GAZELLE®

G9802

Duct Air Leakage Tester
User Manual

Important Notes:

Symbols for warning mentioned in this manual are defined below .

[Symbols classifications]

Warning: To Prevent Serious Injury or Death.

Warnings in this classification indicate a danger that may result in serious injury or death if not observed.

Caution: To Prevent Damage to the Product.

Warnings in this classification indicate a risk of damage to the product that may void the product warranty if not observed

[Description of Symbols]

This symbol indicates a prohibition. Do not take the prohibited action shown inside or near this symbol.

● This symbol indicates a mandatory action. A specific action is given near the symbol.

Warning	
 Heat forbidden	○ Never bring the fabric hood near flammable gas or heat source … Otherwise, the heat may cause a fire or explosion .
 Disassembly prohibition	○ Do not disassembly or refit the instrument . … Otherwise, it may result in electric shock or a fire.
 Using properly	○ Use properly under the instruction manual. … Otherwise, it may cause sensor damaged or an electric shock even a fire .
 Using roperly	○ If abnormal smells, noises or smoke occur, or if liquid enters the instrument, pull out the AC adapter and remove the batteries immediately. Then send it to the maintenance Dept. of GAZELLE for after service . … Or, there is a risk of an electric shock or a fire or instrument malfunction.
	○ Do not expose the instrument to water or rain. … Otherwise, may cause an electric shock, a fire and person injure.

CAUTION	
	○ Always unplug when the instrument not in use . … Failure to do so may cause an electric shock, a fire or circuit damage .
	○ Do not use or leave the instrument in a high temperature, high humidity or dusty environment. Do not leave the instrument under direct sunlight. … Otherwise, the instrument may not function properly out of the specified operating conditions or the inside components damaged.
	○ Never dropping the unit or place heavy objects on i … Otherwise, It may cause damage or malfunction to the instrument

CONTENTS

1 Introduction

Duct Air Leakage Tester is mainly used for HVAC duct air leakage testing. Testing can be in sections and the overall pipeline after whole system installation to make the HVAC system effective and avoiding energy waste. G9802 as the upgraded one can judge the whether the duct seal is qualified based on and compliant with the corresponding accreditation standards. The Tester integrates various current testing standards from Europe, America, and domestic duct industries, and performs tests based on relevant certification standards to directly determine whether the duct's sealing performance meets the required criteria. It is portable, designed to fit into a car's trunk, lightweight, easy to transport and carry, and capable of measuring a wide range of flow rates. It's more efficient and convenient, saving time and labor. Touch screen with LCD color display and friendly Man-machine interface will make operation convenient and easier.

1.1 Product Features

- Duct air leakage testing under positive or negative flow.
- Compliant with the following standards: EN1507: 2006, EN12237: 2003, Eurovent 2/2, DW/143, SMACNA Standard, AABC Standard, GB50243—2003/2016.
- The software includes built-in measurement standards, and the results can directly indicate whether the duct sealing meets the requirements.
- Wide airflow measurement range, simple structure, two nozzle options (large and small), and easy nozzle replacement.
- Real-time display the leakage, testing pressure, temperature, and atmospheric pressure.
- 1000 groups data storage, review and delete.
- 5 inches LCD touch screen for easy operation.
- Can be loaded in the trunk of an SUV for convenient transportation and handling.
- Capable of measuring large flow ranges and high pressures.

1.2 Main Specifications

Model		G9802
Air Flow	Range	Large nozzle: 41~483CFM
		Small nozzle: 2.4~41CFM
	Accuracy	±(2.5% of reading +0.06 CFM)
	Resolution	0.01 CFM
Static Pressure	Range	± 10 in. wg.
	Accuracy	±(1% of reading +0.004 in. wg.)
	Resolution	0.001 in. wg.
Temperature	Range	32℉ ~ 140℉
	Accuracy	±1 ℉
	Resolution	0.1 °F
Atmospheric pressure	Range	20.6 ~38.3 in.Hg.
	Accuracy	±2% of reading
	Resolution	0.1 in.Hg.
Power supply	G9802	100-120V,1 Phase, 50/60Hz,16A
	G9802	200-240V,1 Phase, 50/60Hz,10A
Weight		Net weight approximately 60kg
Dimensions (Width x Depth x Height)		18.9 x 24.7 x 44.3 inches
Data Logging		Up to 1000 measurements

1.3 Packing List

Standard:

Item.	Quantity
Duct Air Leakage Tester	1
Low flow nozzle	1
Ø6 Silicone tube (Blue) 4m	1
Duct connection hose	1
Storage box	1
Power cord	1
Calibration Certification	1
Operation manual	1

Optional Accessories:

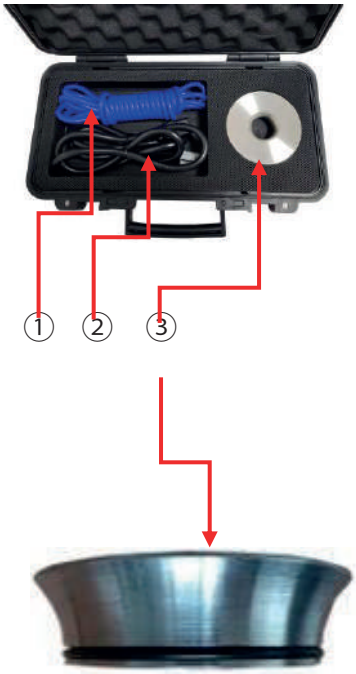
Item.	Quantity
Dust-proof cover	1
static probe	1

2 Configuration and Function

2.1 Outlook and Configuration

Attention
1. The sealing ring is made of rubber. Avoid contact with high temperatures, freezing cold, oil immersion, corrosive gases, liquids, etc. If aging, cracks, or damage occur that affect the sealing performance, please replace it in a timely manner. 2. When storing or using the hose, avoid scratching or damaging it to ensure sealing performance. 3. The intake protection cap must be removed before starting the fan.

2.2 Storage Box



No.	Definition	Function	Remarks
①	Static- pressure Tube	Used when duct pressure testing	
②	Power cord	Power supply connection	
③	Small nozzle	Used for small flow range testing	

Attention

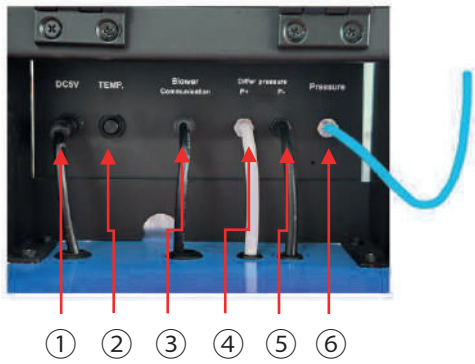
1. The small nozzle is as a precise measurement sensor part, handle it with care and pay attention to avoid scratches or impacts that may affect measurement accuracy.
2. The sealing ring is made of rubber. Pay attention to avoid contact with high temperatures, freezing cold, oil immersion, corrosive gases, liquids, etc. If aging, cracks, or damage occurred that affect the sealing performance, please replace it in a timely manner.

2.3 Controller Box

No.	Item.	Function	Remarks
①	Fan **SPEED** Knob	Adjust the fan speed to control the internal pressure of the test duct	
②	**USB** port	For data exporting and software updates.	
③	Touch Screen	Display user interface for operation.	
④	**START** switch	Fan start running	
⑤	**STOP** switch	Fan stop running	
⑥	**OFF/ON**	Power supply ON/OFF for the controller-box.	

Attention

Adjust the Fan "SPEED" knob for achieving the request pressure in the duct.



No.	Item.	Function	Remarks
①	DC5V	**Power supply socket** where power cable connects to the controller for power supply.	
②	TEMP.	Temperature Sensor Interface: to detect the ambient temperature.	⚠
③	Blower Communication	Communication interface: For communication between the control box and the motor by a cable.	
④	Differ pressure **P+**	Positive Pressure Airflow Interface: P+ connects to the upper white joint of the large nozzle by a white silicone tube.	
⑤	Differ pressure **P-**	Negative Pressure Airflow Interface: P-connects to the lower black joint of the large nozzle by a black silicone tube.	
⑥	Pressure Port	Connect with a blue tube to the pressure end-port of the hose.	⚠

Attention

1. The temperature probe shall not be covered or removed to avoid spray contamination and to ensure proper airflow around the probe.
2. The pressure interface should be connected to the hose pressure interface to ensure proper communication with the internal environment of the test duct. Ensure that this section of the air path remains unobstructed.

***Except for the pressure port, no other interfaces should be disassembled by the user to prevent any damage to the equipment!!!

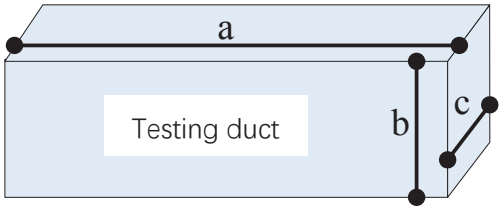
3 Preparation Before testing

3.1 Sealing and Hole Making before testing

a. Refer to Appendix 1. Leakage testing standard for a confirmation of required testing, such as: Leakage standard to be followed. Air tightness / leakage class to be achieved; Testing pressure.

b. Temporarily seal all the openings of the ductwork except one, which will be connected to the duct leakage tester. Calculate the area of testing duct surface to ensure it's available and within the input range.

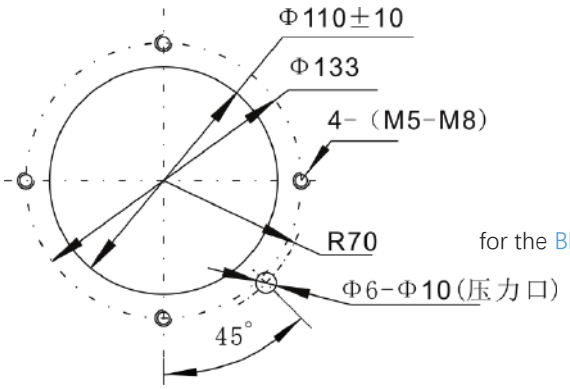
Surface area calculation: Surface area S=(ab + bc + ca)×2



Attention

Long ducts should be tested in sections to ensure that the airflow and surface area are within the testing range of the Tester.

c. The duct being tested must have a designated opening size reserved for connecting to the hose flange, with all other openings temporarily sealed to ensure a proper seal under the test pressure.



Required interface size for duct

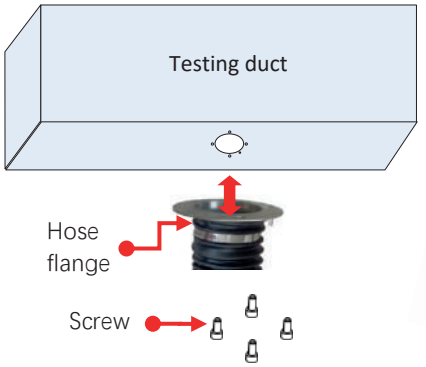
Attention

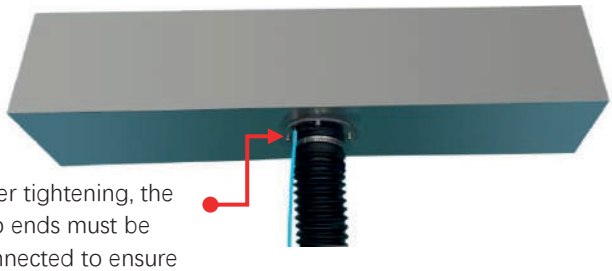
1. Before connecting, clean the duct and flange faces to ensure no residues that could affect the seal.
2. If the duct is uneven to affect the sealing, apply removable sealing glue to the flange face, if necessary, to ensure a proper seal.
3. After tightening, the pressure port of the hose must be connected to the internal leakage measurement space of the duct.

3.2 Testing duct connection

a. Connect the testing duct to the **Tester**
Position the G9802 unit as close to the remaining opening in the ductwork as possible to minimize the flexible tubing needed. Minimize bends in the flexible tubing to reduce the pressure loss, giving the best Performance

b. Connect the hose flange to the duct under test, and fasten the hose to the duct with screws.





After tightening, the two ends must be connected to ensure the hose pressure port is connected to the internal leakage measurement space of the duct.

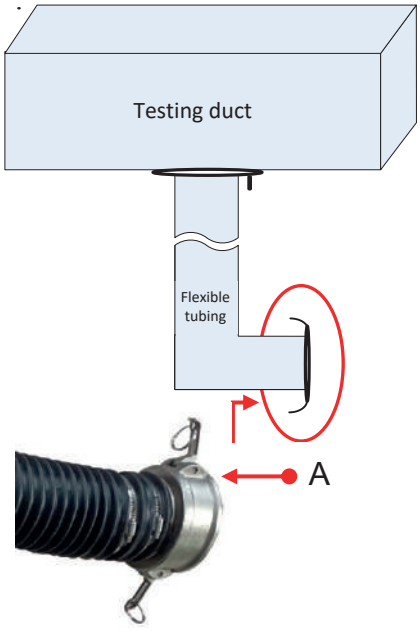
c. Locking joint of the hose and the duct leakage test connection.

** Fit one end of the flexi-tube with adapter spigot to the6905. Make an air-tight seal using one of the over lock straps and lever-locking cam provided.

Test Pressure	Positive pressure	Negative pressure
Port Connections	**A→C**	**A→B**

Connect the other end with flange to the testing duct required. User need to install and connection with proper way according to the practical situation.

** If the static pressure tapping on the testing duct, connect the static tube as the tapping or drill a Φ6mm hole in the duct and insert the static tube into the duct. Seal around the hole. Connect the other end of the static tube to the Controller cabinet



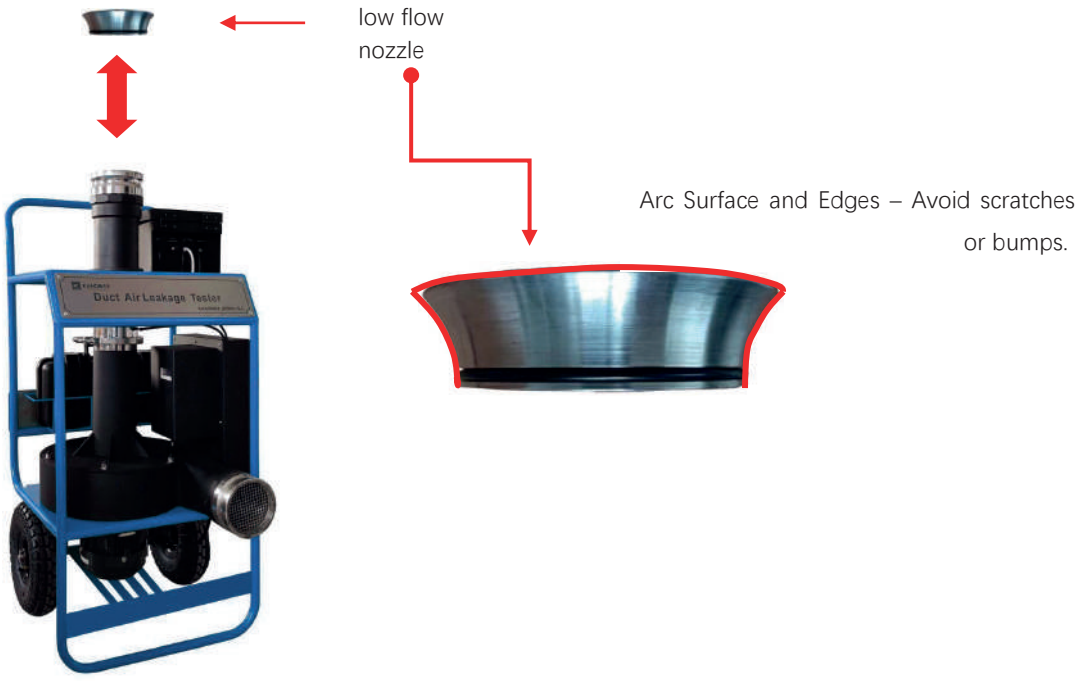
Positive pressure test

Negative pressure test

Attention
1. The locking joints on both sides must be tightened simultaneously to lock the joint. 2. Before starting the fan, remove the protective cap from the intake port.

3.3 Small Nozzle Replacement

The Duct Air Leakage Tester has two flow ranges, achieved through large and small nozzles. The large nozzle is already integrated into the instrument's measuring sensor section. When the small flow test nozzle is needed, user doesn't need to remove the large nozzle; directly install the small nozzle to achieve small leakage testing.



Attention
1. The small nozzle is as a precise measurement sensor part, handle it with care and pay attention to avoid scratches or impacts that may affect measurement accuracy. 2. The sealing ring is made of rubber. Pay attention to avoid contact with high temperatures, freezing cold, oil immersion, corrosive gases, liquids, etc. If aging, cracks, or damage occurred that affect the sealing performance, please replace it in a timely manner. 3. The small nozzle must be installed according to the right direction as shown in the figure as above.

4 Operating Instruction

4.1 Power On

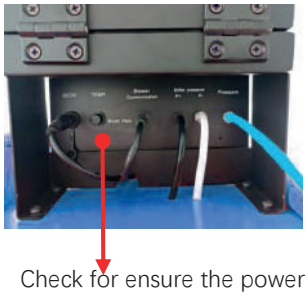
1. Power source switch ON.

Connect power cord

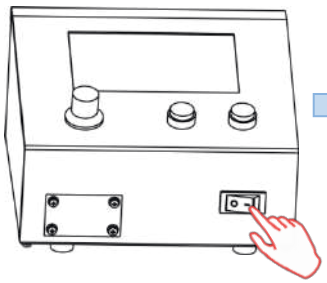
Slide the switch upwards to turn on the power.

2. Turn ON the Controller for start measuring.

Check that the power cable at the controller for proper connection, then turn on the power switch to testing start



Check for ensure the power cable at the control box is properly connected.



Turn **ON** the controller power switch

3. Application Menus

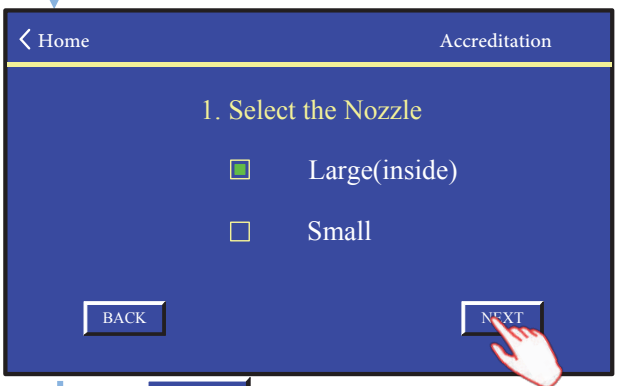
Accreditation	Application items in "Accreditation": set the Accreditation Standard for Duct leakage testing, Testing as steps according to the set standard and save testing data as request.
Measure	Application items in "Measure": Airflow, Pressure, Temperature and Atmosphere.
Setting	Application items in "Setting": Date, Time, testing Mode, Unit and other parameters' setting.
My Data	Application options in "My Data": browsing data or deleting data.
U S B	Application of "USB": Output the data record to U disk.
About	Application of "About": introduce the fundamental performance parameters.

4.2 “Accreditation” menu

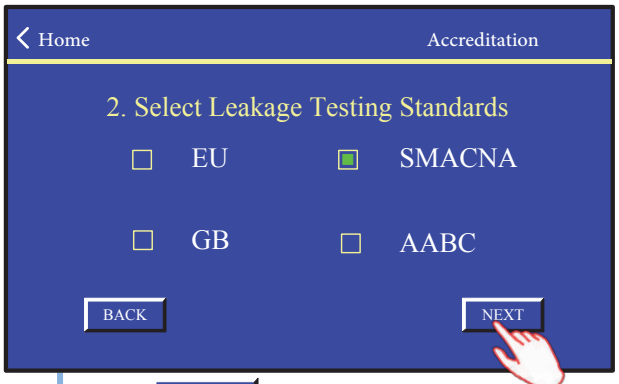
In Accreditation Menu, application items include select Flow device, Leakage testing standard, Air tightness class and input Duct Surface Area and testing time for a requested static pressure in duct. Duct accreditation should be under the request static pressure. And the accreditation result can be stored after testing or re-start the testing.

Click “Accreditation” to access the Application menu

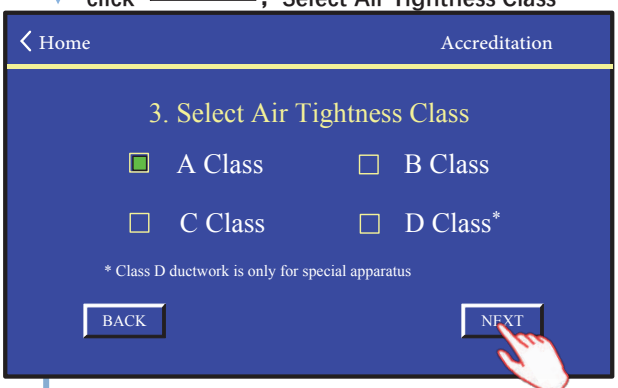
Select the Flow Device.



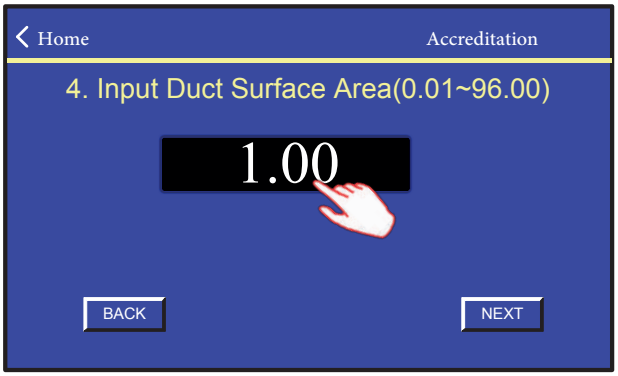
Click NEXT for Testing standard selection



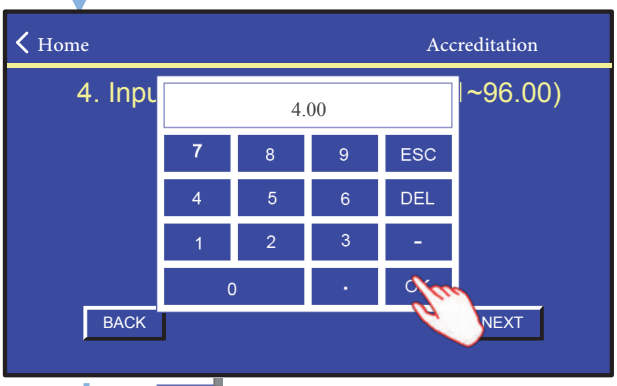
click NEXT, Select Air Tightness Class



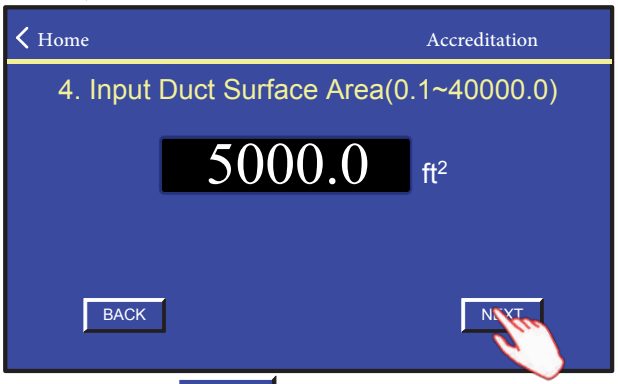
Click NEXT, Set up the pipe surface area



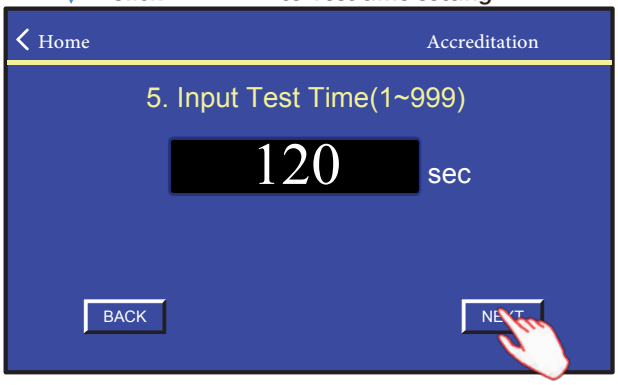
Click to set the duct surface area



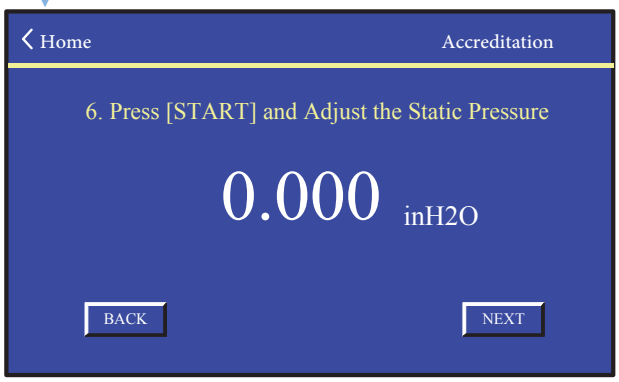
Click OK to complete the duct surface area



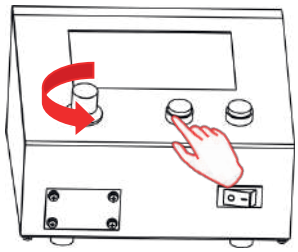
Click NEXT to Test time setting



Click NEXT for adjusting static pressure in duct

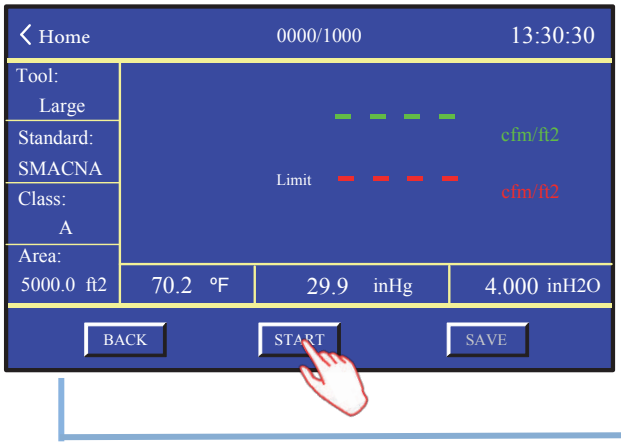


Press “START” for motor start running
Switch “Fan speed control” for adjusting the static pressure in Duct.



Real-time displaying the static pressure in duct.

When pressure statically, click NEXT for starting test.



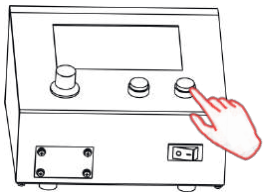
Click START for testing begin

Through after the setting time, output display the testing result.

Click SAVE for data saving.

Click Home Return home page

After the test is complete, click the "STOP" button on the panel to stop the fan running.



Attention

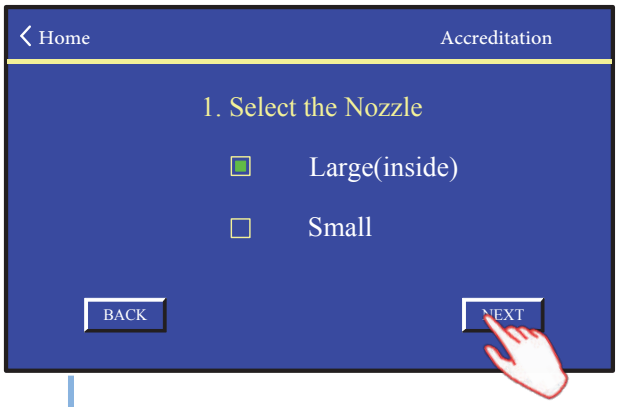
The fan should be completely stopped before restarting. If the fan is not fully stopped, pressing the start button may not initiate the test.

4.3 “Measure” menu

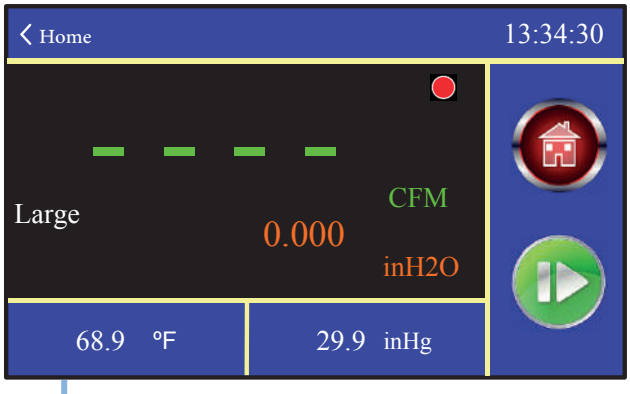
Measure items include: airflow, static pressure, temperature, and atmospheric pressure.

Click “Measure” to access the Application menu.

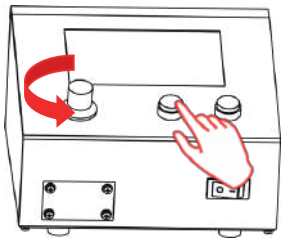
Select the “Large（inside）”



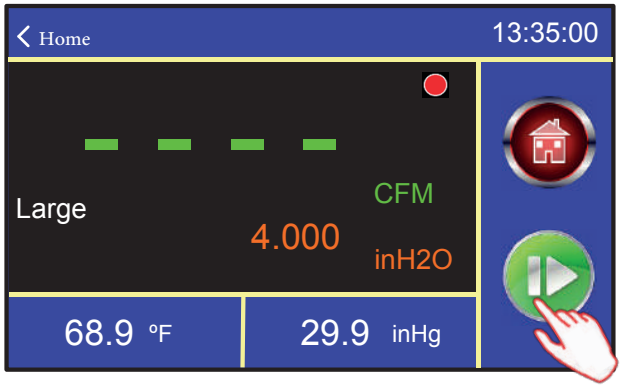
Click "Next" to enter the test interface.



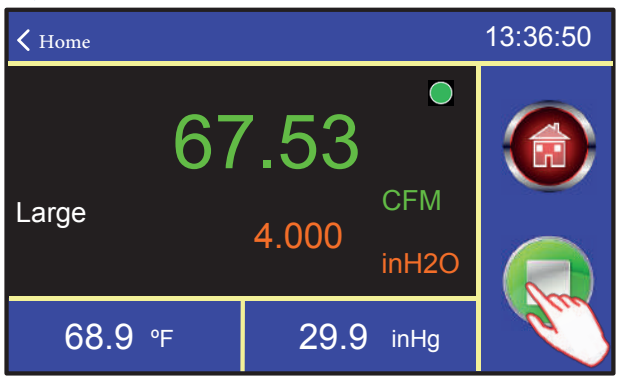
Click the "START" button on the panel to start the motor, and rotate the "fan speed adjustment knob" to adjust the static pressure inside the duct.



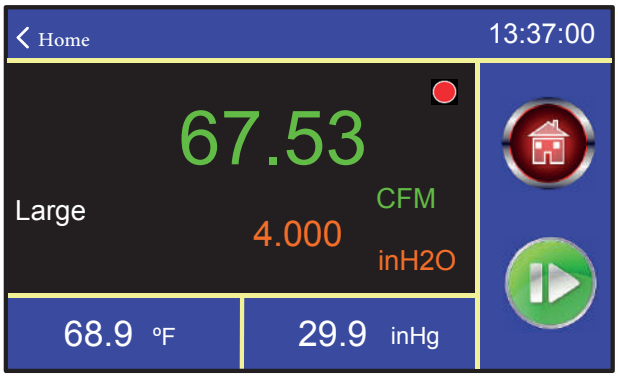
Once the required pressure is achieved, click the  for start Airflow testing.



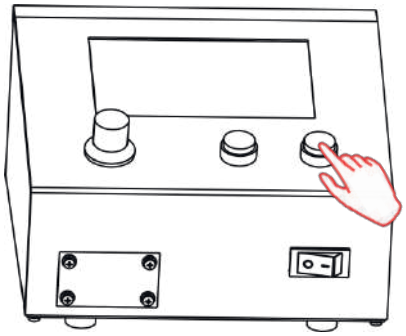
During the test, the airflow is displayed in real time



Click the  to stop Airflow testing.



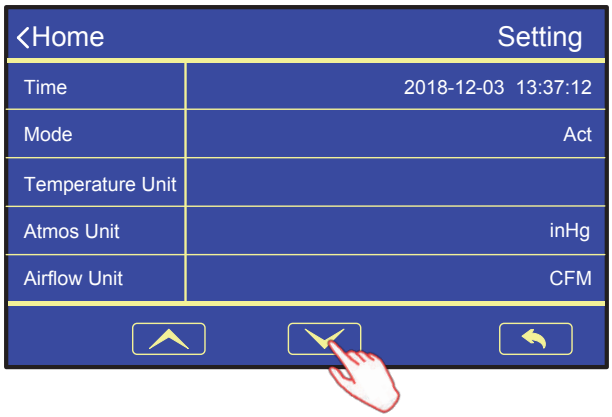
Click the "STOP" button on the panel for Fan stop running.

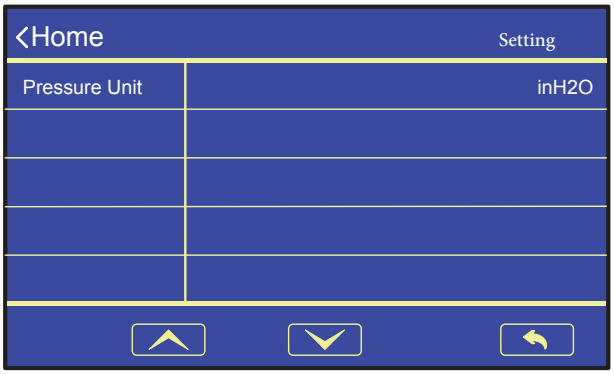


4.4 Parameter Setting Interface

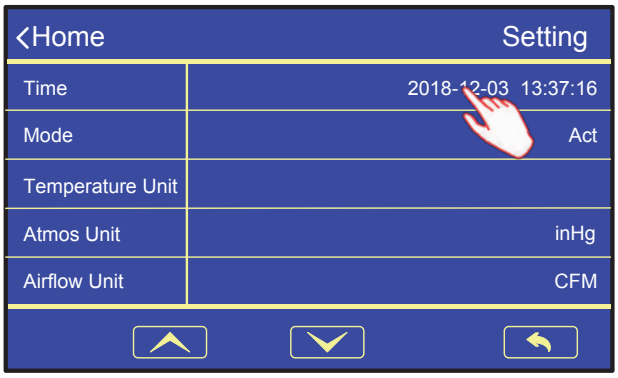
Parameter settings: The parameter settings interface includes: Time Settings: Set time and date. Flow Mode Settings: Choose between standard conditions or working conditions. Temperature Unit Settings. Atmospheric Pressure Unit Settings. Airflow Unit Settings. Static Pressure Unit Settings.

Enter setting interface

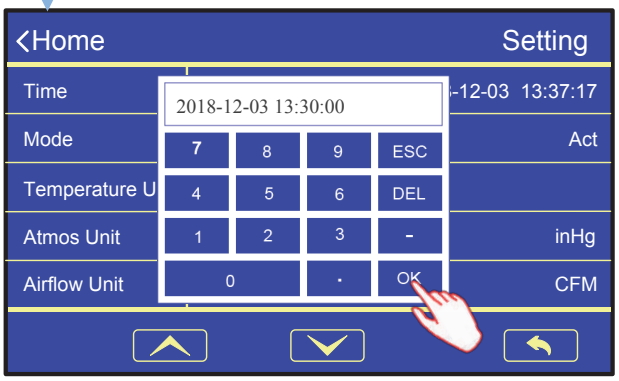




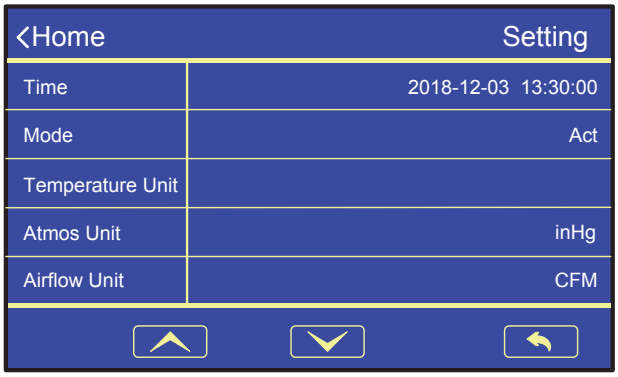
1. Time settings



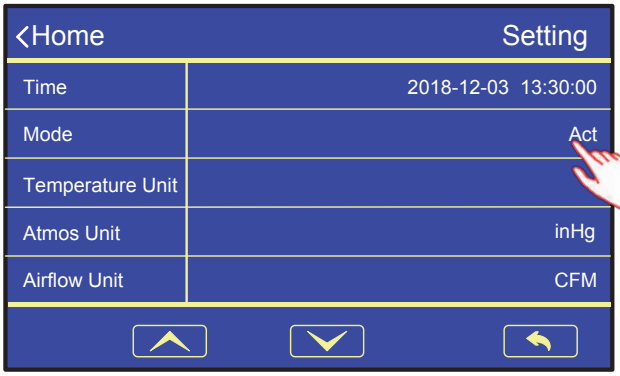
Click on the time to pop up the date-time modification keyboard.



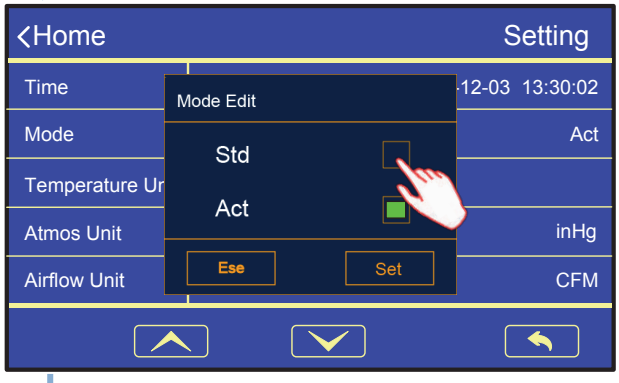
Click OK to save the value

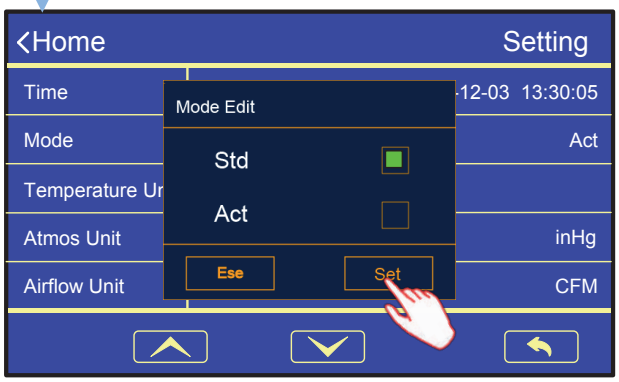


2. Airflow mode settings

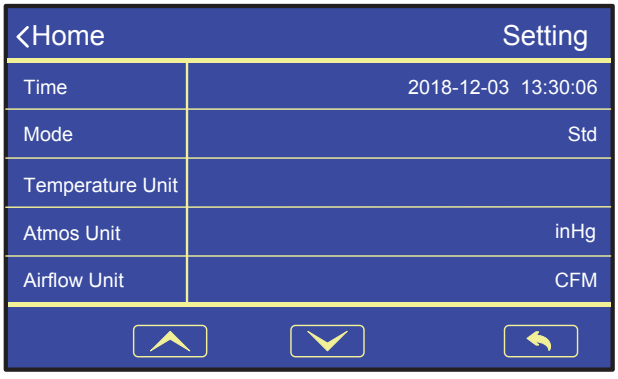


Click the air volume mode to pop up the air volume mode modification dialog box





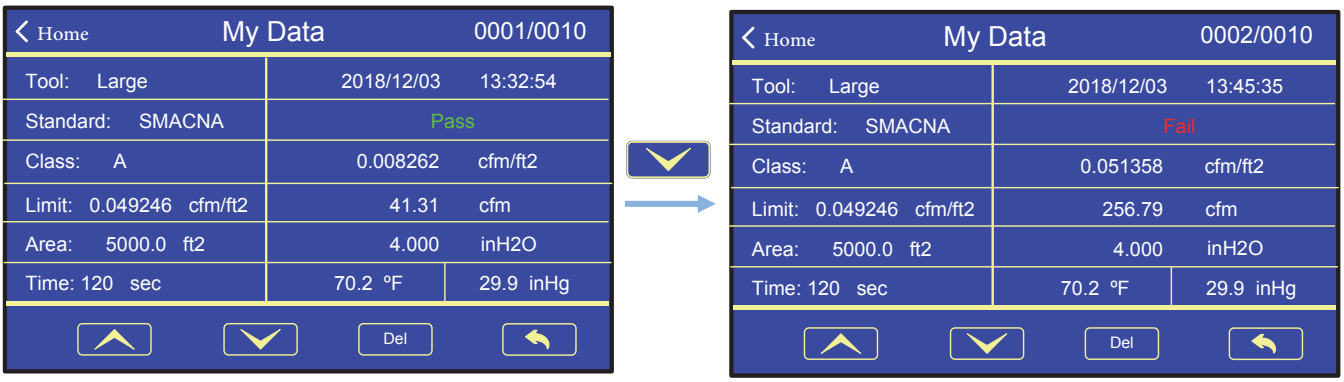
Click “Set” to save the value



4.5 “My Data” menu

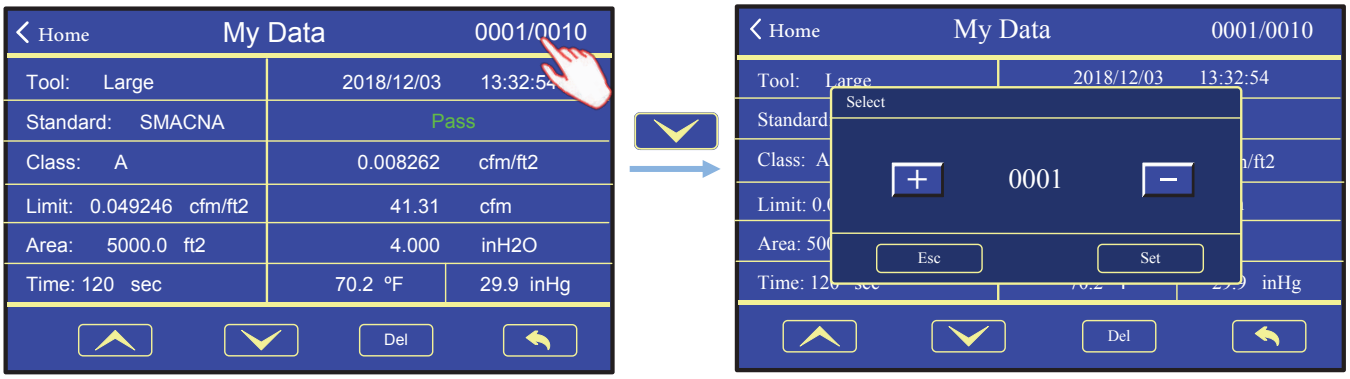
1. Data sequence browsing

Press the  or  Button for page turning browsing.



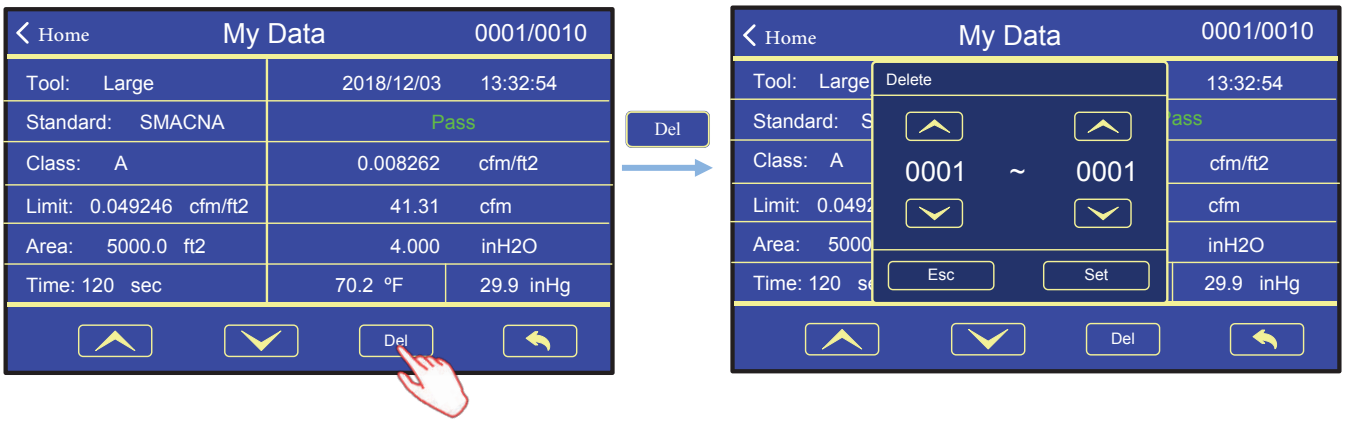
2. Select data browse

Click on the data serial number on upper-right corner for selected data reviewing.



3. Data deletion

By selecting a deletion range, you can delete any amount of data.

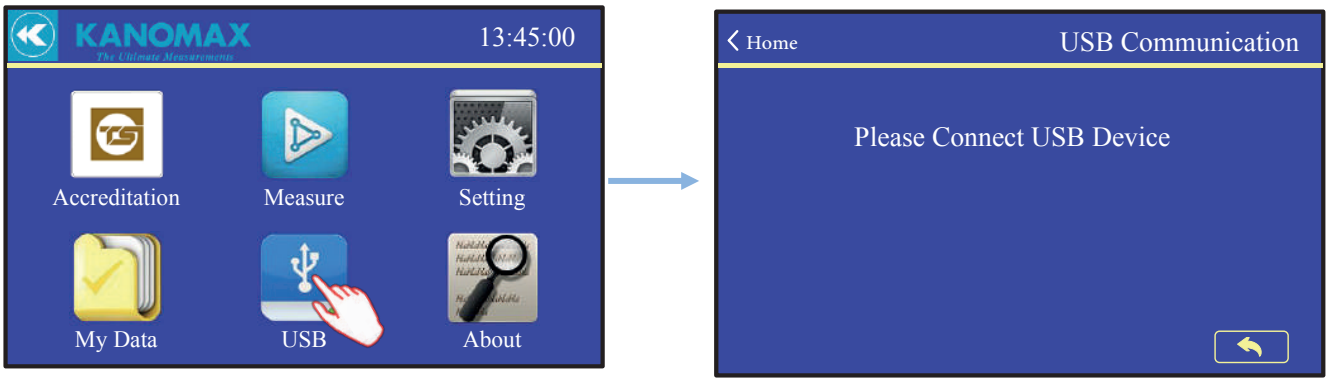


4. Exit interface

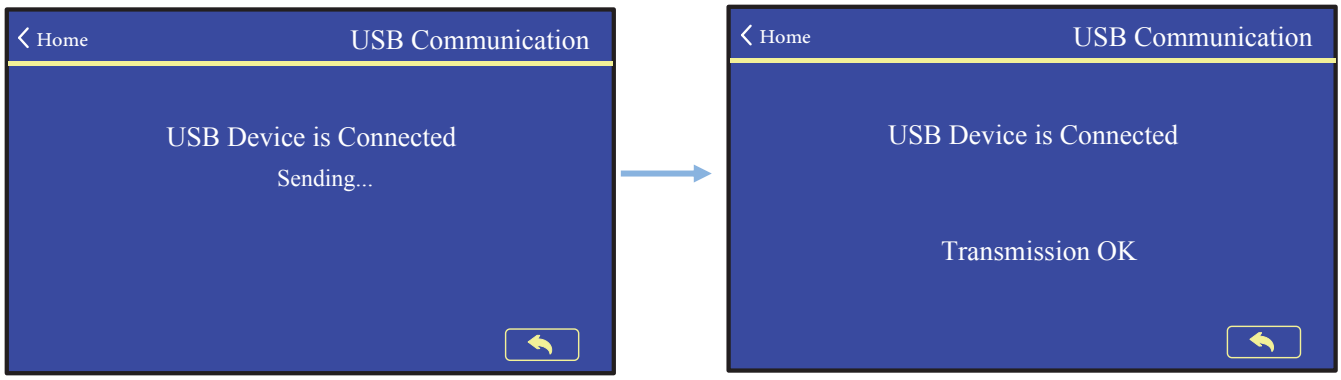
Click the  for exiting the data browsing interface.

4.6 “USB” menu

Data record can be exported by an USB disk.



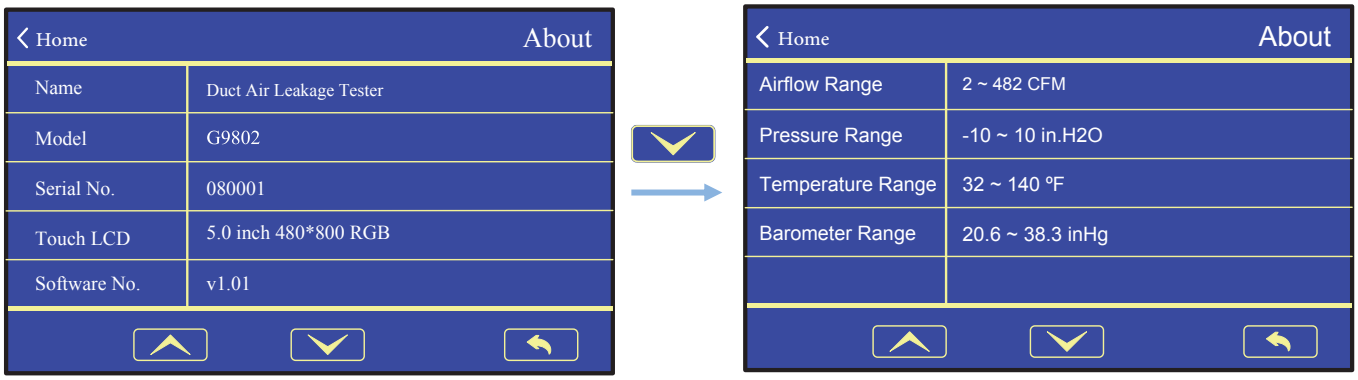
When the USB disk is inserted into the USB port, the instrument will automatically run the USB driver and export all saved data.



Note: A large number of files saved in the USB disk may cause longer exporting time. It is recommended to clean the USB memory before exporting data.

4.7“About” menu

Click “About” for entering the introduction menu, describing the key parameters of the instrument.



5 Common Faults and Troubleshooting

No.	Error Symptoms	Possible Causes	Solution
1	Controller start failure	No power supply connected	Check power supply and wiring according to Section 4.1
		Internal circuitry problem	Please contact the manufacturer
2	Fan motor fail to run	Power phase shortage	Check the power supply
		Motor control line is not connected or poor contact	Check the Motor Control line on the back of Controller and properly connect it..
		Fan hasn't fully stopped, and the start button is pressed	Restart the 220V power supply
		Problem with controller	Restart the controller. If the issue persists, contact the manufacturer
3	Touch Screen failure	External disturbances	Check around, away from the possible external disturbances, re-start the Controller.
		Touch screen failure.	Please contact the manufacturer
4	Incorrect temperature display	Temperature sensor wire is not connected or poorly connected	Check and well connect the temperature line.
5	Incorrect Airflow Display Range	The testing tool set wrong matching with the fixed one.	Reconfigure the flow tool or reinstall/remove the small nozzle
6	USB data exporting failure	USB driver failure	The available USB driver should be support USB 2.0 protocol and FAT file format.
		After plug-in USB driver, data exporting available only once.	USB driver unplug then back plug in for data exporting again.

6 Warranty and Service

6.1. Product Warranty

The limited warranty set forth below is given by GAZELLE INDUSTRIAL with respect to the GAZELLE brand Duct Air Leakage Tester and other accessories (hereafter referred to as "PRODUCT") purchased directly from GAZELLE INDUSTRIAL or from an authorized distributor. Your PRODUCT, when delivered to you in new condition in its original container, is warranted against defects in materials or workmanship as follows: for a period of one (1) year from the date of original purchase, defective parts or a defective PRODUCT returned to GAZELLE INDUSTRIAL, as applicable, and proven to be defective upon inspection, will be exchanged for a new or comparable rebuilt parts, or a refurbished PRODUCT as determined by GAZELLE INDUSTRIAL. Warranty for such replacements shall not extend the original warranty period of the defective PRODUCT.

This limited warranty covers all defects encountered in normal use of the PRODUCT, and does not apply in the following cases:

(1) Use of parts or supplies other than the PRODUCT sold by GAZELLE INDUSTRIAL, which cause damage to the PRODUCT or cause abnormally frequent service calls or service problems.
(2) If any PRODUCT has its serial number or date altered or removed.
(3) Loss of damage to the PRODUCT due to abuse, mishandling, alternation, improper packaging by the owner, accident, natural disaster, electrical current fluctuations, failure to follow operation, maintenance or environmental instructions prescribed in the PRODUCT's operation manual provided by GAZELLE INDUSTRIAL, or service performed by other than GAZELLE INDUSTRIAL.

NO IMPLIED WARRANTY, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, APPLIES TO THE PRODUCT AFTER THE APPLICABLE PERIOD OF THE EXPRESS LIMITED WARRANTY STATED ABOVE, AND NO OTHER EXPRESS WARRANTY OR GUARANTY, EXCEPT AS MENTIONED ABOVE, GIVEN BY ANY PERSON OR ENTITY WITH RESPECT TO THE PRODUCT SHALL BIND GAZELLE INDUSTRIAL. GAZELLE INDUSTRIAL SHALL NOT BE LIABLE FOR LOSS OF STORAGE CHARGES, LOSS OR CORRUPTION OF DATA, OR ANY OTHER SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES CAUSED BY THE USE OR MISUSE OF, OR INABILITY TO USE, THE PRODUCT, REGARDLESS OF THE LEGAL THEORY ON WHICH THE CLAIM IS BASED, AND EVEN IF GAZELLE INDUSTRIAL HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.IN NO EVENT SHALL RECOVERY OF ANY KIND AGAINST GAZELLE INDUSTRIAL BE GREATER IN AMOUNT THAN THE PURCHASE PRICE OF THE PRODUCT SOLD BY GAZELLE INDUSTRIAL AND CAUSING THE ALLEGED DAMAGE.WITHOUT LIMITING THE FOREGOING, THE OWNER ASSUMES ALL RISK AND LIABILITY FOR LOSS, DAMAGE OF, OR INJURY TO THE OWNER AND THE OWNER'S PROPERTY AND TO OTHERS AND THEIR PROPERTY ARISING OUT OF USE OR MISUSE OF, OR INABILITY TO USE, THE PRODUCT NOT CAUSED DIRECTLY BY THE NEGLIGENCE OF GAZELLE INDUSTRIAL. THIS LIMITED WARRANTY SHALL NOT EXTEND TO ANYONE OTHER THAN THE ORIGINAL PURCHASER OF THE PRODUCT, OR THE PERSON FOR WHOM IT WAS PURCHASED AS A GIFT, AND STATES THE PURCHASER'S EXCLUSIVE REMEDY.

6.2. After service

- When you have a problem with yourinstrument, please check out the “Common Trouble Shooting” section first.
- If that does not help, please contact yourlocal distributor, or contacts on the last page.
- During the warranty period, we will repair at no charge a product that proves to be defective due to material or workmanship under normal use.
  All return shipping charges are the responsibility of the customer.
- Repair after warranty expiration:
  Upon request, we will repair the instrument at the customer’s expense, if the instrument’s performance is found to be recoverable by providing the repair.
- Replacement parts are available for a minimum period of five (5)years after termination of production. This storage period of replacement parts is considered as the period during which we can provide repair service. For further information, please contactyour local distributor, or contacts on the last page.

When making an inquiry, please provide the following information

* Model No. ———
* Serial No. ———
* Description of the problem:———
* Data of Purchase: Day, Month, and Year

Appendix 1 Duct Identification Standards

No.	Standard	Nation	Description
1	BS EN 12237:2003	EU	Ventilation for buildings—Ductwork—Strength and leakage of circular sheet metal ducts.
2	BS EN 1507:2006	EU	Ventilation for buildings—Sheet metal air ducts with rectangular section—Requirements for strength and leakage.
3	DW/143	EU	HVAC—A practical guide to Ductwork leakage testing.
4	Eurovent 2/2	EU	Air leakage rate in sheet metal air distribution systems.
5	SMACNA HVAC Air Duct Leakage Test manual First edition,2012.	US	Duct construction leakage classification, expected leakage rates for sealed and unsealed ductwork, duct leakage test procedures, recommendations on use of leakage testing, types of test apparatus and test setup and sample leakage analysis.
6	AABC	US	Associated Air Balance Council AABC Standard
7	GB50243：2003/2016	GB	Code of acceptance for construction quality of ventilation and air conditioning works

1. EU Standards EN12237

Air Tightness Class	Air Leakage Limit(fmax)$m^3/s/m^2$	Static Pressure Limit (ps) Pa	
		Negative	Positive
A	$\frac{0.027 \times P_t^{0.65}}{1000}$	500	500
B	$\frac{0.009 \times P_t^{0.65}}{1000}$	750	1000
C	$\frac{0.003 \times P_t^{0.65}}{1000}$	750	2000
D	$\frac{0.001 \times P_t^{0.65}}{1000}$	750	2000

*Class D ductwork is only for special apparatus

2. EU Standards EN1507

Air Tightness Class	Air Leakage Limit(fmax)$m^3/s/m^2$	Static Pressure Limit (ps) Pa			
		Negative	Positive at pressure class		
			1	2	3
A	$\frac{0.027 \times P_t^{0.65}}{1000}$	200	400		
B	$\frac{0.009 \times P_t^{0.65}}{1000}$	500	400	1000	2000
C	$\frac{0.003 \times P_t^{0.65}}{1000}$	750	400	1000	2000
D*	$\frac{0.001 \times P_t^{0.65}}{1000}$	750	400	1000	2000

*Class D ductwork is only for special apparatus

3. EU Standards Dw/143

Duct Pressure Class	Static Pressure Limit		Maximum Air Velocity m/s	Air leakage limits l/s/m^2
	Positive Pa	Negative Pa		
Low-pressure –Class A	500	500	10	$0.027 \times P_t^{0.65}$
Medium pressure – Class B	1000	750	20	$0.009 \times P_t^{0.65}$
High pressure – Class C	2000	750	40	$0.003 \times P_t^{0.65}$

4. EU Standards Eurovent 2/2

Air Tightness Class	Air leakage limit(fmax)$m^3/s/m^2$
A	$\frac{0.027 \times P_t^{0.65}}{1000}$
B	$\frac{0.009 \times P_t^{0.65}}{1000}$
C	$\frac{0.003 \times P_t^{0.65}}{1000}$

5. US Standards SMACNA

Duct Class	1/2-,1-,2-inwg	3-inwg	4-,6-,10-inwg
Seal Class	C	B	A
Sealing Applicable	Transverse Joints Only	Transverse Joints and Seams	Joints, Seams and All Wall Penetrations
Leakage Class			
Rectangular Metal	16	8	4
Round Metal	8	4	2

Maximum air leakage is then defined as

$F=C_LP^{0.65}$

F = Maximum air leakage(cfm/100 ft^2)

C_L = Leakage class

P = Pressure (in.wg)

6. US Standards AABC

No.	Type of System	Minimum Test Pressure	Maximum Allowable Leakage
1	Fractional horsepower fan system; fan coils, small exhaust/supply fans, and residential system	0.50''WC(125Pa)	2%
2	Small systems; split DX systems – usually systems under 2000 CFM(940l/s), and residential systems	1.00''WC(250Pa)	2%
3	VAV and CAV terminal boxes and associated downstream ductwork	1.00''WC(250Pa)	2%
4	Single zone, multi-zone, return ducts, and exhaust duct systems	2.00''WC(500Pa)	2%
5	Chilled-beam primary supply	2.00''WC(500Pa)	1%
6	All ducts in chases and concealed spaces, main return ducts on VAV and CAV systems, main ducts on general exhaust or outside air systems	3.00''WC(745Pa)	1%
7	VAV and CAV terminal boxes tested with upstream ductwork	4.00''WC(995Pa)	1%
8	Supply ducts for VAV and CAV systems	4.00''WC(995Pa)	1%
9	Dual duct systems, both hot duct and cold duct	6.00''WC(1495Pa)	1%
10	High pressure induction system	6.00''WC(1495Pa)	0.5%
11	Exhaust systems for labs with air valves	6.00''WC(1495Pa)	0.5%
12	Grease duct Systems	4.00''WC(995Pa)	0.0%
13	Supply, return, and exhaust ductwork located outdoors	3.00''WC(745Pa)	1%

Determine the total allowable leakage of each duct system, including the allowed leakage rate of each component. If the entire duct system cannot be tested, determine the allowed leakage rate in a section of duct. To do this, determine the surface area of the total duct system, and the surface area of each section of the system to be tested.

Tested section air flow rate

$$= \frac{\text{Surface area of tested section}}{\text{Surface area of duct work in entire system}} \times \text{Total system operating air flow rate}$$

Allowable leakage airflow rate for tested section = Tested section air flow rate × Allowable percent leakge

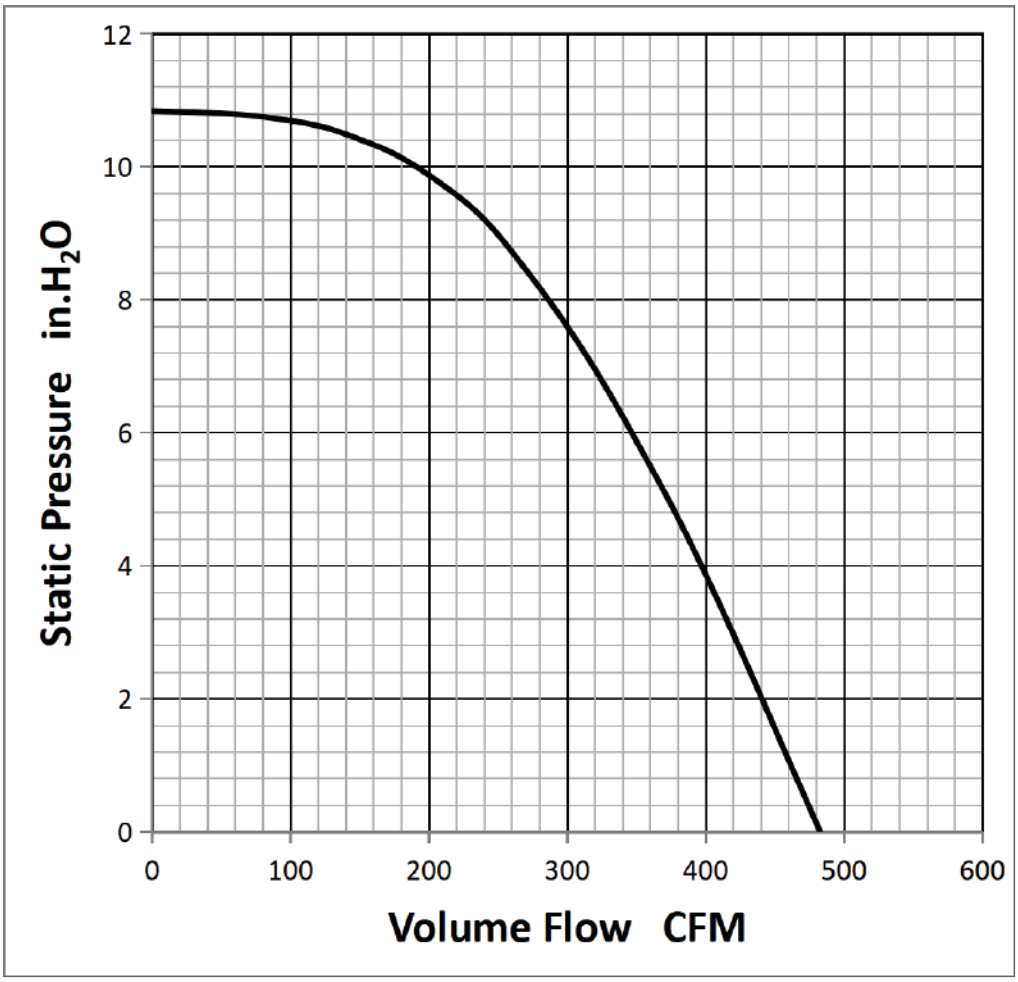
7. GB Standard GB50243

Rectangular Duct Pressure Class	Maximum leakage rate $m^3/h/m^2$
Low pressure system	$0.1056 \times P^{0.65}$
Medium pressure system	$0.0352 \times P^{0.65}$
High pressure system	$0.0117 \times P^{0.65}$

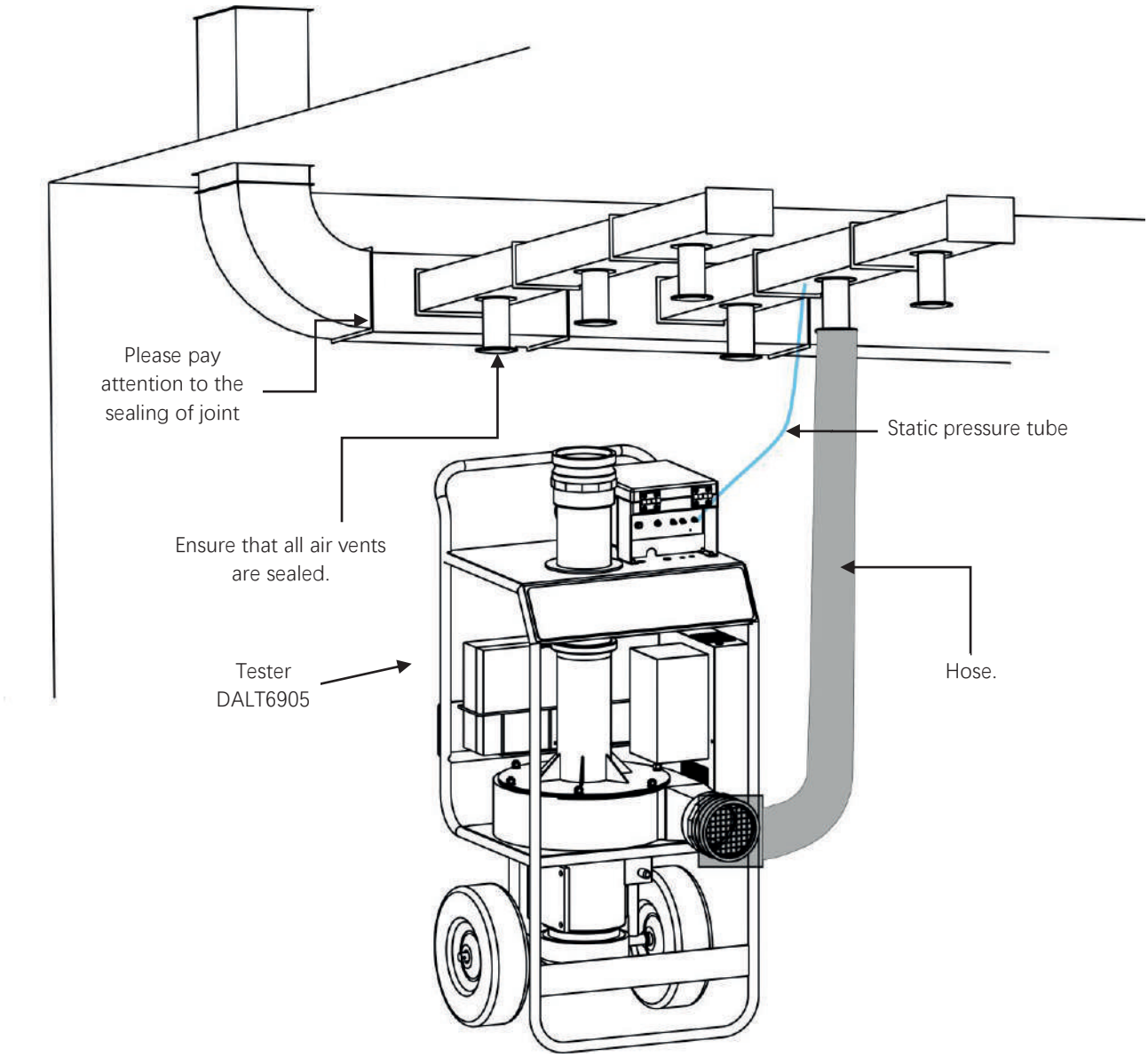
P--Refers to the working pressure (Pa) of the Duct system

1. The allowable air leakage for low pressure, medium pressure round metal ducts, composite material ducts, and non-metallic ducts with a non-flanged connection should be 50% of the specified value for rectangular ducts.
2. The allowable air leakage for brick and concrete ducts should not exceed 1.5 times the specified value for rectangular low pressure system ducts.
3. Smoke exhaust and dust removal low-temperature air supply systems should follow the medium pressure system duct specifications, and class 1~5 clean air conditioning systems should follow the high pressure system duct specifications.

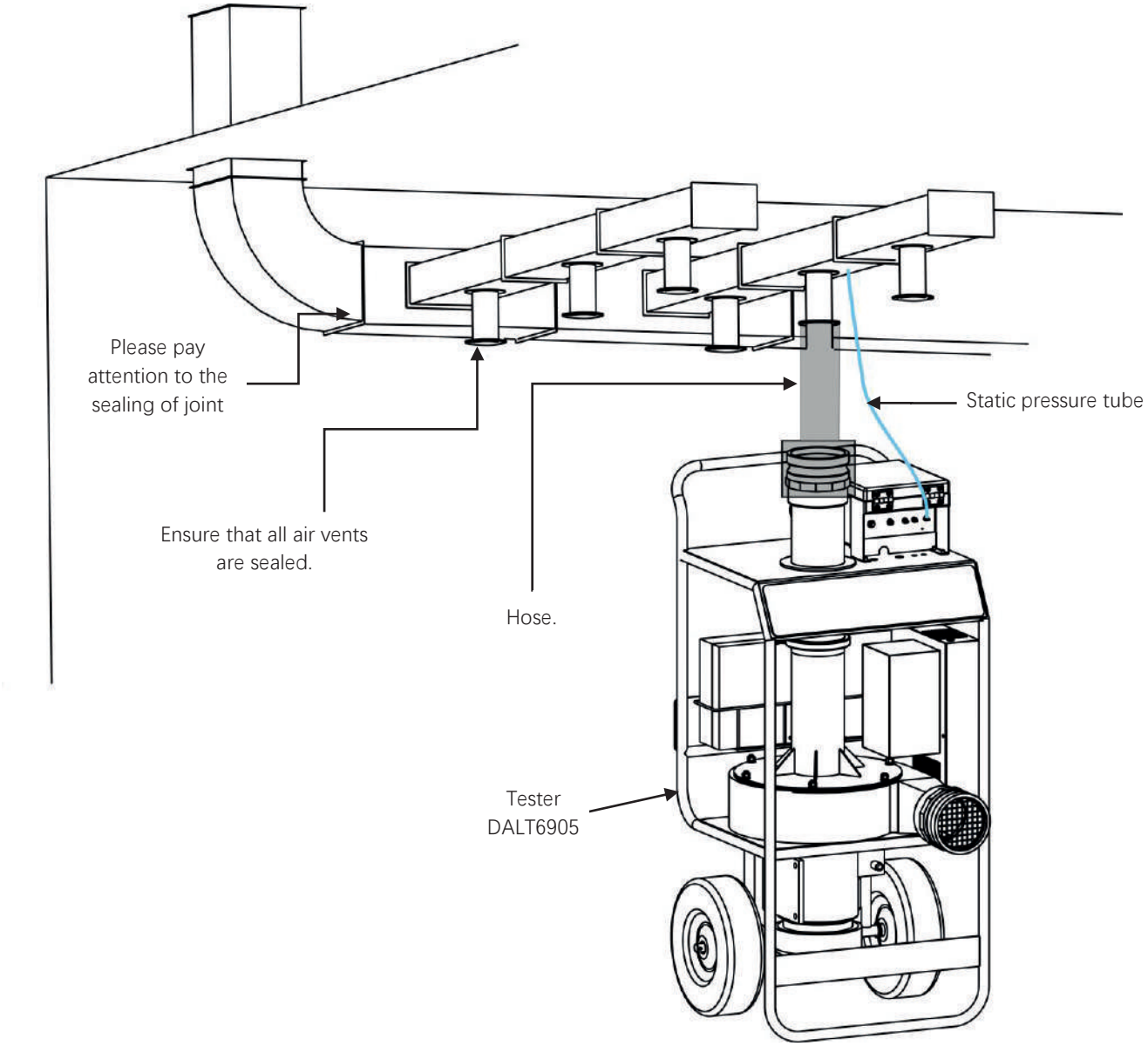
Appendix 2. Fan Performance Curve



Appendix 3. Installation Diagram (Positive Pressure)



Installation Diagram (Negative Pressure)



How to Find Leaks

1. **Look** - at blanks, access openings and difficult joints.
2. **Listen** - with test rig running, leaks should be audible.
3. **Feel**– running your hand (particularly if wet) over joints can help locate leaks.
4. **Soap and Water**– paint over joints and look for bubbles.
5. **Smoke Pellet**– placed inside ductwork (obtain permission for use).

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