NOY

Part of Atlas Copco Group



Helium Mass Spectrometer Leak Detector

Operation Manual

NLD 200

Version：N1.4 /2025.11

Anhui NOY Technology Co., LTD

NLD200 Helium Mass Spectrometer Leak Detector



Figure 1 NLD200

Explain

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1. About this Manual

1.1.User Notice

Thank you for choosing to use our company's "NHJ" series helium mass spectrometer leak detector. Before installing and testing the helium mass spectrometer leak detector, please read this manual carefully to ensure that it is in optimal conditions and working safely. Only by strictly following this manual and using the helium mass spectrometer leak detector correctly can it operate safely and effectively.

This product must be operated and maintained by trained personnel. It is the responsibility of the user to carefully read and strictly comply with the safety measures described in the manual.

❖ **The images in this manual are for reference only. Without affecting performance and safety, our company reserves the right to upgrade products and change components without prior notice.**

1.1. Icon agreement

Warning



The warning refers to a potentially dangerous situation, which may cause personal injury if operated incorrectly.

Caution



Caution refers to potentially dangerous situations where operational errors can result in minor injuries to the instrument or person.

Notice



Notice refers to the situation where there is no harm, informing users of the precautions they need to pay attention to during daily use.

2. Security Information

2.1. Explanation

Operators and maintenance personnel must be aware of all hazards associated with this product; And it is necessary to know how to identify and avoid dangerous and potentially hazardous conditions. Inexperienced, incorrect, or negligent operation of equipment may result in serious consequences.

All operators or maintenance personnel must carefully read the operation and maintenance instructions and all additional materials and must strictly comply with all warnings and precautions.

If you have any questions regarding safety, operation, or maintenance, please consult our after-sales service personnel.

2.2. Operation Condition

2.2.1. The product is only intended for indoor, industrial, and laboratory use.

2.2.2. Operating temperature: 5°C~40°C, relative humidity: ⩽ 80%.

2.2.3. Working voltage：DC24V.

2.2.4. Max operating current：14.6A.

2.2.5. Altitude: below 2000 meters.

2.2.6. Max allowable magnetic field：8mT.

2.3. Danger

Improper operation by operators or maintenance personnel may cause injury to operators or surrounding personnel or damage the leak detector.

Warning



- It is strictly prohibited to use in environments containing flammable and explosive gases.
- The leak detector cannot suck in any liquid.
- When using hydrogen as a detection gas, maintain a concentration of less than 5% to avoid combustion.
- There is a permanent magnet in the leak detector, which may affect the pacemaker. Please keep a sufficient distance.
- If smoke, odor or noise is detected in the product, please stop using it immediately and contact the after-sales service personnel.
- Please do not disassemble or modify the product as it may cause electric shock or injury to personnel, and the product may not function properly. If disassembly or modification is required, please contact the manufacturer or after-sales personnel.
- Before installation and maintenance work, the power supply of the equipment must be disconnected.

- Leak detectors cannot be used with hazardous gases. Before using a leak detector, ensure that the product being tested has been cleared of hazardous gases. When detecting hazardous gases, the exhaust port of the leak detector should be connected to an exhaust device with purification function.

3. Product Description

3.1. Introduction

The NLD200 helium mass spectrometer leak detector is a modular combined leak detector. With a small volume and flexible configuration, the vacuum system and a variety of gas circuit combinations, it can be applied to a variety of detection requirements and is widely used in the automation industry. It has the characteristics of short start-up time, fast leak detection speed, high sensitivity, and strong helium cleaning ability.

Helium mass spectrometer leak detector is a detection instrument that locates and quantifies the leakage points of sealed objects. The helium mass spectrometer leak detector selects inert gas helium as the detection gas. Helium has the characteristics of non-toxicity, inertness, low atmospheric content, small atomic weight, non-flammability, and easy passage through leaks. Helium is a safe gas that can be stored in various sizes of bottles and cans and is widely used in many fields.

★ Aerospace
★ Scientific Research
★ Military Industry
★ Automotive Refrigeration
★ Pressure vessels
★ Analytical instruments
★ Nuclear Industry
★ Power Plants
★ New Energy Industry
★ Semiconductor Industry
★ Precision machining
★ Medical instruments
★ High vacuum equipment engineering

3.2. Instrument construction

3.2.1. Overall dimensions

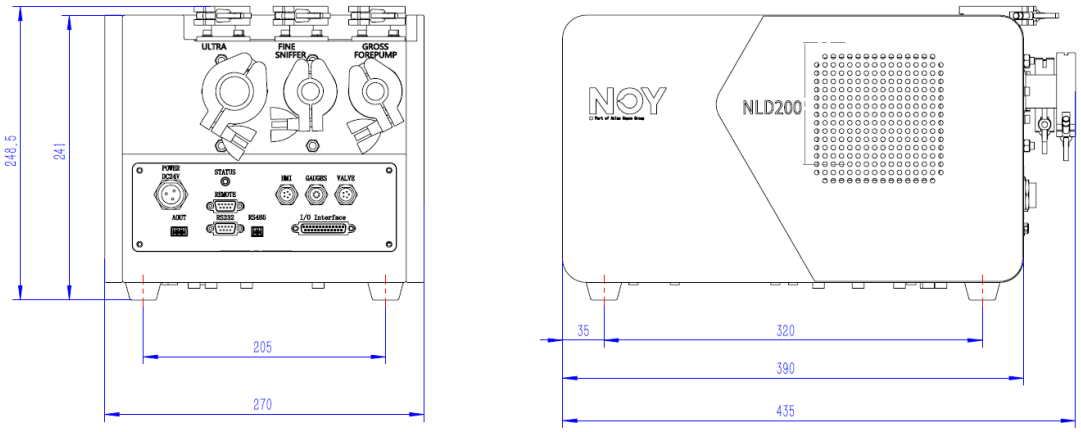


Figure 2 NLD200 external dimension diagram

3.2.2. Vacuum interface

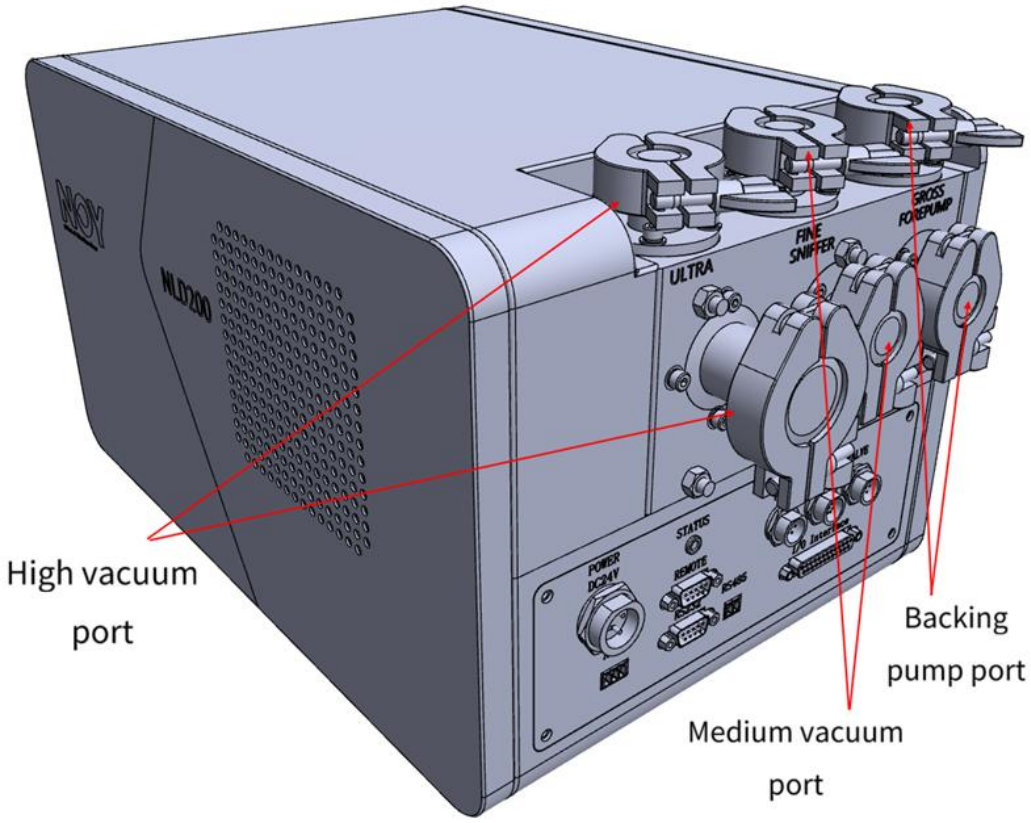


Figure 3 NLD200 Vacuum interface

S/N	Material name	Explain
1	High vacuum port	It is connected to the high vacuum port of the molecular pump, with high leakage detection accuracy and low leakage detection pressure. It can be used optionally.
2	Medium vacuum port	Connected to the medium vacuum port in the molecular pump, it has high leak detection accuracy and can be selected for use.
3	Backing pump port	Internally connected to the exhaust port of the molecular pump and externally connected to the backing pump, this interface must be connected to the backing pump.

3.2.3. External Control Output Signal Interface

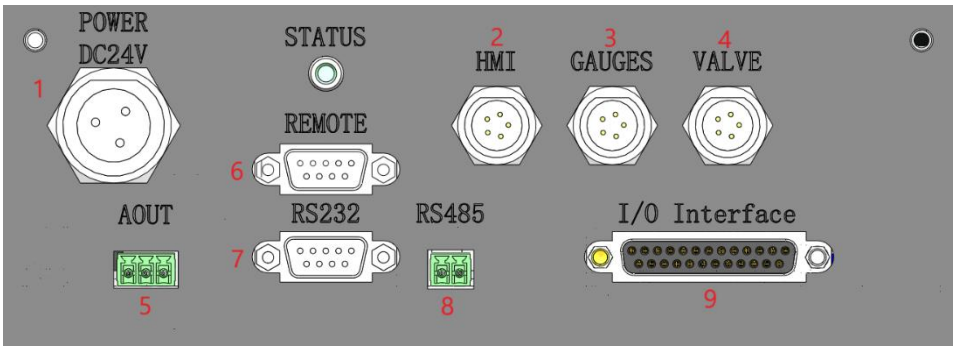
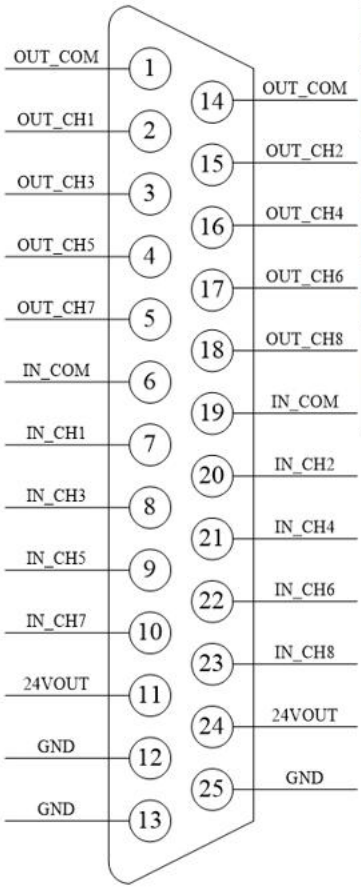


Figure 4 External Control Output Signal Interface

1	DC24V power interface	6	Remote control interface
2	Display module interface	7	RS232 interface
3	Vacuum signal interface	8	RS485 interface
4	reference leak valve interface	9	External input/output interface
5	Analog output interface		

3.2.3.1. Input output interface



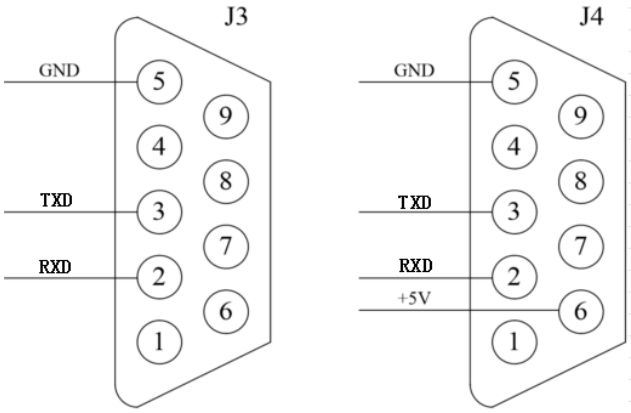
Channel number	Trigger mode	Level mode
IN_CH1	Calibration CAL	Calibration CAL(1)
IN_CH2	Vacuum mode/ sniffer mode	Vacuum mode/ sniffer mode (0/1)
IN_CH3	Zero adjustment	Zero adjustment(1)
IN_CH4	stop	stop(1)
IN_CH5	stop/start	stop/start(0/1)
IN_CH6	undefined	undefined
IN_CH7	undefined	undefined
IN_CH8	undefined	undefined

Note: In level mode, calibration must be used to set IN_CH5 to 0; To clear the calibration status, a stop signal must be used, IN_CH4.

Channel number	Signal definition
OUT_CH1	Alarm value 1 output
OUT_CH2	Alarm value 2 output
OUT_CH3	Alarm value 3 output
OUT_CH4	Alarm value 4 output
OUT_CH5	Vacuum pressure 1 output
OUT_CH6	Vacuum pressure 2 output
OUT_CH7	Standby output
OUT_CH8	Error output

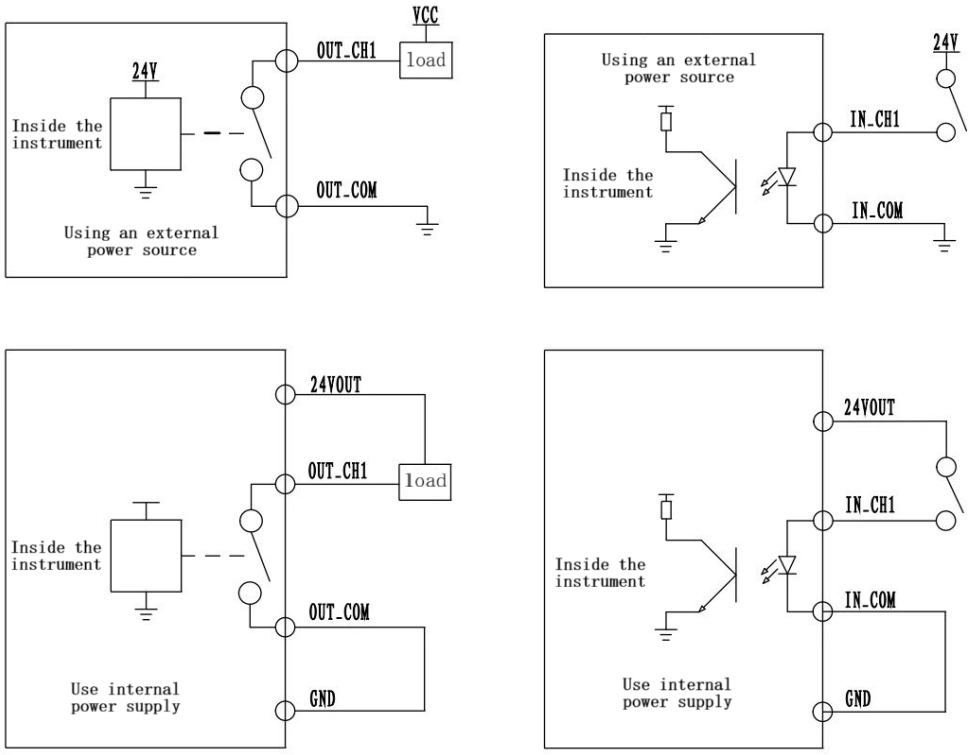
3.2.3.2. RS232 and remote-control interface

Interface: DB9 male head



RS232 interface Remote control interface

3.2.3.3. Usage of output interface



3.3. Technical parameters

Table 1 Performance Parameters of NLD200 Leak Detector

Model	Environmental parameters	Numerical value
NLD200	Minimum detectable leak rate	3×10^{-13} Pa・m^3/s
	Search gas	He, H2
	Response time	⩽0.5S
	Start Time	⩽90S
	Leakage rate display range	$(1\times10^{-2}\sim1.0\times10^{-13})$ Pa・m^3/s
	ULTRA max leak detection pressure	40Pa
	FINE max leak detection pressure	200Pa
	GROSS max leak detection pressure	2000Pa
	Backing Pump	⩾2.5L/S
	Communication	RS232, RS485, USB
	Calibration	External leak calibration
	HMI (inch)	5
	Language	Chinese/English/Italian/ Korean / Japanese / Thai / Hindi / Malay /Hungarian
	Interface size	DN25/DN16
	External dimensions	(435x 270x 249) mm
	Weight	22Kg

Table 2 Usage and Storage Conditions

Model	Environmental parameters	Numerical value
NLD200	Ambient temperature (°C)	5～40
	Relative humidity	≤80%
	Maximum altitude （m）	2000
	Voltage	DC24V±5%
	Max magnetic field （mT）	8
	Imax（A）	14.6
	Pollution degree	2
	Storage temperature （°C）	-20～55

Caution



Particular attention

After the leak detector is shut down, wait for more than 30 minutes before moving it, otherwise it may damage the molecular pump.

Exemption scope

(1) Prevent particles from entering the leak detector and causing damage to the molecular pump. Our company is exempt from warranty for this phenomenon, and corresponding fees will be charged for repairs.

(2) Prevent particulate matter from entering the interior of the mechanical pump and causing damage to the pump. Our company is exempt from warranty for this phenomenon, and corresponding fees will be charged for repairs.

(3) If the mechanical pump equipped with the leak detector is an oil pump, the pump oil needs to be replaced regularly. If the oil level is lower than the lowest mark of the pump oil window, it is necessary to refuel in a timely manner; If the pump oil appears black, brown, or white emulsion, it needs to be replaced with the same pump oil. Otherwise, long-term operation will cause the mechanical pump's ultimate vacuum to deteriorate, the pressure in the front stage to increase, and the molecular pump of the leak detector to be overloaded, resulting in other malfunctions such as molecular pumps. During maintenance, if our company's maintenance personnel discover the above phenomena and cause mechanical pump and leak detector failures, our company is exempt from warranty and will charge corresponding fees for maintenance.

4. Installation of Leak Detector

4.1. Installation requirements

4.1.1. Power supply closes to leak detector.

4.1.2. Power voltage 24V⎓±5%, and the power supply should have a reliable grounding.

4.1.3. Leave a ventilation space of at least 10 centimeters around the leak detector.

4.1.4. Backing Pump

If using your own backing pump, please ensure that the pumping speed of the backing pump is greater than 2.5L/s and that the backing pump has an independent power supply.

Before operating the oil sealed backing pump, it is necessary to inject an appropriate amount of oil in advance. The glass window for observing the oil level is located on the side of the mechanical pump. When the pump is not running, the oil level should be below the upper limit of the observation window.

When the pump is running, the oil level should be higher than the lower limit of the oil level in the observation window.

Please refer to the 'Manual for Backing Pump'

4.2. Interface selection and component installation

4.2.1. Interface selection

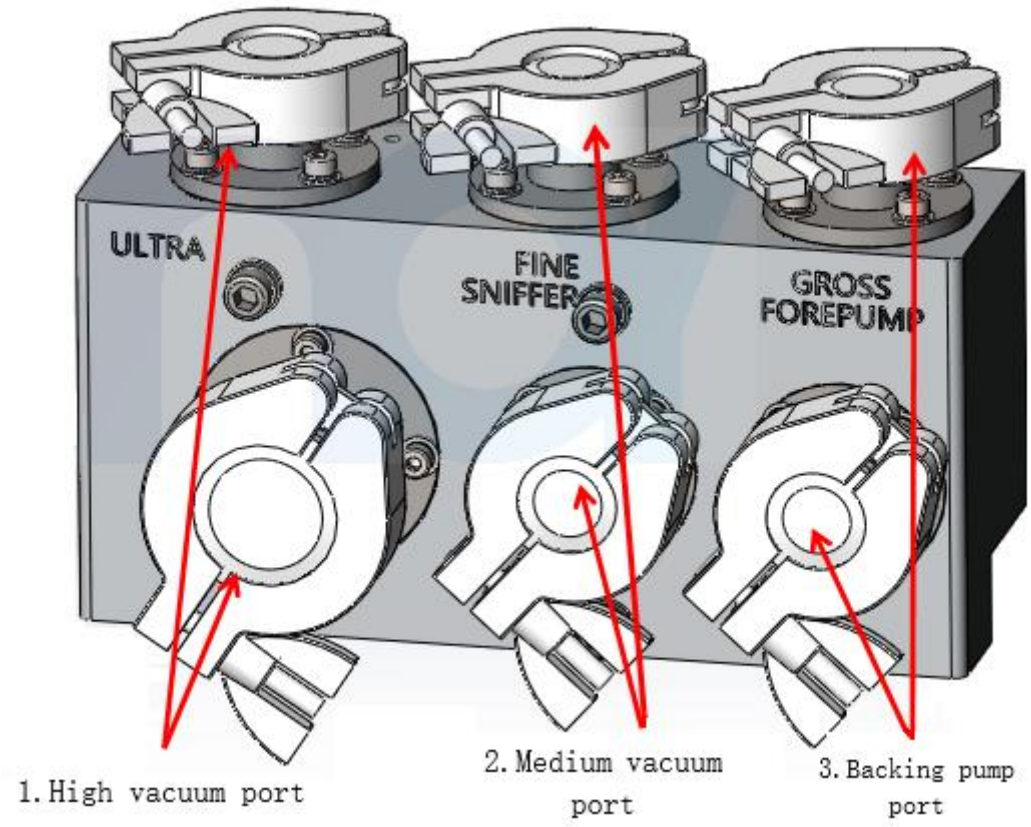


Fig.5 vacuum interface

S/N	interface	Explain
1	Ultra interface for high-level inspection KF16/KF25	The max detection pressure is 40Pa. The leakage detection accuracy is set to "high", and the control unit displays ULTRA.
2	Fine interface for medium detection KF16	The max detection pressure is 200Pa, the leakage detection accuracy is set to "medium", and the control unit displays FINE.
3	Backing pump interface KF16	Backing pump connection port and Gross port

4.2.2. Component installation

4.2.2.1. Connect the pressure sensor Pirani to one of the GROSS/FOREPUMP connections.

4.2.2.2. Connect the backing pump to the second GROSS/FOREPUMP connection.

4.2.2.3. Connect internal calibration leaks to one of the FINE or ULTRA connectors.

4.2.2.4. If you want to connect a sniffer, in sniffer mode, connect the sniffer to the vacuum connector FINE/SNIFFER.

4.2.3. Electrical connection

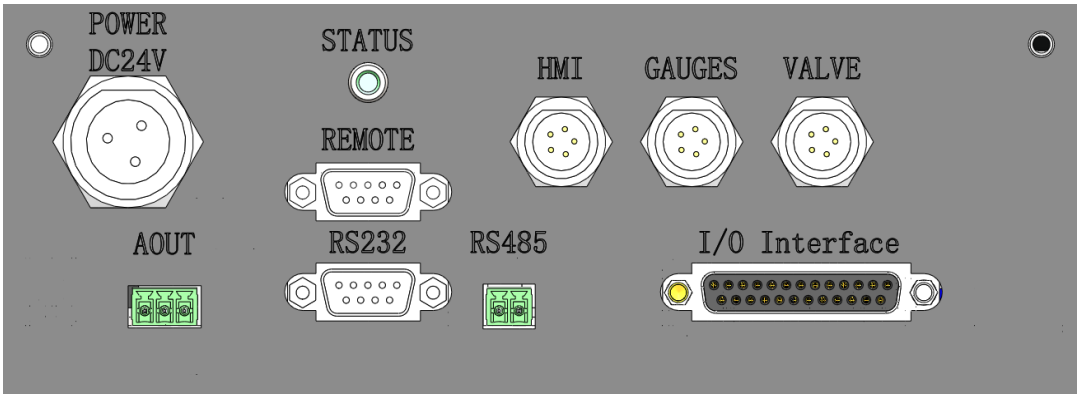


Fig.6 Electrical interface

4.2.3.1. Connect the supplied power cord to the socket "DC24V".

4.2.3.2. Connect the touch screen to the “HMI” socket.

4.2.3.3. Connect the pressure sensor harness to the socket "gauges".

4.2.3.4. Connect the internal calibration leak solenoid valve harness to the socket "valve".

5. Operation

5.1. HMI



Fig.7 HMI

5.1.1. Communication and power interface: used to supply power to the touch screen and communicate with the host of the leak detector.

5.1.2. Display screen: used to display information, set parameters and control the leak detector when it is running.

5.2. Preparation before power on

5.2.1. Confirm that the working environment of the leak detector meets the requirements of technical parameters.

5.2.2. Confirm that the instrument is reliably grounded.

5.2.3. Connect vacuum line and valve.

5.2.4. Connect the backing pump and turn it on.

5.2.5. Connect the power cord of the product and supply power.

Display after the leak detector is powered on.

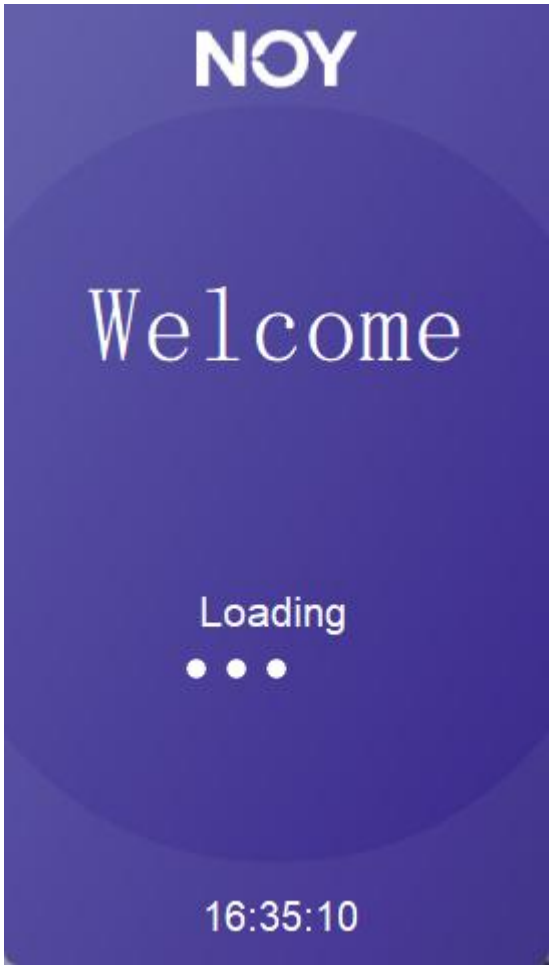


Fig.8 Startup screen

5.3. Start up

After supplying power to the leak detector, the leak detector enters the startup process.



Fig.9 Startup screen

The starting time of the leak detector is less than 90s. The startup process of the leak detector is the process of the main components of the leak detector starting to work and self-test.

5.3.1. Startup time: time of the startup process.

5.3.2. Vacuum degree: real time vacuum degree of molecular pump exhaust port.

5.3.3. Startup progress: the startup percentage is displayed by the circular progress bar.

5.4. Standby mode

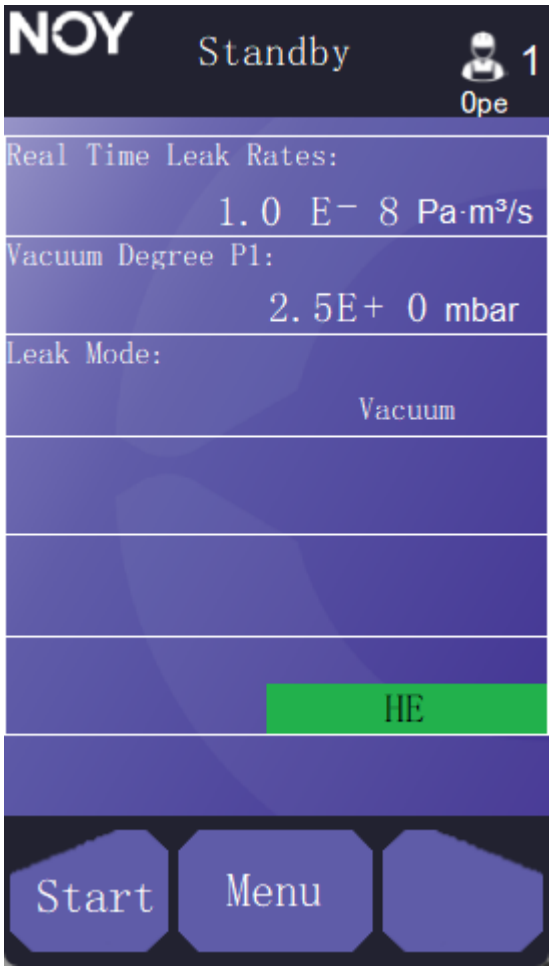


Fig.10 Standby mode

Standby mode indicates that the startup of the leak detector has been completed. Can enter leak detection mode.

5.4.1. Leak mode: indicates that the current leak detector is operating in vacuum mode.

5.4.2. Real time leak rates: refers to the leakage rate value of the leak detector before the stop state.

5.4.3. Vacuum degree: Display the vacuum degree value of the molecular pump exhaust port.

5.4.4. Start button: click the start button to control the leak detector to enter the leak detection mode, such as Fig.21.

5.4.5. Menu button: click the menu button to call out the menu

page.

5.4.6. User login: click the top right corner of the screen to call out the login page.

5.5. Measurement

5.5.1. Select the vacuum interface as required and connect the vacuum valve and measuring object.

5.5.2. Calibrate after 20 minutes of warm-up. See Calibration Settings for details.

5.5.3. Select the desired operating mode.

5.5.4. Set parameters that meet the requirements.

5.5.5. Vacuum the measuring object to a predetermined pressure and open the leak detection valve.

5.5.6. Click the start button to start the measurement process. See Section 6 for specific leak detection methods.

5.5.7. Observe the measurement result by displaying the leakage rate and recording the measured value.

5.5.8. Click the stop button to stop the measurement.

5.5.9. Close the vacuum valve;

5.5.10. Disconnect the power supply and turn off the instrument.

5.6. Parameter setting



Fig.11 Setting interface

Select different users on the login page and enter the corresponding password to log in to the corresponding user and obtain the corresponding permissions. The initial password of ordinary users is 8; After login, enter the setting interface.

5.6.1. Alarm settings

In the settings interface, click on the alarm settings, and the alarm settings interface will appear.

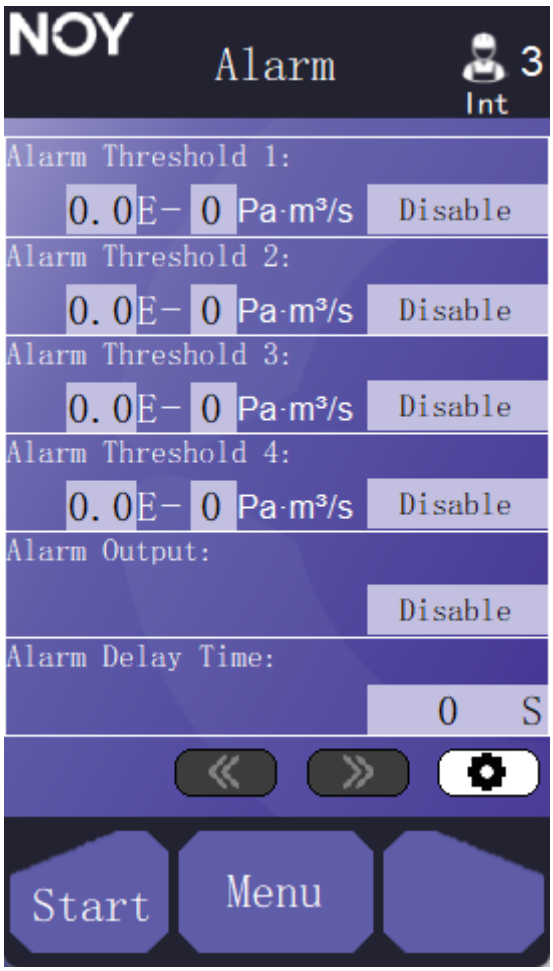


Fig.12 Alarm settings

5.6.1.1. Alarm threshold：If the leakage of the inspected item exceeds the set value, the leak detector outputs an alarm signal or alarm.

5.6.1.2. Alarm Delay Time: After reaching the alarm value, the alarm will be triggered after a set delay of seconds.

5.6.1.3. Alarm output: Disable, Enable.

Disable refers to the prohibition of the leak detector from outputting alarm signals.

Enable refers to the leak detector allowing the output of alarm signals.

5.6.2. Leak settings

In the settings interface, click on leak settings to enter the leak detection settings interface.



Fig.13 Leak settings 1/2

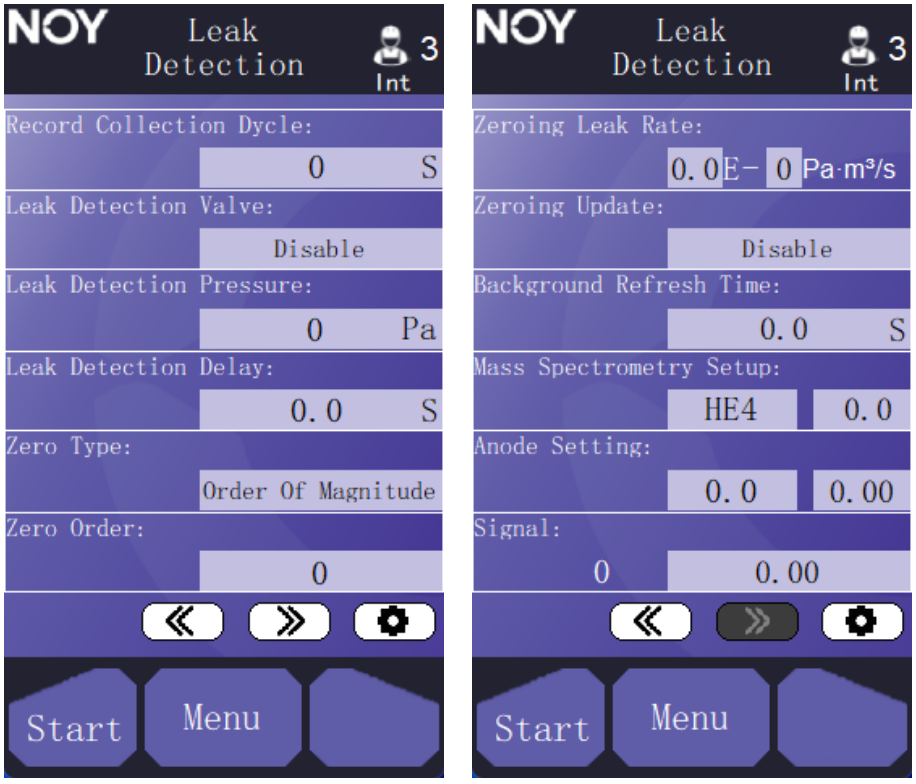


Fig.14 Leak settings 3/4

5.6.2.1. Leak Mode: vacuum mode, for negative pressure mode leak detection of workpieces. The sniffer mode is

used for leak detection in the positive pressure mode of the workpiece.

5.6.2.2. Filament: Auto, for automatic switching of the filament; Filament 1 and Filament 2 are manually switched.

5.6.2.3. Leak unit： Pa・m^3/s 、mbar・l/s、atm・cc/s.

5.6.2.4. Vacuum unit：mbar、Pa、atm、Torr.

5.6.2.5. Leak Rate Decimal: Set the leakage rate display decimal places to one or two.

5.6.2.6. Leak Rate display: Main interface display modes: numerical mode, histogram, curve chart.

5.6.2.7. Large leak Protection: Disable or Enable.

5.6.2.8. Protection leak Rate: Set the leak rate of large leak protection.

5.6.2.9. The machine factor is set in the software to modify the error between the displayed value and the actual value. Factory setting for vacuum factor: 1.0; Sniffer factor: 1.0.

If you need to modify it, click the number to modify it.

5.6.2.10. ZERO can be used to suppress undesired helium backgrounds. If "ZERO" is enabled, the currently measured leak rate value will be interpreted as a helium background and subtracted from all subsequently measured values. The background value suppressed by "ZERO" is adjusted automatically if the background changes inside the device.

5.6.2.11. Zero Order: After entering zero calibration mode, the

zero-display value is the index of the displayed value before zero calibration minus the set value.

5.6.2.12. Zero Type: Type of zero calibration, Order of magnitude.

5.6.2.13. Mass spectrometry settings: settings for search gas He、H2.

5.6.3. Calibration Settings

In the settings interface, tap on the Calibration Settings to enter the calibration settings interface.

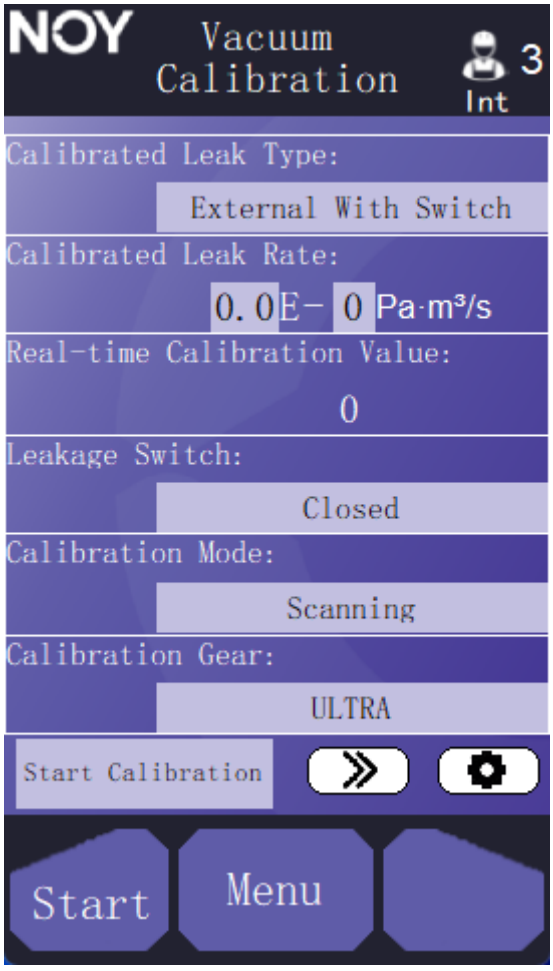


Fig.15 Leakage Setting Interface

5.6.3.1. Calibrated Leak type: Select ‘Build in’.

‘Built in’ refers to the use of built-in leakage;

'External with switch' refers to the external leakage itself having a switch;

'External without switch' means that the external leakage itself does not have a switch.

5.6.3.2. Calibrated Leak rate: The set value is the calibrated value on the standard leak.

5.6.3.3. Calibration Mode: Select 'Scanning'.

Set the calibration mode for the next calibration. Scan calibration is a method of performing a new helium peak scan and fast calibration is a fast micro scan calibration.

5.6.3.4. Calibration gear: set to ULRTA mode when the calibration leak is installed at the ULRTA port; Set to FINE mode when the calibration leak is installed at FINE port.

5.6.3.5. Click Start calibration, and the instrument will be calibrated automatically. Follow the prompts on the interface to complete the calibration.

5.6.4. Communication settings

In the settings interface, tap on the communication settings to enter the communication settings interface.

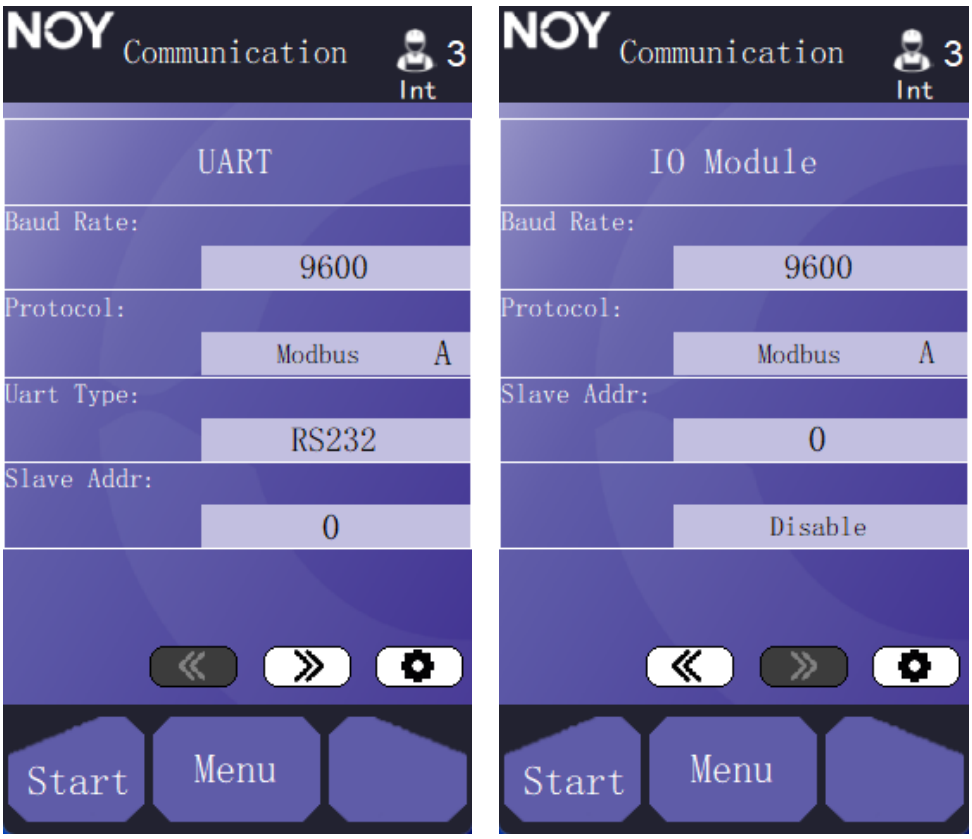


Fig.16 Communication settings

5.6.4.1. Communication settings: External serial port.

5.6.4.2. Baud rate: 9600、19200、38400、57600、115200。

5.6.4.3. Protocol: Modbus, NOY protocol 1, protocol 2, protocol 3.

5.6.4.4. Uart type: RS232、RS485

The actual setting value is determined based on the serial protocol of the connected device.

5.6.5. Interface settings

In the settings interface, tap on the interface settings to enter the interface settings interface.

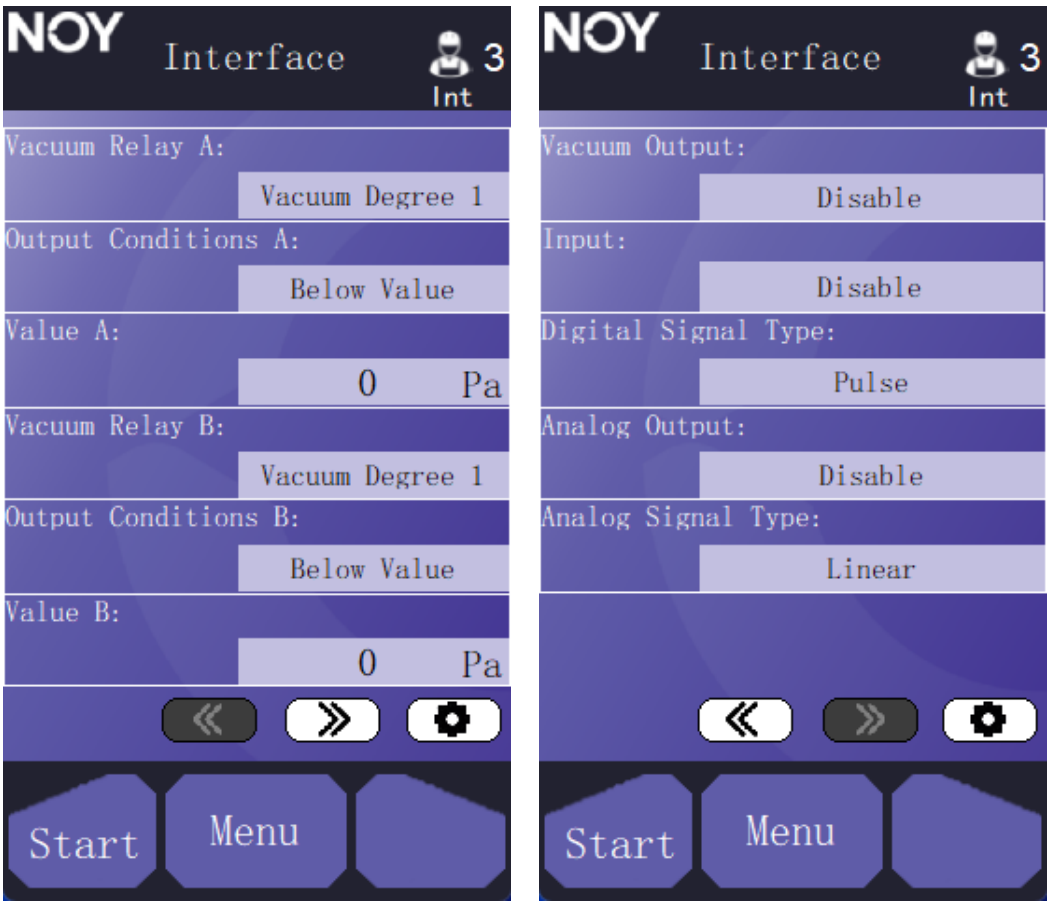


Fig.17 Interface settings

5.6.5.1. Output conditions: Below or above value.

Below value: When the vacuum relay output is allowed, if the vacuum degree of the leak detection port is lower than the set value, the relay outputs a vacuum signal.

Above value: When the vacuum relay output is allowed, if the vacuum degree of the leak detection port is higher than the set value, the relay outputs a vacuum signal.

Value A or B: Set the vacuum value when the customer needs to output a signal.

5.6.5.2. Vacuum output: Disable, Enable.

Disable: The vacuum relay on the output board is

prohibited from outputting.

Enable: Allow the vacuum relay on the output board to output.

5.6.5.3. Input: Disable, Enable.

Disable: Prohibit switch input signals and control instruments.

Enable: Allow switch input signals to control instruments.

5.6.5.4. Digital Signal Type: pulse, level.

Pulse: When the switch input is allowed, an external pulse signal can be used to control the instrument.

Level: When the switch input is allowed, an external level signal can be used to control the instrument.

5.6.5.5. Analog output: Disable, Enable.

Disable: The instrument is prohibited from outputting analog signals.

Enable: Allow the instrument to output analog signals.

5.6.5.6. Analog Signal Type: linear, Index.

Linear: When the analog output is allowed, output a linear analog signal.

Index: When the analog output is allowed, output an exponential analog signal.

5.6.6. Other settings

On the settings interface, tap on other settings to enter the other settings interface.



Fig.18 Other settings

Click the display box to select the change password, time, and language. After changing the original password "8", remember it firmly to avoid forgetting.

5.6.7. Historical records

On the settings interface, tap ‘Record’ to enter the record interface.



Fig.19 Record interface

Historical records: It records the leakage rate detected by the leak detector at the end of each leak detection. Compare with the alarm value and output the leak detection result OK/NG.

Export: If you need to export the recorded values, simply insert the USB drive into the USB port on the side of the display screen, and then click Export to import the data into the USB

drive. Simply insert the USB flash drive into the computer to read the recorded data.

Delete: It means deleting the recorded data. Clear data memory.

With the update of software versions, the above functions may perform slightly differently on different devices without further notice.

The above parameter indicators, on the premise of meeting national standards, the manufacturer reserves the right to upgrade and modify the indicators of the product without further notice.

5.7. Status interface

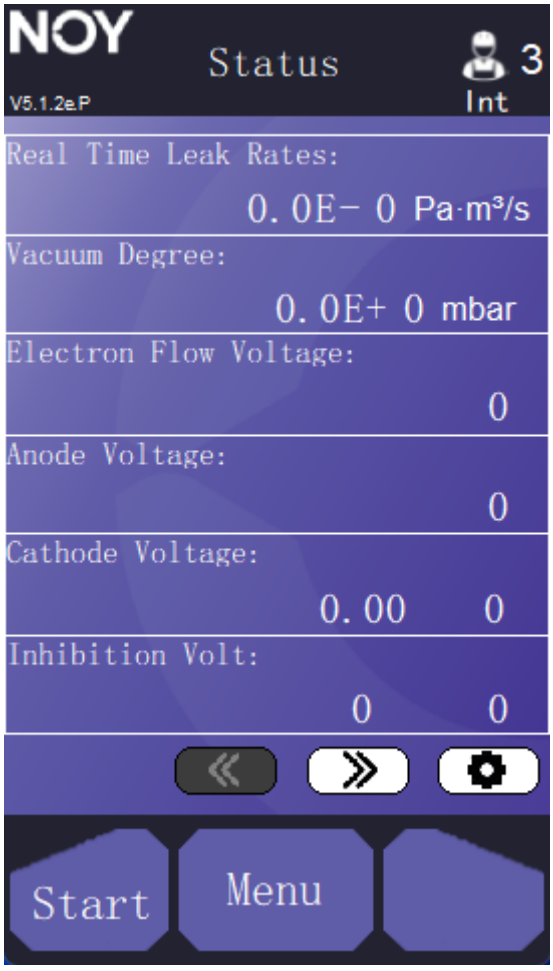


Fig.20 System Status

Status interface: Display the instrument's internal settings and operating parameters. Convenient for customers and after-sales personnel to view.

6. Common leak detection methods

There are multiple detection methods for using helium as an exploration gas. The detection method is usually determined based on the actual working conditions of the tested object. It is recommended to maintain the same pressure difference and usage method as the actual use of the test piece during testing. For example, vacuum objects should be tested in a vacuum environment, and pressure tanks should be tested while the tank is pressurized.

6.1. Negative pressure detection

Negative pressure detection is the process of using a vacuum pump or leak detector to evacuate the interior of the object being tested. When a certain pressure is reached, the leak detector controls its own valve and starts testing. Then test through the following methods:

6.1.1. Helium Spray Method

Use a pressure reducing valve or flow meter to adjust the helium gas to a certain flow rate, connect the helium gas with a spray gun, and spray helium gas towards the suspected leak point on the tested part. Observe the display value of the leak detector to determine if there are any leakage points.

This method can find the location of the leakage point and the relative leakage rate.

6.1.2. Bell jar method

Use a plastic bag or bell jar to wrap the tested parts. Then

fill the helium into the plastic bag or bell jar to make the tested part full of helium. Observe the display value of the leak detector for a certain time to judge the overall leakage rate of the tested part.

This method can test the overall leakage rate of the tested component.

6.2. Positive pressure detection

Positive pressure testing is the process of filling a certain amount of helium gas or a mixture of helium and nitrogen gas into the interior of the tested object. Use inhalation method or bell jar method again to test the leakage point or leakage rate of the tested object.

6.2.1. Inhalation method

Install a dedicated helium suction probe at the leak detection port of the leak detector and then use the probe to detect helium at the suspected leak point of the tested object. Observe the display value of the leak detector while detecting to determine the leakage point of the tested component.

This method can detect the leakage point position and relative leakage rate of the detected component.

6.2.2. Bell jar method

Inject helium gas or a mixture of helium and nitrogen gas at a certain pressure into the interior of the tested object. Cover the tested item with a bell jar and use a leak detector to evacuate the bell jar. The helium gas leaked from the inside of the tested object will be detected by a leak detector and the

leakage rate will be quantified.

This method can detect the overall leakage rate of the tested item.

6.3. Inside-out testing method

The inside-out testing method is mainly aimed at electronic components or some small-sized workpieces. The inside-out testing method for leak detection is somewhat like the bell jar method in negative pressure.

6.3.1. Put the tested parts into the pressure tank with proper size.

6.3.2. Fill the pressure tank with helium at a certain pressure and keep the pressure for a period.

6.3.3. Take out the part to be tested and remove the residual helium on the surface of the part to be tested.

6.3.4. Put the parts to be tested into the bell jar or leak detection tank for leak detection test. Read the display value of the leak detector after a certain time of testing by the leak detector, that is, the leakage rate of the tested part.

Refer to：QJ3212-2005《Test methods for leaks using the helium mass spectrometer leak detector in the inside-out testing method》

7. Maintenance and upkeep of instruments

7.1. Power on test

When the leak detector is not in use for a long time, it is required to conduct a power on test every month, and after 2 hours of power on, recalibrate and calibrate it.

7.2. Maintenance of mechanical pumps

7.2.1. Oil

Normal oil is clean and transparent. If the oil color becomes dark, it needs to be replaced with new oil. If there is gas or liquid dissolved in the oil, it will affect the maximum pressure of the pump. It can be continuously operated for 30 minutes with the inlet closed and the gas damper open for degassing.

7.2.2. Change the oil

It is recommended to change the oil of the pump after the first 100 hours of operation. In the future, when extracting clean gas under low pressure, replace the oil every 2000 hours; But if you remove contaminated or corrosive process gases, or operate at high inlet pressures or temperatures, please determine the frequency of oil change based on your specific operating conditions.

7.3. Spare parts list

Number	Material name	Specifications	Quantity
1	O-ring seal	ISO2861-1,DN25	1
2	O-ring seal	ISO2861-1,DN16	1
3	Clamp	ISO2861-1,DN25	1
4	Clamp	ISO2861-1,DN16	1
5	ion source		1
6	Main control board		1
7	Ion source power board		1
8	Fan	12025,24V	1
9	Fan	LFS0624SH,24V	1
10	Switching Mode Power Supply	DC24V,350W	1

7.4. Common fault analysis and handling

Category	Fault phenomenon	Inspection and analysis methods
Power Supply	The leak detector does not run after startup	Is the power cord connected properly. Check whether 24V power supply is normal.
	No display after startup	Check if the touch screen connection cable is loose.
Fan	The fan is not turning	Check if the fan plug is loose. Check if the fan socket has 24V. Check if the fan is functioning properly.

Backing Pump	After startup, there is a picture on the display screen, and the backing pump does not start	Check if the mechanical pump switch is turned on. Check if the power cord of the mechanical pump is reliably connected.
	The sound of the mechanical pump is abnormal.	Check the connecting clamps of the mechanical pump. Check if the leak detection port is sealed. Check if the protective cover of the mechanical pump fan is deformed. Check if the oil level of the mechanical pump is too low. Check for any major leaks. Check if the mechanical pump oil has solidified.
molecular pump	Molecular pump abnormality	Check if the output value of the exhaust pipe gauge is correct. Check the power supply of the molecular pump. Check the signal line of the molecular pump. Check if all interfaces of the molecular pump are properly connected.
display	Display error, no display	Check if the power and signal lines of the display screen are normal.
ion source	The filament is not powered	Check if the molecular pump has been fully started. Check if the ion source socket is loose.
	Repeatedly powering up the ion source	Check if the wire sequence of the ion source socket is incorrect. Check if the pins of the ion source are connected or disconnected.

7.5. Analysis and Handling of Common Errors and Warning Codes

7.5.1. Common Error Codes, Analysis, and Handling

Error code	Meaning	reason	Check and exclude
10	Abnormal pressure at the leak detection port	The signal line of the vacuum gauge at the leak detection port has fallen off or has poor contact; The vacuum gauge at the leak detection port is damaged or contaminated.	Check the vacuum gauge wiring harness; Replace or clean the vacuum gauge.
13	Abnormal vacuum in the front stage of the molecular pump	The backing pump of the leak detector is not working properly. The vacuum gauge at the exhaust port of the molecular pump is damaged or contaminated. The exhaust valve of the molecular pump is not properly opened	Check if the backing pump is working properly. Replace the vacuum gauge. Check if the vacuum valve is open.
16	Molecular pump startup timeout	The backing pump is not working properly; The molecular pump is not working properly; The molecular pump is in an incorrect state.	Check if the backing pump and evacuation valve are working properly. Check if the molecular pump is functioning properly. Shut down for 30 minutes and wait for the molecular pump error status to clear before restarting.

20	Abnormal high voltage of ion source anode	Ion source damage. The filament drive board is damaged. Poor contact of ion source power supply harness.	Switch the filament or replace the ion source. Repair and replace the filament drive board. Repair and replace the ion source power supply harness.
21	Low emission current	Atmospheric intrusion. The filament is aging or damaged. The filament drive board is damaged. Poor contact of ion source power supply harness.	Check parameters to avoid atmospheric intrusion. Repair and replace the ion source. Repair and replace the filament drive board. Repair and replace the ion source power supply harness.
22	High emission current	Atmospheric intrusion. The filament is aging or damaged. The filament drive board is damaged. Poor contact of ion source power supply harness.	Check parameters to avoid atmospheric intrusion. Repair and replace the ion source. Repair and replace the filament drive board. Repair and replace the ion source power supply harness.
23	Abnormal power supply of filament board	The filament drive board is damaged	Repair and replace the filament drive board
24	Abnormal 80V power supply for filament board	The filament drive board is damaged	Repair and replace the filament drive board
26	Molecular pump communication failure	Poor contact with molecular pump communication harness. The molecular pump controller is abnormal.	Repair and replace the communication harness of the molecular pump.

			Repair and replace the molecular pump controller.
27	Molecular pump communication timeout	Poor contact of molecular pump communication harness. The molecular pump controller is abnormal.	Repair and replace the communication harness of the molecular pump. Repair and replace the molecular pump controller.
36	Low rotational speed of molecular pump	Atmospheric intrusion. Molecular pump alarm error. High ambient temperature, molecular pump overheating. Vacuum pipeline leakage or pre stage vacuum difference.	Check parameters to avoid atmospheric intrusion. Check if the molecular pump and controller are functioning properly; Check the front stage vacuum pump. Check if the ventilation and heat dissipation are normal.
37	Molecular pump malfunction (Red light on)	Atmospheric intrusion. Molecular pump or controller damaged. High ambient temperature, molecular pump overheating. Vacuum pipeline leakage or pre stage vacuum difference.	Check parameters to avoid atmospheric intrusion. Check if the molecular pump and controller are functioning properly; Check the front stage vacuum pump. Check if the ventilation and heat dissipation are normal.
38	Molecular pump malfunction (Yellow light on)	Atmospheric intrusion. Molecular pump or controller damaged. High ambient temperature, molecular pump overheating. Vacuum pipeline leakage or pre stage vacuum difference.	Check parameters to avoid atmospheric intrusion. Check if the molecular pump and controller are functioning properly; Check the front stage vacuum pump. Check if the ventilation and heat dissipation are

			normal.
39	High pressure at the exhaust port of the molecular pump	Atmospheric intrusion. Vacuum pipeline leakage or pre stage vacuum difference. The vacuum gauge at the exhaust port of the molecular pump is damaged.	Check parameters to avoid atmospheric intrusion. Check the front stage vacuum pump. Repair and replace the vacuum gauge at the exhaust port of the molecular pump.
40	During standby, the pressure at the exhaust port of the molecular pump is high	Vacuum pipeline leakage or pre stage vacuum difference. The vacuum gauge at the exhaust port of the molecular pump is damaged.	Check the front stage vacuum pump. Repair and replace the vacuum gauge at the exhaust port of the molecular pump.
50	Abnormal deceleration of molecular pump	Atmospheric intrusion. Molecular pump alarm error. High ambient temperature, molecular pump overheating. Vacuum pipeline leakage or pre stage vacuum difference.	Check parameters to avoid atmospheric intrusion. Check if the molecular pump and controller are functioning properly; Check the front stage vacuum pump. Check if the ventilation and heat dissipation are normal.

7.5.2. Common Warning Codes, Analysis, and Handling

Warning code	Meaning	Reason	Check and exclude
1	When calibrating the sniffer mode, the background is abnormal.	Low background value collected during calibration.	Is the suction gun blocked.
2	The difference between the calibration signal of the sniffer and the background is small.	The helium background in the environment is too high, or the standard leakage fails and the filament ages.	Wait for the background in the environment to decrease before calibrating.
3	The calibration signal of the sniffer is less than the background value.	The helium background in the environment is too high, or the standard leakage fails and the filament ages.	Wait for the background in the environment to decrease before calibrating.
4	The calibration signal is abnormally large	Is the leakage connection normal; Leakage failure and filament aging.	Check for standard leak connections; Re calibrate;
5	The calibration signal is abnormally small	Standard leakage failure and filament aging.	Replace standard leakage holes; Re calibrate;
6	Abnormal exhaust port of molecular pump during leak detection	Leakage inside the solenoid valve or poor vacuum degree at the leak detection port.	Check the connection between the leak detection port and the vacuum pipeline.
7	The helium background	The helium background in the environment is too high.	Wait for the background in the

	signal is abnormally large		environment to decrease before calibrating.
8	Abnormal calibration signal	Is the leakage connection normal; Leakage failure and filament aging.	Check for standard leak connections; Re calibrate;
9	Large leakage protection	The pressure at the leak detection port suddenly increases.	Check if the vacuum pipeline of the leak detection port is abnormal.
10	time out for pump-down time	The vacuum degree of the leak detection port cannot reach the working pressure	Check if the vacuum pipeline of the leak detection port is blocked.
11	Sniffer blockage	The pressure at the leak detection port is too low	Check the sniffer filter
12	Sniffer leakage	The pressure at the leak detection port is too high	Check if the connections of the sniffer are damaged .

Explanation: If the fault cannot be resolved, please contact our after-sales personnel.

8. Communication Protocol

The instrument has one RS485 and two RS232 interfaces, supporting standard Modbus protocol and multiple proprietary communication protocols.

The following is NOY protocol 3 in our own agreement.

❖ Protocol format

COMMAND <CR>

PARAMETER n1 n2 n3 …. <CR>

<CR>indicates carriage return, HEX value 0X0D, all data is in ASCII format

❖ Read leakage rate and status instructions

LR<CR>,G4<CR>

Return data format: LR=1.00E-09 MEAS<CR>

LR=1.00E-09 represents leakage rate

There is a space behind it, and the data after the space may be:

MEAS: The current leak detector is in leak detection mode

STBY: The current leak detector is in standby mode

CALI: The current leak detector is in calibration state

ACCL: The current leak detector is in the startup state

ERRO: The current leak detector is in an error state

TSTC: The current leak detector is in the testing leak state

❖ Zero adjustment command for leak detector

ZERO ON<CR>

Return data format：OK<CR>

After successful zeroing, the leak detector responds

❖ Cancel the zero adjustment command of the leak detector

ZERO OFF<CR>

Return data format：OK<CR>

After successfully canceling the zero adjustment, the leak detector responds

❖ Read leakage rate instruction

G1<CR>

Return data format: 1.00E-09 <CR>

1.00E-09 represents leakage rate

❖ Read status instructions

S1<CR>

Return data format: MEAS<CR>

MEAS: The leak detector is in leak detection mode

STBY: The leak detector is in standby mode.

CALI: The leak detector is in calibration state.

ACCL: The leak detector is in the starting state.

ERRO: The leak detector is in an incorrect state.

STOP: The leak detector is in a paused state.

❖ Leak detector starts leak detection command

START<CR>

Return data format：OK<CR>

Return data list

OK: The leak detection instruction has been successfully executed

E1: The start command is invalid, and the leak detector is not in standby mode

❖ Stop leak detection command for leak detector

STOP<CR>

Return data format: OK<CR>

Return data list

OOK: Stop leak detection instruction execution successful

E1: Stop command is invalid, leak detector is not in leak detection state

❖ Read the current leak detection port pressure command

G3<CR>

Return data format，1.0E-5<CR>

1.0E-5represents the current vacuum level value

❖ Read leakage rate unit instruction

G5<CR>

Return data format，1<CR>

0=Pa.m³/S

1=mbar.l/s

2=atm.cc/s

❖ Read the vacuum unit instruction

G6<CR>

Return data format，1<CR>

0=mbar

1=Pa

2=atm

9. Services

9.1. Installation service

9.1.1. Provide free on-site installation and debugging services for leak detectors sold.

9.1.2. After on-site installation and debugging, technicians will provide free technical training to the customer's leak detector operators.

9.2. After sales service

9.2.1. After the leak detector is sold, the warranty period is one year from the date of shipment. During the warranty period, our company provides free repairs for any malfunctions caused by the correct use of the leak detector (excluding consumables such as sealing rings and ion sources).

9.2.2. Our company implements lifelong maintenance for products to relieve users' worries.

9.3. Contact Information

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Total Solution For Leak Detection