)	11 pcs
Calibrating Hole Plate	1 unit for each Φ 7.8, Φ 21.6
Non-hole Plate	1 pc
Sample Area Testing Area Ring	1 unit for each 5 cm ² , 20 cm ² , 50 cm ² , 100 cm ²
Sample Diameter Constant Value Ring	1 unit for Φ 50, Φ 70
Sample Pressing Ring	1 unit
Testing Software	1 pc
Serial Port Connecting Wire	1 unit
Fuse Tube	2 pcs



Fison Instruments Ltd 272 Bath Street Glasgow G2 4JR UK
 Email: info@fison.com | Website: www.fison.com