



# Sensitivity

# Speed

# Automation

# Flexibility

# Reliability

## The 979 Concept

The 979 helium leak detector adds a new dimension of capability to mass spectrometer based helium leak testing. With its compact, portable design and total automation, the 979 offers unsurpassed flexibility and reliability for evacuation as well as sniffing applications.

### Enhanced Sensitivity

By coupling the industry's most sensitive helium spectrometer to a multiple flow vacuum system, the 979 provides helium leak rate sensitivity to the  $10^{-11}$  atm-cc/sec range.

### High Tolerable Operating Pressures

The maintenance-free MacroTorr version spectrometer high vacuum pump provides tolerable fine-leak testing pressures to 5 Torr. This means that testing can begin sooner, and under higher gas load conditions. An optional dual pumping configuration with gross leak valving allows leak testing to begin at atmospheric pressure.

### Quick Response Time

With its high speed vacuum system and signal amplification design, the internal leak rate response time of the 979 is .5 seconds. This makes it ideally suited for fast response sniffing as well as rapid evacuation type leak testing.

### Automatic and User-friendly Setups

By utilizing a new electronics platform, the 979 combines state-of-the-art automation and extensive setup flexibility with a truly user-friendly operator interface. A touch-screen based setup panel guides the user through the setups quickly and effectively, without abbreviated commands or interpretation of confusing graphic symbols.

### Flexibility

The 979 can be provided in standard or dry pumped configurations, and be cart or bench mounted. The core leak detector is also ideally suited for use with customer supplied pumping systems. All 979 leak detectors can be instantly converted from the evacuation to the sniffing mode, simply by connecting a probe to the testing port and pressing the sniff mode selection button.

### Enhanced Reliability

Beyond normal calibration, there is no routine maintenance required for the core 979 leak detector unit. The spectrometer tube, high vacuum pumping system and valve block are designed for extra long operating life with servicing only performed on an as-required basis. Furthermore, the advanced diagnostic capabilities of the 979 minimizes down time.



# Dual Operation Modes

## Evacuation Testing

In evacuation type leak testing, there are two basic ways to configure the test. The first is known as the outside-in method where the inside of the object under test is evacuated by the leak detector. Helium is then applied to the outside and is pumped into the leak detector if a leak is present. The other evacuation technique is known as the inside-out method which involves filling the inside of the part with helium while evacuating around its outside with the leak detector.

In the evacuation testing mode, the 979's front panel Test button is pressed and the pump-down cycle begins. Upon reaching the selected transfer pressure, the internal Test valve is opened and helium sensing begins. As the test port is further pumped and residual helium is removed, a transition into the extra high sensitivity mode occurs, allowing measurement of leaks below the  $10^{-9}$  atm-cc/sec range. The evacuation test cycle on the 979 can also be remotely controlled. A wide selection of pumps is available for use with the 979 including standard series and dry models with displacements to over 450 l/min. for extra fast pump-down and high gas load capability.

## Sniff Testing

Sniff testing is performed on helium pressurized test objects by placing a sampling probe near (i.e. < 0.5 cm) the potential leak source. Since there is a net flow of air into the probe, helium from the leak also enters it and is carried to the leak detector.

When the 979 is configured for sniff testing by plugging in a probe, helium leaks as small as  $10^{-8}$  atm-cc/sec range can be detected. Due to the high sampling flow rate and fast internal response time, the 979 provides sniffing response times of less than one second and allows probe speeds of up to 12 in. (30 cm) per second for  $10^{-6}$  atm-cc/sec range leaks. While performing sniff testing, the 979 has the ability to "zero-out" the helium background signal without affecting sensitivity, and to calibrate to an external reference leak.

Varian has published several detailed Application Solution notes on evacuation and sniff leak testing techniques and is pleased to provide these on request.

# User Friendly Front Panel

One of the driving criteria during the design of the 979 was to incorporate an operation panel that combines a user friendly functions with the flexibility to optimize the unit for a variety of applications.

- **Main Leak Rate display** – A large, highly visible 50 segment LED bargraph (log or linear format) with separate exponent display.
- **Test Port Pressure display** – Tri-Color LED bargraph showing test port pressure and operating range
- **Spec Tube Pressure display** – Tri-Color LED bargraph showing spectrometer tube pressure and operating range
- **TEST button** – Starts the test cycle with automatic pumpdown and transition into the test mode. This button is also used to activate the hold mode which allows rate of pressure rise testing.



- **VENT button** – Closes the testing valve and opens the test port vent valve.
- **ZERO button** – Removes background signal prior to applying helium tracer without affecting test sensitivity.
- **READ CALIBRATED LEAK button** – Roughs out and then opens the internal calibrated leak.
- **CALIBRATE button** – Initiates an automatic spectrometer tuning process followed by calibration to the value of internal (or external) standard leak.
- **SNIFFER ON/OFF button** – Selects between operation in the sniffing or evacuation mode.
- **AUDIO VOLUME** – Increases or decreases the leak rate audio volume.

## Touch Screen Interface

A unique front panel touch screen is used for display, setups and servicing. Among the wide range of selections made through this screen are numerical leak rate and pressure display, fine test transfer pressure, auto/manual ranging, auto test cycling, pump selection, sniffer setup, reject and audio set points, calibrated leak value, spectrometer and vacuum system settings.



## Remote Operation Capability

### Remote Control Unit

The 979 features a rugged hand-held remote control option that provides leak rate display, audio and control of the leak detector from 50 ft. away from the main unit. The leak rate is displayed in a bargraph format, and a built-in headphone jack provides a variable pitch audio output. In addition to volume control, dedicated buttons provide control of the leak detector's Test, Vent, Calibrate and Zero functions. Since this unit is redundant to the controls and displays on the main 979 front panel, the leak detector is still fully functional in the event of a damaged or missing remote unit.

### Interface Panel

A variety of interface choices are provided to allow remote data acquisition and operation of the 979 leak detector. An I/O connector provides opto isolated discrete outputs of the machine status and set points, an analog leak rate signal, and accepts remote operation inputs commands by 5 - 24V opto isolated inputs. The 9600 baud RS-232 serial port provides complete bi-directional communications for machine monitoring, diagnostics and remote control.

# Leak Testing Applications

## Semiconductor Process Tools

Several key features are required for precision, contamination-free leak testing of vacuum based process tools. First and foremost is an oil-free rough and high vacuum pumping system that the 979 Dry provides for fast response leak testing without introducing hydrocarbons into your process system. With the MacroTorr based spectrometer pump, the 979 can begin leak testing as high as 5 Torr, while the optional dual pump configuration allows testing at atmospheric pressure. Thus, the process system does not require excessively long rough pumping times, and can be tested when vacuum limiting leaks are present.

The 979 Dry can operated in conjunction with the process tool's own vacuum system. A typical connecting location would be the foreline of the system's turbo pump. Which enhances the helium signal response time to the leak detector.

In addition to the 979's all-dry pumping system, the basic 979 unit and universal cart are clean room compatible.

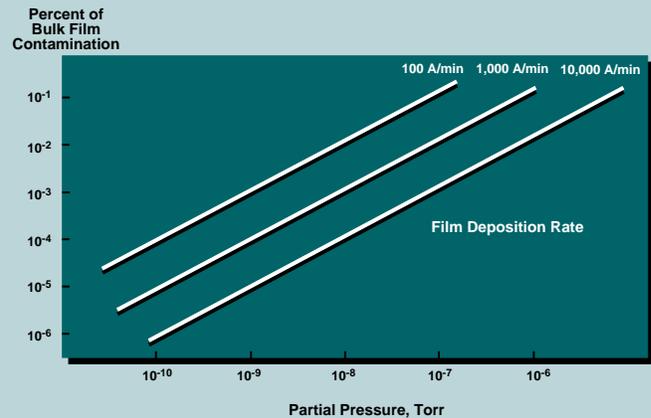
## Rapid Cycle Evacuation Testing

With its inherently fast helium response time and ability to begin fine-mode leak testing at pressures of up to 5 Torr, the 979 is ideally suited for rapid cycle evacuation testing. Pass/fail determination in less than four seconds is possible for  $10^{-5}$  atm-cc/sec range processes.

The cycle sequencing feature uses your selected roughing and test times to automatically control the machine from pumpdown through test followed by venting of the test port. If the measured leak rate exceeds that of the stored set point value, a "fail" message is displayed and a reject signal is provided on the remote I/O. The machine can be locally or remotely operated in this mode with each cycle initiated by a simple Start command.

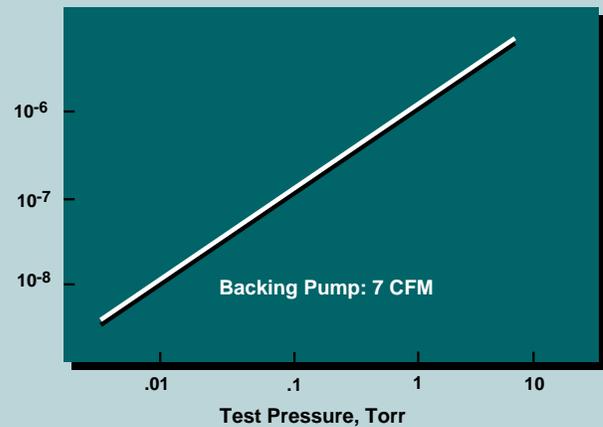
For high sensitivity testing of critical and hermetically sealed components, the multi-flow mode of the 979 provides testing sensitivities to the  $10^{-11}$  atm-cc/sec range without requiring a liquid nitrogen cold trap.

Since the 979 uses an externally mounted rough/fore pump, the core unit weighs less and occupies a smaller footprint than leak detectors with enclosed pumps. This provides more flexibility in terms of test system mounting and pump selection. It also leads to inherently cooler leak detector and pump operating temperatures, thus enhancing overall reliability. The external pump is also much more accessible than enclosed pumps for oil checking, changing and for pump exchanges.



Film Contamination vs Background Pressure

Approximate Helium Background Signal vs Test Pressure (atm cc/sec with 5 PPM Ambient)



Helium Background Signal vs Pressure

## Sniff-Testing of Pressurized Components

Manufacturing facilities producing components and systems used in the pressurized operation mode typically employ high sensitivity helium sniff testing. Examples of items tested in this manner include refrigeration systems, fluid fittings and pumps.



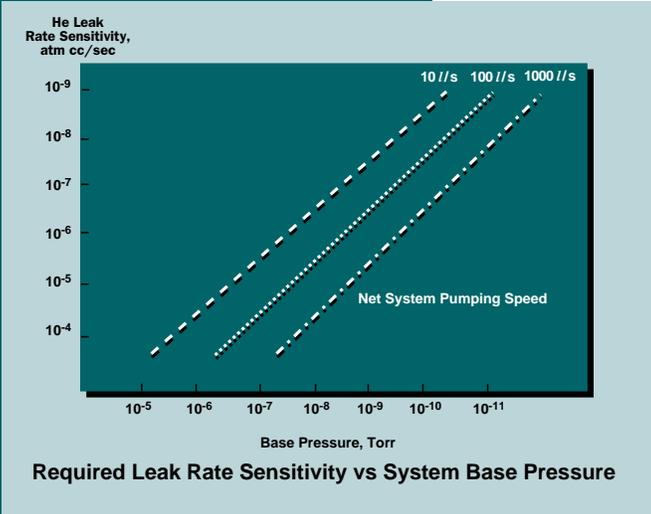
Two of the key desired criteria for production sniff testing are minimized leak response time and maximum possible probe speed without missing a leak source. With the 979 configured in its sniffing mode, leak response times of 0.75 seconds or less are possible, with ultimate sensitivity to  $10^{-8}$  atm-cc/sec range. Sniffing probe speeds as high as 12 in. (30 cm) per second can be used while sensing for the presence of leaks as small as  $10^{-6}$  atm-cc/sec. The 979 can conveniently perform calibration routines with external standard leaks while in the sniffing mode. Automatic compensation of background signal can be selected for high and fluctuating helium ambient environments.

An inherent feature of the 979 is its ability to instantly change from sniffing to evacuation testing modes. Thus, one machine can be selected for different or changing processes. With the externally mounted rough/fore pump, internal heat dissipation is minimized to enhance reliability in high temperature operating environments.

## General Leak Testing: Process Vessels and Vacuum Systems

The 979 is designed for rapid startups with totally automatic self calibration. The clear leak rate display and high power audio output provide unambiguous results required by operators in busy and noisy industrial environments. An inherently rugged design allows the unit to be moved quickly to wherever it is needed and be operated with no utility requirements other than electrical power. Complete built-in protection is provided from accidental test port venting and power failures.

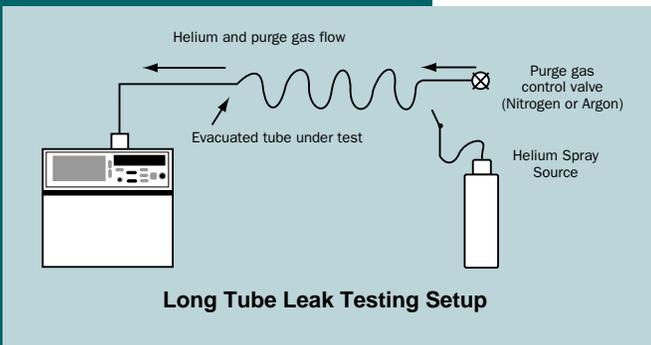
The core unit can be completely operated without its own dedicated rough/fore pump simply by connecting it to a suitable vacuum pump on your own system. This allows leak testing to take full advantage of your system's high pumping speed to minimize the helium signal response time. To take "split-flow" pumping into account, calibration to the internal leak source or to an external calibrated leak on the system can be easily selected by the 979's front panel controls.



## Gas Distribution Systems and Components

Helium leak testing of gas distribution systems and components has been widely adopted to ensure process integrity and safety. Individual components are typically tested in the  $10^{-8}$  to  $10^{-10}$  atm-cc/sec sensitivity range by:

1. Evacuating the inside with the leak detector and applying a helium spray to the outside (outside-in method), or by
2. Pressurizing the inside of the component with helium while evacuating around its outside (inside-out method). In situations where long and narrow (i.e. 0.6 cm diameter, 10 – 100 meters long) flow lines are to be outside-in tested, an inert gas purge flow (i.e. argon or nitrogen) from the far end of the line helps carry the helium signal from potential leaks much more quickly than without purge flow. The 979 is capable of operating with over 5 sccm of inert gas purge flow while leak testing in the  $10^{-9}$  atm-cc/sec sensitivity range.



Other features beneficial for testing critical gas distribution systems and components are its background zeroing capability and optional all dry pumping arrangement.

# Specifications

## Helium sensitivity

2 x 10<sup>-10</sup> atm-cc/sec minimum detectable leak, standard sensitivity version (V70LP MacroTorr).

6 x 10<sup>-12</sup> atm-cc/sec minimum detectable leak, high sensitivity version (V70D MacroTorr).

## Internal helium response time

0.5 second

## Calibration

Fully automatic tuning and calibration routine using the standard internal or an optional external calibrated leak. Internal leak value is 10<sup>-8</sup> (high sensitivity) or 10<sup>-7</sup> leak (standard sensitivity). Sniff leak mode calibrates to an external sniffing leak.

## Leak Units

Selectable (atm-cc/sec, mbar-l/sec, Torr-l/sec, Pa m<sup>3</sup>/sec)

## Zero Control

Selectable mode background offset

## Maximum pressure (fine test mode)

Standard sensitivity version

≤ 5 Torr 10<sup>-3</sup> → 10<sup>-7</sup> std cc/sec full scale

≤ 500 mTorr 10<sup>-7</sup> → 10<sup>-9</sup> std cc/sec full scale

High sensitivity version

≤ 5 Torr 10<sup>-5</sup> → 10<sup>-9</sup> std cc/sec full scale

≤ 500 mTorr 10<sup>-7</sup> → 10<sup>-11</sup> std cc/sec full scale

## Audio

Pitch controlled, dedicated volume control buttons, programmable audio threshold

## Spectrometer Tube

Sensitivity optimized design, header mounted dual thoriated iridium ion source.

## Test Port Vacuum Gauge

Wide range, quick response ConvecTorr (convection type).

## High Vacuum Pump

Maintenance-free MacroTorr based hybrid Turbo.

## Test port connection

1½ in. Compression port fitting. KF25 adapter included

## Remote pump connection

KF25 vacuum fitting

## Rough/Fore Vacuum Pump

Dual stage rotary vane type pump (979)

Orbiting scroll type dry pump (979 Dry)

## Recommended ambient operating temperature

50 F (10° C) to 100° F (38° C)

## Remote I/O

Parallel interface (37 pin female) with discrete status outputs, opto isolated (5 - 24V) inputs.

Serial RS-232 interface, 9600 baud.

## Leak Rate Analog Output

0 - 10V, selectable linear or log

## Weight

50 lb. (23 kg) net - base unit.

140 lb. (63 kg) net - w/universal cart ans 200 l/min. pump

## Power Requirements

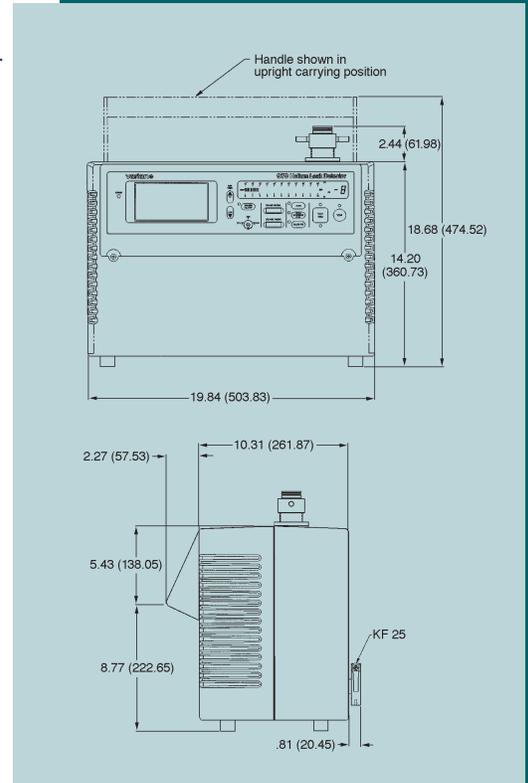
108 - 132V, 20A (216 - 264V, 7.5A) with single pump

108 - 132V, 20A (216 - 264V, 10A) with dual pumps

(Note: Input voltage setup can be field modified)

## Conformance Standards

Meets applicable CSA, UL and CE requirements



## Ordering Information

The basic 979 leak detector includes a built in helium calibrated leak, I/O interface and 8' (2.5 m) long power input cord. To derive the order number of the desired 979 configuration, insert your selection from the list of choices below:

### Standard Pumped Configuration

	<b>L979</b>	<b>XX</b>	<b>XX</b>	<b>XX</b>	<b>XXX</b>
Optional dedicated forepump (dual pump version only) with roughing valve and gross leak assembly	_____	_____	_____	_____	_____
00 = None	_____	_____	_____	_____	_____
20 = With 200 l/min. (7 cfm) dedicated forepump	_____	_____	_____	_____	_____
30 = With 300 l/min. (11 cfm) dedicated forepump	_____	_____	_____	_____	_____
45 = With 450 l/min. (17 cfm) dedicated forepump	_____	_____	_____	_____	_____
Roughing/Forepump (single pump version), roughing pump (dual pump version)	_____	_____	_____	_____	_____
00 = No roughing/backing pump	_____	_____	_____	_____	_____
20 = 200 l/min. (7 cfm) pump	_____	_____	_____	_____	_____
30 = 300 l/min. (11 cfm) pump	_____	_____	_____	_____	_____
45 = 450 l/min. (17 cfm) pump	_____	_____	_____	_____	_____
Mounting	_____	_____	_____	_____	_____
B = Bench-mounted	_____	_____	_____	_____	_____
T = Two Wheel Cart	_____	_____	_____	_____	_____
U = Universal Cart	_____	_____	_____	_____	_____
High Vacuum Pump	_____	_____	_____	_____	_____
T = High Sensitivity MDL = 6 x 10 <sup>-12</sup> atm-cc/sec	_____	_____	_____	_____	_____
L = Standard Sensitivity MDL = 2 x 10 <sup>-10</sup> atm-cc/sec	_____	_____	_____	_____	_____
Voltage	_____	_____	_____	_____	_____
120 = 120V nominal (operable 108 - 132V)	_____	_____	_____	_____	_____
220 = 220V nominal (operable 216 - 264V)	_____	_____	_____	_____	_____

### Dry Pumped Configuration

	<b>D979</b>	<b>XX3</b>	<b>5</b>	<b>XX</b>	<b>XXX</b>
Optional dedicated forepump (dual pump version only) with roughing valve and gross leak assembly	_____	_____	_____	_____	_____
00 = None	_____	_____	_____	_____	_____
35 = With dedicated forepump, roughing valve and gross leak assembly	_____	_____	_____	_____	_____
Mounting	_____	_____	_____	_____	_____
B = Bench-mounted	_____	_____	_____	_____	_____
U = Universal Cart	_____	_____	_____	_____	_____
High Vacuum Pump	_____	_____	_____	_____	_____
T = High Sensitivity MDL = 6 x 10 <sup>-12</sup> atm-cc/sec	_____	_____	_____	_____	_____
L = Standard Sensitivity MDL = 2 x 10 <sup>-10</sup> atm-cc/sec	_____	_____	_____	_____	_____
Voltage	_____	_____	_____	_____	_____
120 = 120V nominal (operable 108 - 132V)	_____	_____	_____	_____	_____
220 = 220V nominal (operable 216 - 264V)	_____	_____	_____	_____	_____

## Accessories

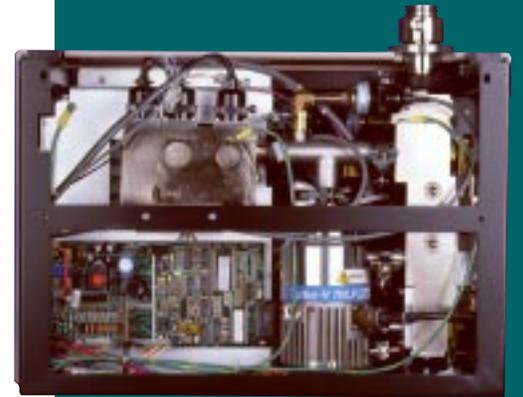
Remote control/display unit with 25' (8m) cord

Sniffer Probe with 10' (3m) flow line (MacroTorr version recommended)

## Order Number

**L9558301**

**K9565301**



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