OPERATING INSTRUCTIONS

EN

Original

SPEEDAIR 3050

Container Closure Integrity Test

PFEIFFER VACUUM

Disclaimer of liability

These operating instructions describe all models and variants of your product. Note that your product may not be equipped with all features described in this document. Pfeiffer Vacuum constantly adapts its products to the latest state of the art without prior notice. Please take into account that online operating instructions can deviate from the printed operating instructions supplied with your product.

Furthermore, Pfeiffer Vacuum assumes no responsibility or liability for damage resulting from the use of the product that contradicts its proper use or is explicitly defined as foreseeable misuse.

Copyright

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1 About this manual

IMPORTANT
Read carefully before use.
Keep the manual for future consultation.

1.1 Validity

These operating instructions are a customer document of Pfeiffer Vacuum. The operating instructions describe the functions of the named product and provide the most important information for the safe use of the device. The description is written in accordance with the valid directives. The information in these operating instructions refers to the product's current development status. The document shall remain valid provided that the customer does not make any changes to the product.

1.1.1 Applicable documents

SpeedAir 3050	Operating Instructions
LeakTek software operating instructions	LeakTek 6.13
LeakRx software operating instructions	131872
HiScroll 6 operating instructions	PU0097BEN
EC Declaration of conformity	Included with this manual

1) also available at www.pfeiffer-vacuum.com

1.1.2 Products concerned

This document applies to products with the following part numbers:

Part Number	Description
S3050xxxxx	SpeedAir 3050

1.2 Target group

These operating instructions are aimed at all persons performing the following activities on the product:

- Transportation
- Setup (Installation)
- Usage and operation
- Decommissioning
- Maintenance and cleaning
- Storage or disposal

The work described in this document is only permitted to be performed by persons with the appropriate technical qualifications (expert personnel) or who have received the relevant training from Pfeiffer Vacuum.

1.3 Conventions

1.3.1 Instructions in the text

Usage instructions in the document follow a general structure that is complete in itself. The required action is indicated by an individual step or multi-part action steps.

Individual action step

A horizontal, solid triangle indicates the only step in an action.

► This is an individual action step.

Sequence of multi-part action steps

The numerical list indicates an action with multiple necessary steps.

1. Step 1
2. Step 2
3. ...

1.3.2 Pictographs

Pictographs used in the document indicate useful information.

Note

Tip

1.3.3 Labels

Indicates an electrical shock hazard in the event of contact.

P.N.	SpeedAir 3050/2000220268	VOLTS	115/220 V AC
S.N.	US1124130003	POWER	360W
DATE	OCTOBER 2024	FREQ.	50/60 HZ
Intertek 4004834	Pfeiffer Vacuum Inc. Conforms to UL 61010-1 and Certified to CSA C22.2# 61010-1	FUSE	20A 250V T Time Delay

Rating plate (example).

P/N	Designation - Part number	POWER	Maximum power consumption
S/N	Serial number	FREQ.	Use frequency
DATE	Date of manufacture	FUSE	20 A - 250 VAC T time delay
VOLTS	Use voltage		

1.3.4 Abbreviations

CCIT	Container Closure Integrity Test
UUT	Unit Under Test
CDA	Compressed Dry Air
SPC	Statistical Process Control
DAQ	Data Acquisition System
PID	Proportional Integral Derivative (control loop with feedback)
HDMI	High Definition Multimedia Interface
IMFS	Intelligent Molecular Flow Sensor
USB	Universal Serial Bus
µg/cc	micro-gram/cc
µg/min	micro-gram/min

2 Safety

2.1 General safety information

The following 4 risk levels and 1 information level are taken into account in this document.

⚠ DANGER

Immediately pending danger

Indicates an immediately pending danger that will result in death or serious injury if not observed.

► Instructions to avoid the danger situation

⚠ WARNING

Potential pending danger

Indicates a pending danger that could result in death or serious injury if not observed.

► Instructions to avoid the danger situation

⚠ CAUTION

Potential pending danger

Indicates a pending danger that could result in minor injuries if not observed.

► Instructions to avoid the danger situation

NOTICE

Danger of damage to property

Is used to highlight actions that are not associated with personal injury.

► Instructions to avoid damage to property

Notes, tips or examples indicate important information about the product or about this document.

2.1.1 Safety instructions

All safety instructions in this document are based on the results of the risk assessment carried out in accordance with Machinery Directive 2006/42/EC Annex I and EN ISO 12100 Section 5. Where applicable, all life cycle phases of the product were taken into account.

⚠ WARNING

Risk of fatal injury due to electric shock on account of incorrect installation

The device's power supply uses life-threatening voltages. Unsafe or improper installation can lead to life-threatening situations from electric shocks obtained from working with or on the unit.

► Ensure safe integration into an emergency off safety circuit.
► Do not carry out your own conversions or modifications on the unit.

⚠ WARNING

Risk of electric shock due to non-compliant electrical installations

This product uses mains voltage for its electrical supply. Non-compliant electrical installations or installations not done to professional standards may endanger the user's life.

► Only qualified technicians trained in the relevant electrical safety and EMC regulations are authorized to work on the electrical installation.
► This product must not be modified or converted arbitrarily.

⚠ WARNING

Danger of electrocution by contact during maintenance or overhaul

There is an electric shock hazard in case of contact with a powered product and not electrically isolated.

- ► Before carrying out any work, set the main switch to **O**.
- ► Take care to ensure that the mains connection is always visible and accessible so that the equipment can be disconnected at any time.
- ► Disconnect the mains power cable from the mains.

2.1.2 Precautions

Duty to provide information on potential dangers

The product holder or user is obliged to make all operating personnel aware of dangers posed by this product.

Every person who is involved in the installation, operation or maintenance of the product must read, understand and adhere to the safety-related parts of this document.

Obligation to provide personal protective equipment

The operators or employers are obliged to provide the user of the product with the necessary personal protective equipment (PPE).

Persons responsible for installing, operating and repairing the product must wear PPE for safety.

Infringement of conformity due to modifications to the product

The Declaration of Conformity from the manufacturer is no longer valid if the operator changes the original product or installs additional equipment.

- Following the installation into a system, the operator is required to check and re-evaluate the conformity of the overall system in the context of the relevant European Directives, before commissioning that system.

Installation and maintenance procedures described in this manual must be performed by qualified technicians trained in the relevant health and safety aspects (EMC, electrical safety, chemical pollution). Our service centers can provide the necessary training.

- ► Do not expose any part of the human body to the vacuum.
- ► Comply with all safety and risk prevention instructions in accordance with local safety standards.
- ► Regularly check compliance with all precautionary measures.
- ► Do not remove the blanking plates sealing the inlet and exhaust ports if the product is not connected to the pumping line.

2.2 Intended use

SpeedAir 3050 leak testing equipment is designed for Pharmaceutical Container Closure Integrity Test (CCIT).

2.3 Foreseeable misuse

Misuse of the product will render the warranty and any claims void.

Any use, whether intended or not, that diverges from the uses already mentioned will be treated as non-compliant.

3 Transportation and Storage

3.1 Receipt of the product

Condition of the delivery

- Check that the product has not been damaged during transport.
- If the product is damaged, take the necessary measures with the carrier **and** notify the manufacturer.

► Keep the product in its original packaging so it stays as clean as it was when dispatched by us. Only unpack the product once it has arrived at the location where it will be used.
► Keep the blanking plates in place on the inlet, exhaust and purge ports while the product is not connected to utilities.

Keep the packaging (recyclable materials) in case the product needs to be transported or stored.

3.2 Unpacking

1. Unpack the equipment.
2. Make sure the equipment is in good condition with the proper caps.

3.3 Handling

⚠ WARNING

Risk of crushing related to product tilting

Although the product fully complies with the EEC safety regulations, there is a risk of tilting when it is moved over the floor or is not properly secured.

► Do not place the product on an inclined plane.
► Place it on a flat, hard floor.
► Do not push the product sideways.

⚠ CAUTION

Risk of injury due to heavy loads

System is constructed on self-contained trolley to facilitate moving to installation location.

► The weight of the equipment may injure the user if it is handled incorrectly and is therefore hazardous to health.
► The manufacturer cannot be held liable for the consequences of using other handling equipment.

3.4 Storage

Pfeiffer Vacuum recommends storing the products in their original transport packaging.

► Store the product in a clean, dry environment for a maximum of 3 months, in accordance with the specified temperature conditions (see chapter “Environmental conditions”).

Beyond 3 months, factors such as temperature, humidity, salt in the air, etc. could damage some components (elastomers, lubricants, etc.). If this happens, contact our service center.

4 Product description

4.1 Product identification

To correctly identify the product when communicating with our service center, always have the information from the product rating plate available (see chapter "Labels").

4.2 Scope of delivery

- One SpeedAir 3050 equipment
- USB drive for software
- 1 set of operating instructions (equipment and software (LeakTek and Leak Rx) on USB drive)
- 1 mains supply cable for 120 VAC voltage
- 1 mains supply cable for 220 VAC voltage
- 1 verification orifice leak (model depending on equipment, delivered with its certificate)
- Additional verification orifices and/or tooling depending on the selected options.

4.3 Variants

SpeedAir 3050 is comprised with the following options.

Option		Description
Sensor size	2 µg/min, Full Scale 10 µg/min, Full Scale 50 µg/min, Full Scale 100 µg/min, Full Scale	Sensor selection is function of product outgassing and required size of defect detection.
External pressure sensor	0–10 Torr 0–50 Torr 0–100 Torr	External pressure sensor used in initial pull down stage to detect and abort test in gross leak condition.

4.4 Overview

The SpeedAir 3050 with internal sensor, integrated manifold and accessories provides a complete solution for Container Closure Integrity Testing (CCIT). Operating at hard vacuum (0.5 – 20 Torr in the transitional and/or molecular flow regime), the sensor electrical signal is proportional to Mass Flow. Once the UUT or chamber is evacuated and reaches steady state condition (stable vacuum and temperature), the amount of mass flow extracted from the UUT equals the mass flow of any leak. In other words, the sensor measures the make-up flow required to keep the vacuum steady in the UUT under evacuated condition. For short cycle times, a flow signature compared to a referenced “master” part it utilized.

The controller performs on board mass (e.g., µg/min) flow measurements. The measured mass flow rate can be displayed as calculated volume flow at actual or standard temperature and pressure conditions.

LeakTek or 21 CFR Part 11 compliant LeakRx software is used with the instrument. The software allows the user to configure desired parameters to meet specific requirements. It can be used to download to the instrument as well as view, save, and analyze test data. The instrument can be configured to run up to 4 Test Types (see chapter "Setup") without downloading new parameters or any number of saved test setups (recipes) can be downloaded as the active test.

An advantage of mass extraction measurement is that the measured leak rate is independent of the UUT volume, and the measurement is a direct leak flow measurement. "Calibration" to account for test volume is not required. The supplied verification orifice or "calibrated leak" is used to verify equipment operation with a blank or master part.

4.5 SpeedAir 3050 softwares

SpeedAir 3050 is delivered with 2 softwares.

- **LeakTek** software
- **LeakRx** software

In these Operating Instructions, "software" is used for both "LeakTek" and "LeakRx" software.

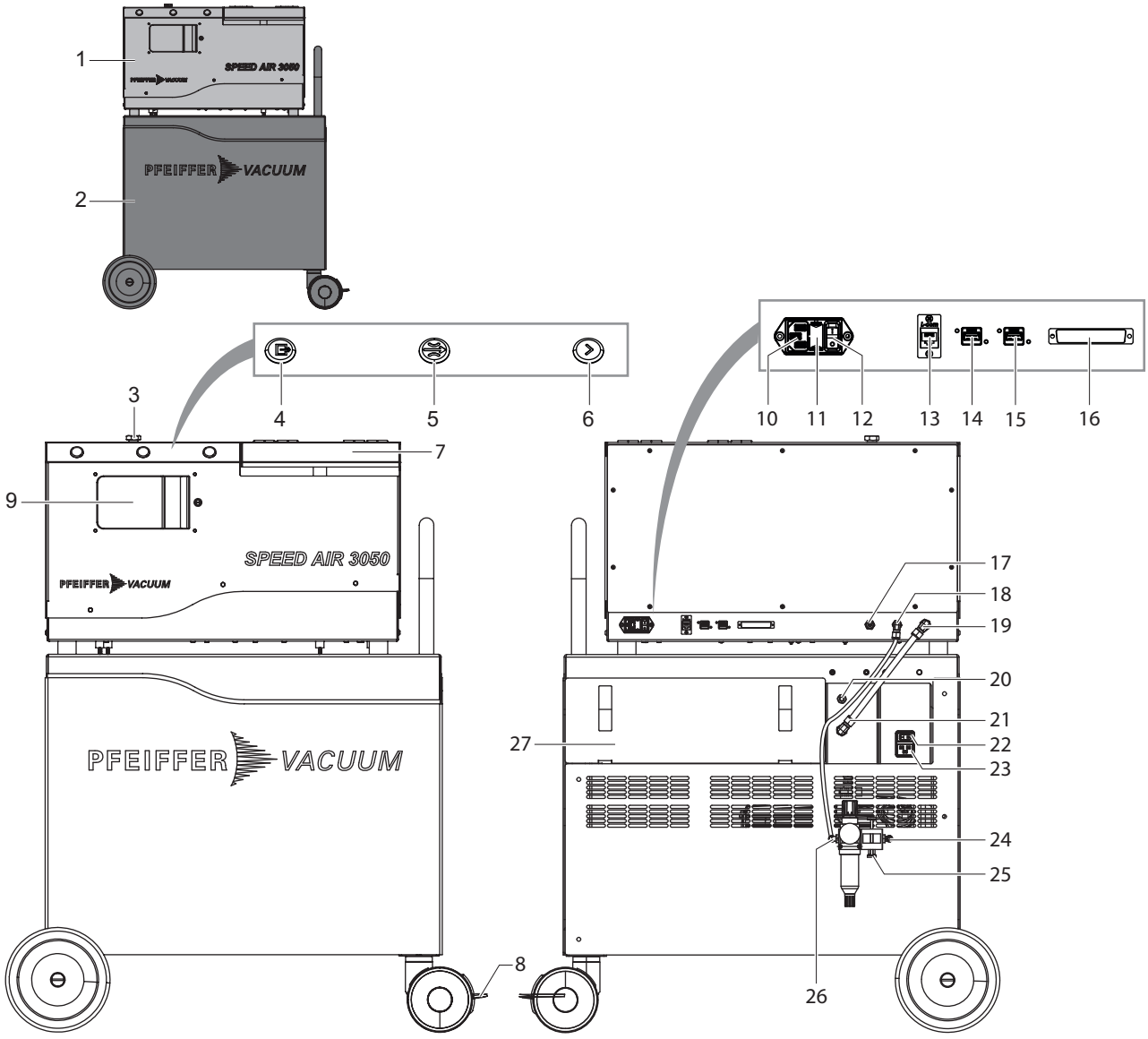
- If a software information/instruction is common for both softwares, the software name is not indicated ("software" only)
- If a software information/instruction is specific for one software, the software name is indicated ("LeakTek" or "LeakRx").

The LeakRx is a FDA 21 CFR Part 11 compliant version of the LeakTek software.

The software is a Windows based data acquisition software package designed for use with Pfeiffer Vacuum's mass extraction sensor. It allows:

- to download test parameters of a given CCIT
- to upload parameters stored in a sensor
- to calibrate a specified sensor
- to acquire and store data
- to analyze and report feature.

4.6 Human/machine interface

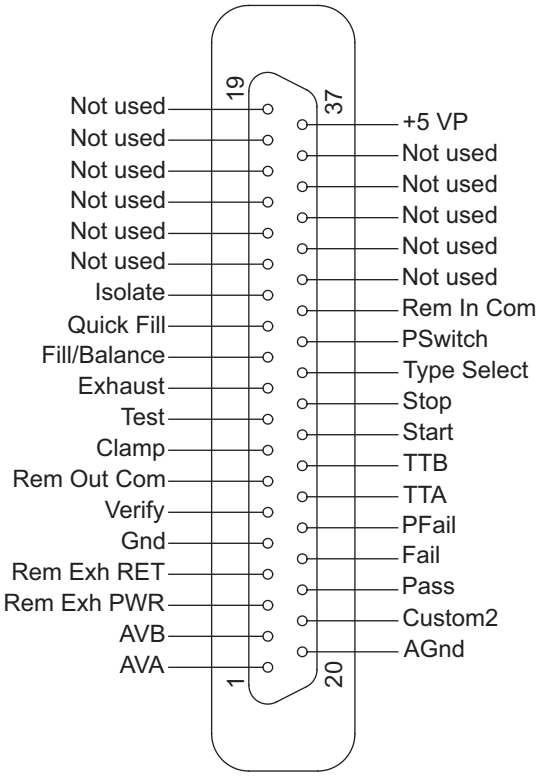


1 Instrument
2 Cart
3 UUT port (VCO 8)
4 **Vent** button
5 **Verify** button
6 **Start** button
7 LCD touchscreen
8 Brakes
9 Access to verification orifice
10 Instrument power supply
11 Instrument fuse
12 Instrument switch
13 Ethernet connector (RJ45)
14 USB-A connector
15 USB-A connector
16 37-pin D-Sub I/O communication interface connector
17 N_2 purge input connector (1/4" or 6 mm tube)
18 Pilot air input connector (1/4" tube, connetced to pneumatic pilot outlet connector)
19 Vacuum input connector (3/8" tube connected to vacuum pump outlet connector)
20 Needle valve for vacuum adjustment
21 Vacuum pump outlet connector (3/8" tube connected to instrument vacuum input connector)
22 Main circuit breaker
23 Main power supply
24 Pneumatic pilot inlet connector (1/4" or 6 mm tube)
25 Combo pneumatic regulator/shut-off
26 Pneumatic pilot outlet connector (1/4" tube, connected to pilot air input connector)
27 Storage compartment

4.7 Remote I/O

A male 37-pin D-connector is located on the rear panel of the equipment.

Standard remote I/O connections



Pin	Function	Specifications
Pin 1	Analog output A	0–5 VDC
Pin 2	Analog output B	0–5 VDC
Pin 3	Not used	-
Pin 4	Remote exhaust valve return	0 VDC
Pin 5	Ground/Common	0 VDC
Pin 6	Verify input	5–30 VDC, source or sink [1] - 30 mA max
Pin 7	Remote output common	5–30 VDC, source or sink [1] - 100 mA max
Pin 8	Clamp output	5–30 VDC, source or sink [1] - 100 mA max
Pin 9	Pressure/Test output	5–30 VDC, source or sink [1] - 100 mA max
Pin 10	Exhaust output	5–30 VDC, source or sink [1] - 100 mA max
Pin 11	Evacuation/Shunt output	5–30 VDC, source or sink [1] - 100 mA max
Pin 12	Pre-Evacuation output	5–30 VDC, source or sink [1] - 100 mA max
Pin 13	Isolate output	5–30 VDC, source or sink [1] - 100 mA max
Pin 14	Not used	0 VDC
Pin 15	Not used	-
Pin 16	Not used	-
Pin 17	Not used	-
Pin 18	Not used	-
Pin 19	Not used	-
Pin 20	Analog ground	0 VDC
Pin 21	Custom equipment output	5–30 VDC, source or sink [1] - 100 mA max
Pin 22	Pass output	5–30 VDC, source or sink [1] - 100 mA max
Pin 23	Fail output	5–30 VDC, source or sink [1] - 100 mA max
Pin 24	PFail output	5–30 VDC, source or sink [1] - 100 mA max
Pin 25	TTA output	5–30 VDC, source or sink [1] - 100 mA max

Pin	Function	Specifications
Pin 26	TTB output	5–30 VDC, source or sink [1] - 100 mA max Test Type1: TTA:1 - TTB: 0 Test Type2: TTA:0 - TTB: 1 Test Type3: TTA:1 - TTB: 1 Test Type4: TTA:0 - TTB: 0
Pin 27	Start input	5–30 VDC, source or sink [1] - 30 mA max Apply a pulse to the sensor 'Start input' pin to start a test.
Pin 28	Stop input	5–30 VDC, source or sink [1] - 30 mA max Apply a pulse to the sensor 'Stop input' pin to stop a test.
Pin 29	Test type input	5–30 VDC, source or sink [1] - 30 mA max Apply a pulse to the sensor 'Test Type input' pin to switch to the other test type.
Pin 30	Pressure switch input	5–30 VDC, source or sink [1] - 30 mA max
Pin 31	Remote input common	5–30 VDC, source or sink [1]
Pin 32	Not used	-
Pin 33	Not used	-
Pin 34	Not used	-
Pin 35	Not used	-
Pin 36	Not used	-
Pin 37	+5 VDC power (do not use to power external devices)	+5 VDC
1) Either Sinking or Sourcing may be selected for all inputs or outputs i.e., all sinking inputs, all sourcing outputs, etc. Use pins 7 and 31 to select type and voltage of inputs and outputs.		

List of pass and failure mode with pin outs

Mode	Description	Pin out
Pass	The test met all criteria set in the set-up screen.	Pin 22
Gross leak fail	The vacuum is below the vacuum minimum setting in pressure testing or pressure switch not turned on in during Evacuation delay.	Pin 23
Gross leak vacuum fail	The vacuum is larger than the vacuum maximum setting in vacuum testing.	Pin 23
Blockage fail	Pressure switch not turned off at the end of the test during deplete time. External pressure is within the limits for external pressure off action.	Pin 23 - Pin 24
Fine leak fail	Flow is above the maximum flow limit setting.	Pin 23
Low flow fail	Flow is below the minimum flow limit setting.	Pin 23
Back flow	The flow sensor detected the flow in opposite direction or system leak check failure.	Pin 23
Over pressure	The vacuum is larger than the vacuum maximum setting in pressure testing.	Pin 23
Under pressure	The vacuum is below the vacuum minimum setting in vacuum testing.	Pin 23
Flow saturation	Exceeding flow sensor limit.	Pin 23
Pressure saturation	Exceeding pressure sensor limit.	Pin 23
Temperature saturation	Exceeding temperature sensor limit.	Pin 23
PresRng-HI	External pressure higher than set limit.	Pin 23 - Pin 24
PresRng-Lo	External pressure lower than set limit.	Pin 23 - Pin 24

5 Installation

5.1 Locating

⚠ WARNING

Risk of injury due to heavy loads

The weight of the equipment may injure the user if it is handled incorrectly and is therefore hazardous to health.

The equipment must be immobilized when it is being used or maintained.

- ► Engage the brakes to immobilize it.
- ► Use the equipment handle to move it.
- ► The manufacturer cannot be held liable for the consequences of using other handling equipment.

Mount and locate the equipment as close as possible to the UUT (test chamber) to minimize equipment/UUT connection tube length and volume.

Larger volumes reduce the equipment response time to a given leak flow.

The equipment must be used in horizontal position, standing on its 4 wheels, with the brakes on.

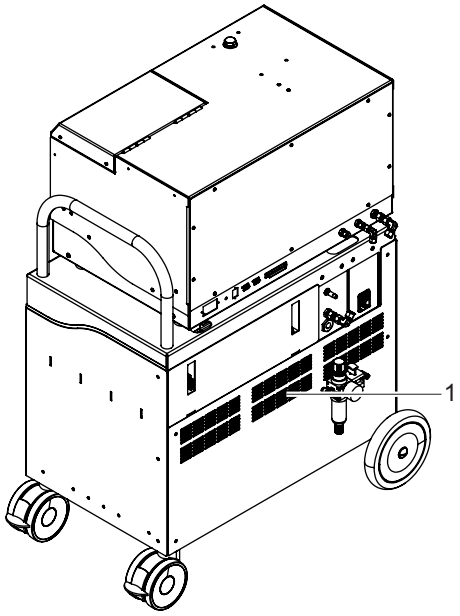
- The equipment must be stored for at least 8 hours under normal use conditions (see chapter “Environmental conditions”) before switching on.
- The equipment must be correctly lighted to allow a clear view of its indicator lights and its monitor, with no shadows or reflections.
- The equipment should be installed in an area with controlled humidity levels.

Ventilation

To guarantee the characteristics and performances of the equipment within the boundaries of the operating conditions:

- Do not obstruct the ventilation grids.
- Ensure the rear of the equipment with the air circulation grids is at least 110 mm away from fixed walls.

The equipment is **not rated** to operate in class 1 or 2 environments.



1 Air inlet/extraction

5.2 Compressed dry air (CDA) connection

The compressed air allows to operate the valves.

The compressed dry air supply is to be supplied by the end user.

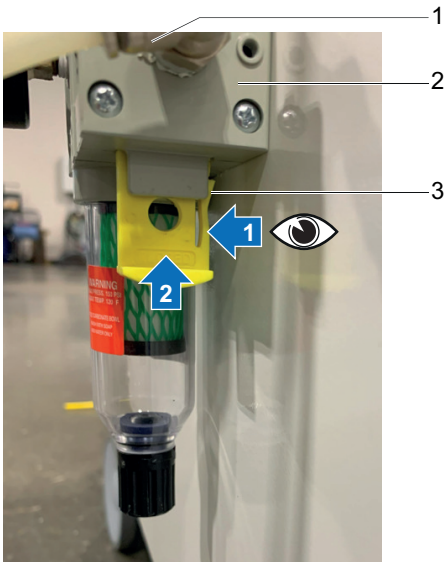
- Connection (see chapter "Human/Machine Interface")

A compressed dry air supply with the given characteristics is required (see chapter “Compressed dry air characteristics”).

The user is ultimately responsible for the installation and must apply applicable safety precautions in accordance with local regulations.

- ► When installing the compressed dry air circuit, provide accessories to isolate the equipment in the installation and facilitate its maintenance (isolation valve, etc.).
- ► Fit flexible hoses in the circuit to reduce the transmission of vibrations, and hoses of the same diameter as the connector.
- ► When multiple regulators are utilized to step the pressure down, be sure volume (≥ 10 L) exists between the two to avoid “cross-talk” variation from the pressure supply.
- ► Air consumption spikes near the equipment can cause variation in reading. If required, a separate drop from compressor may be required.

System pressurization



First pushed gate tab inward, then push gate upwards to pressurize the system.

1 Air supply (from customer) inlet fitting
2 Pneumatic inlet combo (filter, regulator and disconnect)
3 Pressure On/Off gate valve

5.3 Vacuum source and connection

The equipment includes a Pfeiffer Vacuum HiScroll 6 vacuum pump and regulation.

Connections from the regulated supply to the instrument are on the rear of the equipment.

1. If vacuum connections have become loose from vibration in transport, support the bulkhead fitting when tightening the tube fitting.
2. To adjust vacuum level, adjust needle valve for vacuum adjustment (see chapter “Human/machine interface”).

5.4 Venting gas circuit connection

Nitrogen and CDA are the only permitted venting gases.

The venting gas supply is to be supplied by the end-user.

⚠ WARNING

Risk of asphyxia in the event of a burst hose

The equipment uses a specific gas (N_2) which may cause a lack of oxygen in the atmosphere or inside the equipment in the event of a leaking hose in a confined space.

- ► Install the equipment in an environment with sufficient ventilation to absorb any N_2 which may escape in the event of a leaking hose.
- ► Install (recommendation) a flow limiter to prevent a risk of asphyxia in the event of a burst hose. The maximum authorized flow is 25 slm.

- Connection (see chapter “Man/Machine Interface”)

A venting gas supply with the given characteristics is required for optimum performance (see chapters “Venting gas characteristics” and “Compressed dry air characteristics”).

The user and/or equipment integrator are ultimately responsible for the installation and must apply the specific safety guidelines, in accordance with local regulations.

- ► Fit flexible hoses in the circuit to reduce the transmission of vibrations, and hoses of the same diameter as the connector.

5.5 Mains connection

⚠ WARNING

Risk of electric shock due to non-compliant electrical installations

This product uses mains voltage for its electrical supply. Non-compliant electrical installations or installations not done to professional standards may endanger the user’s life.

- ► Only qualified technicians trained in the relevant electrical safety and EMC regulations are authorized to work on the electrical installation.
- ► This product must not be modified or converted arbitrarily.

⚠ WARNING

Danger of electrocution by contact during maintenance or overhaul

There is an electric shock hazard in case of contact with a powered product and not electrically isolated.

- ► Before carrying out any work, set the main switch to **O**.
- ► Take care to ensure that the mains connection is always visible and accessible so that the equipment can be disconnected at any time.
- ► Disconnect the mains power cable from the mains.

⚠ CAUTION

Risk of inaccurate results, product malfunction and/or damaged electronics

Using of ncorrect incoming supply may result in inaccurate results, product malfunction and/or damaged electronics.

Examples: pressure spike or moisture in CDA or venting supply can yield inaccurate results (i.e. rejecting marginally OK part; acceptance of marginally NOK part).

- ► Use correct supply (see chapter “Technical characteristics”).

NOTICE

Risk of loss of performance due to electromagnetic disturbance

The products’ EMC behavior is guaranteed only if the relevant EMC standards are followed during installation.

- ► Use shielded cables and connections for the interfaces in interference-prone environments.

NOTICE

Risk of electrical overload

The equipment is protected against overload via electromechanical-component circuit breakers.

► Never override these interlocks during installation, use, or maintenance.

► Connect the equipment to the mains using the provided cable.
► Connect the mains power cable to the mains (see chapter “Human/Machine interface”).

5.6 Inputs - Outputs - Communications

Analog inputs
0–5 VDC

Digital inputs
All digital inputs are optically isolated.

5–30 VDC sinking or sourcing

Inputs via push button, dry contact, solid-state relays or PLC output.

Digital outputs

Digital outputs do not have enough power to drive an inductive load.

► Use small external relays or optically isolated modules (preferred) to drive valves or large relays.

Ethernet port
The equipment ethernet port does not support Power Over Ethernet (POE).

5.7 UUT fixture

It is the user’s responsibility to properly design any test fixture including:

- all safety requirements,
- elimination of seal "drift" or movement that cause volume changes and bias of readings
- minimization of fixture test volume
- minimization of virtual leaks.

A UUT port (VCO 8) is on the top of the equipment for connecting applicable fixtures. The VCO fitting should be tightened very lightly on the bulkhead by supporting the bulkhead fitting with an 11/16 or 1" wrench when tightening the tube. Do not over tighten.

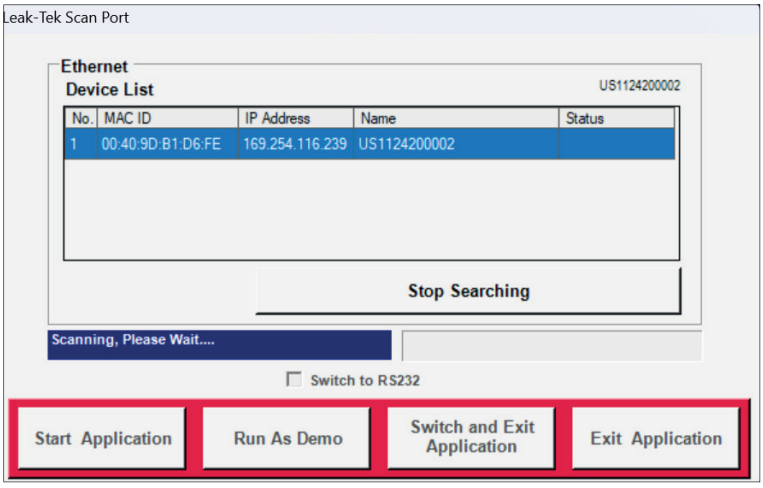
6 Commissioning

6.1 Acclimate

The equipment should acclimate to ambient conditions for at least 8 hours under normal use conditions before switching on (see chapter “Environmental conditions”).

6.2 Communications

When software opens, it attempts to establish communication with sensors attached to the communications port defined in the configuration file.



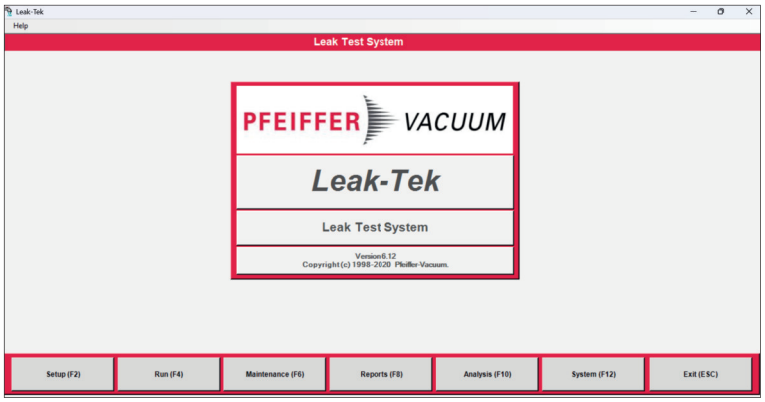
Software displays text in the lower part of the screen as it attempts to find sensors. Sensors that are detected by software for the first time are assigned a Sensor Name.

6.3 Initial operation

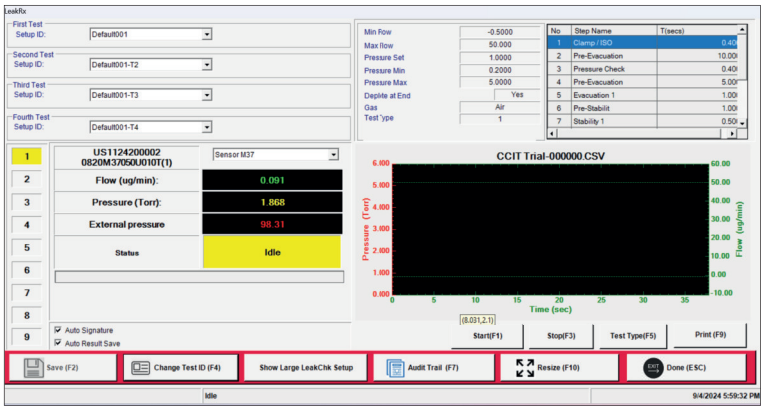
For further detail, see chapter "Main".

1. Power the equipment.

   Initially, Pfeiffer Vacuum recommends LeakTek software be utilized (switch to LeakRx when desired after initial operation is confirmed to be operational). When LeakTek software is launched, the "Main" screen displays.



2. Go to the **[Run (F4)]** tab. External pressure should be > 90 Torr.



3. Confirm UUT port is capped/plugged (provided cap/plug).
4. Hit start (**Start** button on LeakTek software ("Run" mode) or button on the instrument) several times without venting after test to put system under vacuum.
5. Progressively, the system should run more steps and complete a full test cycle (< 10 cycles).
6. Inspect for leaks.
7. External pressure should drop < 10 Torr.
8. When achieved, leave system powered on in vacuum condition for minimum 4 hours (recommended overnight).
9. Test with the equipment capped.
10. The reading should be close to "Zero". If high or low flow is observed, check all upstream and downstream connections for leaks.
11. Confirm an internal verification orifice is installed.
12. Open the verification orifice.
13. Run several tests with the provided cap/plug and the verification orifice open. Flow values should exceed tests without verification orifice.
14. Further part setup (recipe) to follow.

6.4 LeakRx Access rights

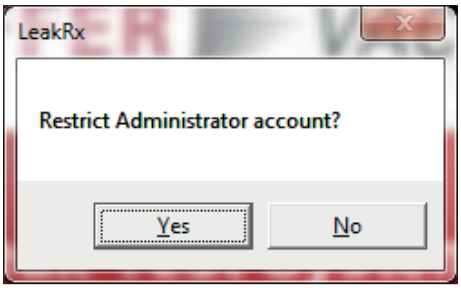
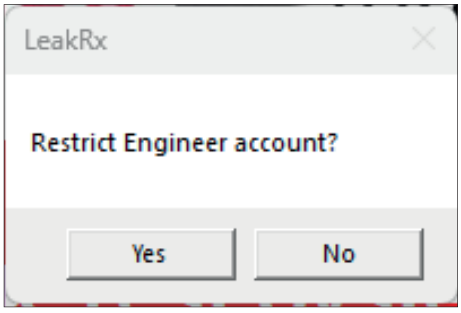
LeakRx Run, Setup, Maintenance, and System screens are password protected.

Default levels of access rights.

Level	Description
Operator	The Operator level can access the Run screen.
Engineer	The Engineer level can access the Run, Setup, Maintenance, and System screens.
Administrator	The Administrator level can create user logins and set access levels while being able to access all screens in the software. The Administrator level can create user logins and set access levels while being able to access all screens in LeakRx.

6.5 LeakRx First launching

When LeakRx is launched and allowed to initialize, two dialog windows display.

Restrict Administrator account?	Restrict Engineer account?
	

Administrator clik on **[Yes]** or **[No]** button.

These dialog boxes are not displayed in future launch of software.

- If Administrator account is restricted (**[Yes]**), any Administrator account cannot access the Run, Setup, or Maintenance screens.

  If Administrator account is not restricted (**[No]**), the Administrator account has all the authorization of an Operator and Engineer account.
- If Engineer account is restricted (**[Yes]**), the Engineer account cannot access the Run screen.

  If Engineer account is not restricted (**[No]**), the Engineer account has the authorization of Operator account.

Once the access level is confirmed, the System screen is displayed.

6.6 LeakRx Change password

[Change PW] button is used to change the password for the user with the user name in User ID.

Preliminary condition: password not locked. If password locked, **[Change PW]** button is not accessible and user cannot change password. Administrator must reset.

1. Launch software.

   User ID & Password dialog window appears.
2. Enter User ID in the dialog box.
3. Enter User ID current password in the dialog box.
4. Clik on **[Change PW]** button. New Password dialog window appears.
5. Enter new password a first time in the dialog box.
6. Clik on **[Change]** button.
7. Enter new password a second time in the dialog box.
8. Clik on **[Verify]** button.

7 Display screens

See Software operating instructions for further detail.

If the PC is inactive (no keyboard or mouse event) for an Administrator defined time, the software logs out back to the Main screen.

The 'Logoff Wait Time' is set from the Logoff Wait Time dialog box on System screen (see chapter “System screen” of the Software operating instructions).

The software resides on a PC (usually embedded) and is independent from the sensor micro-processor. This allows for modification, transfer of base settings, review and save in PC as separate SetupID (recipe). To align or sync the PC and sensor, use:

- Download to sensor (from PC to instrument micro-processor)
- Upload from Sensor (from instrument micro-processor to PC).

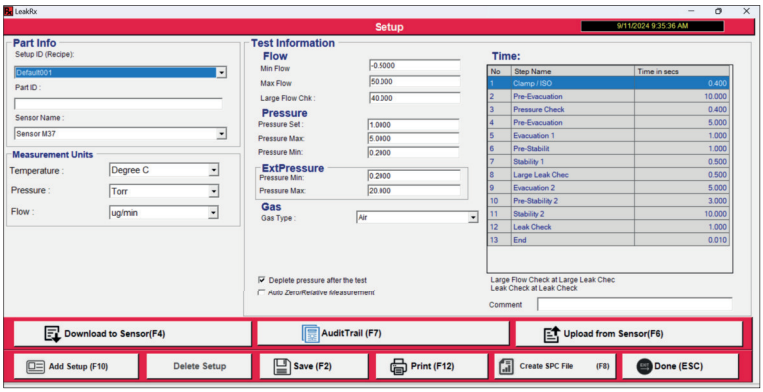
7.1 Main

Initial default screen upon launch

7.2 Setup

Allows to create and modify test parameters for specific SetupID’s (recipes).

This screen is password protected: see chapter “LeakRx Access rights”.



Description		
Part Info	Setup ID	Setup (recipe) name from drop down
	Part ID	User text (comment, batch)
	Sensor Name	Software assigned

Description		
Measurement units	Temperature	Temperature - User select desired units (drop down)
	Pressure	Pressure - User select desired units (drop down)
	Flow	Flow - User select desired units (drop down)
Test Information	Flow/Leak	Flow – Min, Max, Large Leak Chk
	Pressure	Pressure – Set, Max, Min
	ExtPressure	ExtPressure (chamber) – Min, Max
	Gas	Air (from drop down)
Time	Times for each step	
Deplete pressure after the test	Check the "Deplete Pressure after the test" box (✔) causes pressure to be depleted at the end of a test. The default is to hold pressure.	
Auto Zero/Relative Measurement	Auto zero/relative measurement feature is elected via check mark in box.	

7.2.1 SetupID selection

From SetupID drop list, the user can select an available SetupID for each test or Add Setup (new Setup ID (recipe)).

After selection or creation of new SetupID, the selected SetupID can be downloaded to the sensor.

7.2.2 Relative measurement

From Standard Test Sequence (see chapter "Standard test sequence").

At Step 10 in standard test sequence:

- Reservoir is the vacuum supply source.
- The UUT and internal reservoir are balanced.
- At end of step, the internal reservoir and UUT are at same pressure and thus flow is zero.

  If relative measurement is enabled, the flow is zeroed for the current test in process. The test result is relative to the zeroed flow condition. The End of Test result with reflect "RM" designation.

When Relative Measurement is enabled, the Run screen displays Relative Measurement status (see chapter "Test type").

When the "Test step" is greater than the "Zero Flow" step, relative flow measurement is displayed.

During the flow base line step, if the flow is greater than high flow relative limit, then the screen displays a high flow relative measurement error and stop the test.

During the flow base line step, if the flow is lower than the low flow relative limit, then a low flow measurement error is displayed and the test stops.

If the test result is "Pass", "Relative Measurement Pass" shows on the Run screen.

7.2.3 Test type

Test Type are part holders that can be accessed (if enabled) on Run screen.

There are up to 4 active Test Type holders (default, -TT2, -TT3 and -TT4).

Users can select whether to utilize more than one Test Types.

The number of Test Types must be specified in Firmware Configuration

Utilizing Test Type 1 only
All SetupIDs on Test Type 1

"Engineer" role (not "Operator") can select SetupID from PC and download to sensor.

Operator can then run tests on the default Test Type 1.

PC can have infinite number of SetupIDs (as storage permits).

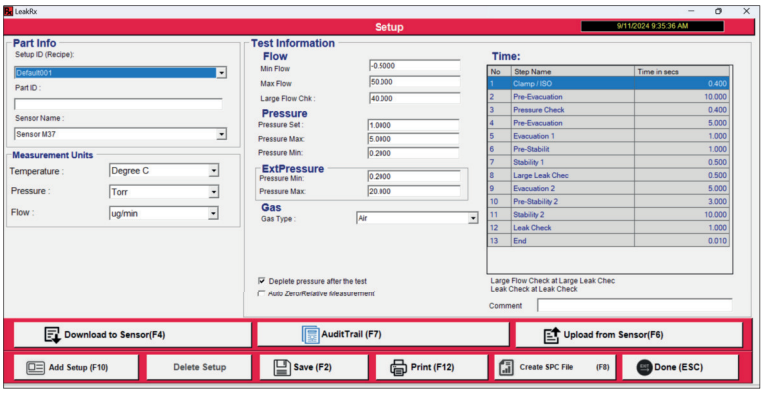
Utilizing up to four Test Types
Test type allows an user to toggle up to 4 active SetupIDs in holders.

A SetupID must be available in the test type holder to select.

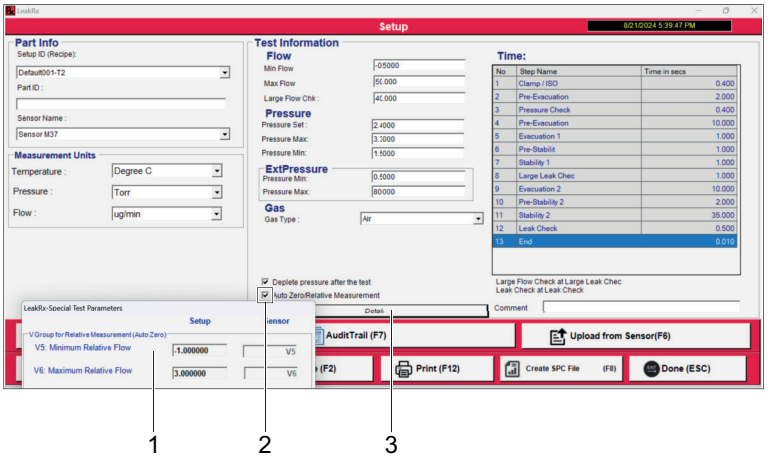
A particular SetupID (recipe) must be setup in a Test Type holder to be selected (example: "Vial1934" in default Test Type 1 must be duplicated to run in any other Test Type holder).

If duplicated in separate Test Type holder, a suffix is added by the software to indicate the alternative holder (i.e. “Vial1934-T2”).

Test result indicates the Test Type (example: Vial1934, Vial1934-T2, Vial1934-T3, Vial1934-T2).



Example: Vial1934 (default Test Type 1)



Examples:

- Vial1934-T2 (Test Type 2 (-T2))
- Vial1934-T3 (Test Type 3 (-T3))
- Vial1934-T4 (Test Type 4 (-T4))

1 Relative Measurement pop up window

2 Relative flow Measurement enabled

3 **[Detail]** button to show Relative Measurement pop up window

7.2.4 Audit Trail

See LeakRx operating instructions for detail.

The 21 CFR Part 11 Regulation dictates that there should be a use of secure, computer-generated, time-stamped audit trails to independently record the date, time of user entries and actions that create, modify or delete electronic records.

The record changes should not obscure previously recorded information. Such Audit Trail documentation shall be retained for agency review and copying.

- All parameter changes in the Setup, Run, Maintenance and Sensor Configuration screens are recorded when the **[Save (F2)]** button is clicked.
- User actions in the screens are recorded as events in the Audit Trail.

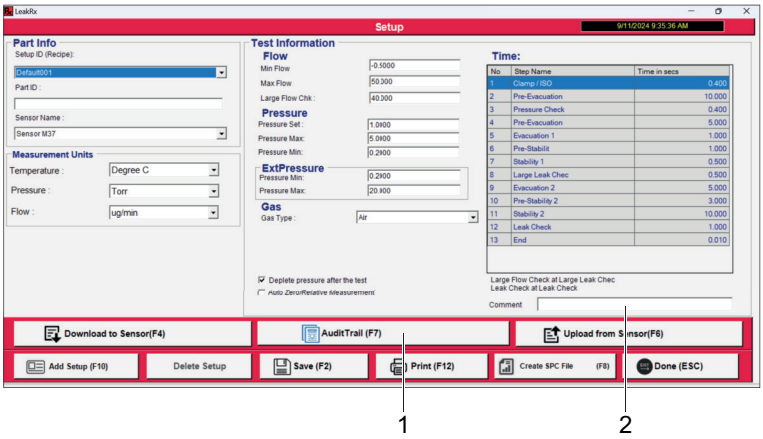
Example

- For Setup screen, actions such as **[Upload from Sensor (F6)]**, **[Download to Sensor (F4)]**, **[Add Setup]**, **[Create SPC File (F8)]** and **[Done (ESC)]** are considered as events.
- An user comment can be added in the comment field before saving new parameters or performing any of the above events. The comment will be automatically appended to the parameter changes or the event and saved in the Audit Trail.
- Additional events such as Successful Logins, Unsuccessful Login attempts and Logout are also recorded in the Audit Trail.

Audit Trail screens access

All the screens are provided with an **[Audit Trail]** button, which brings up the Audit Trail Query Builder and Result window.

All the screens are provided with an Audit Trail button, which brings up the Audit Trail Query Builder and Result Form.

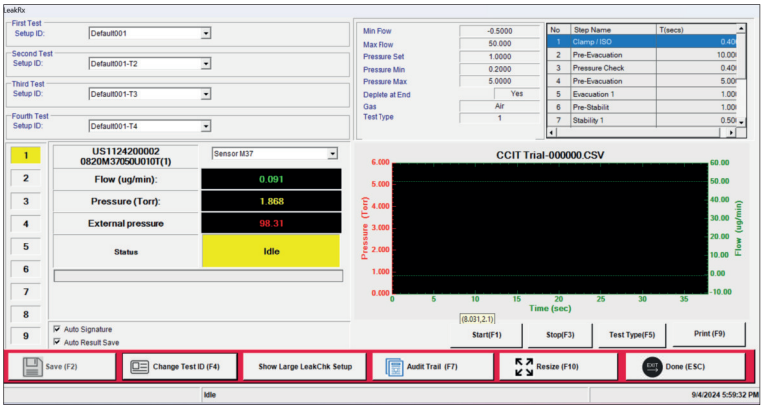


Example: Setup Screen with the [Audit Trail] button

1 **[Audit Trail]** button 2 Comment field

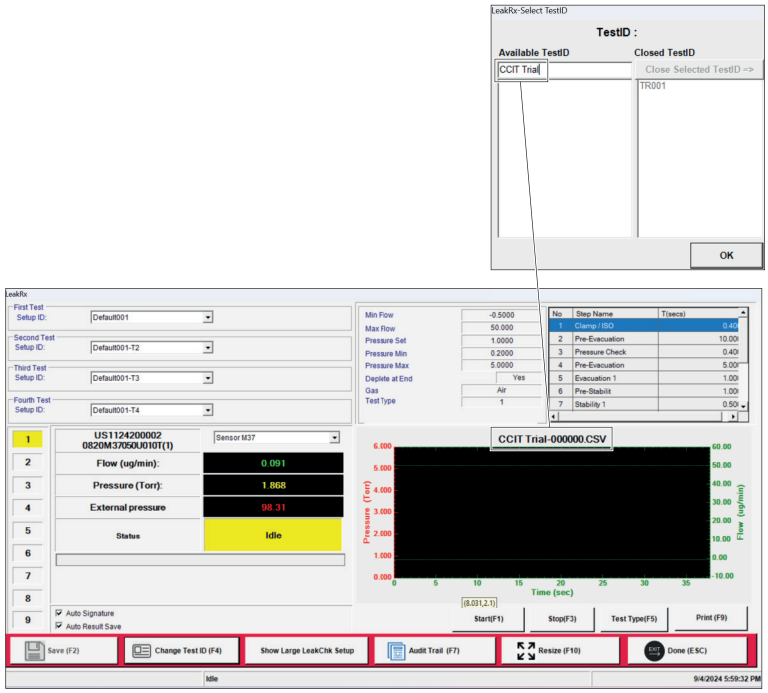
7.3 Run

Allows to run a leak test and ensuing data collection.

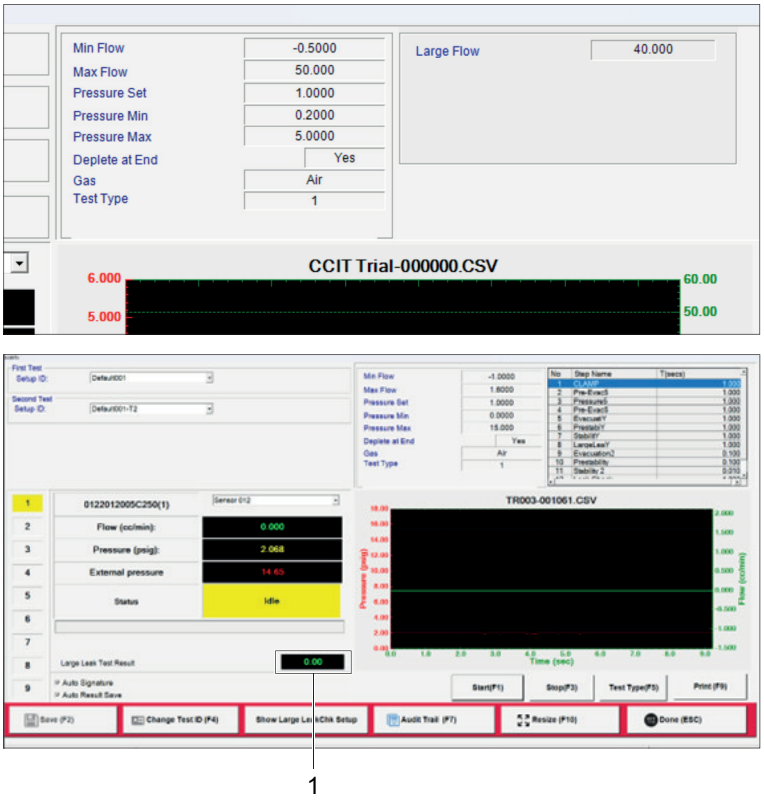


Test cycle can be initiated from the software or remotely from **START** button on instrument or start input wired to 37 pin I/O connector on back of the instrument.

Change Test ID Tab



Show Large LeakChk Setup

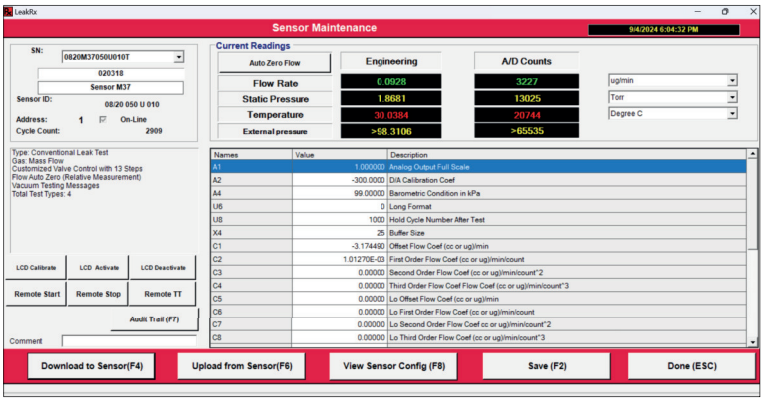


1 Large leak test result

7.4 Maintenance

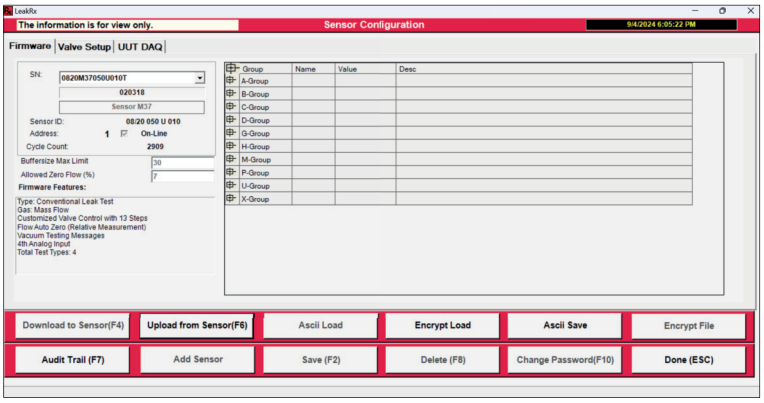
Allows to view sensor configuration information and make minor changes.

This screen is password protected.



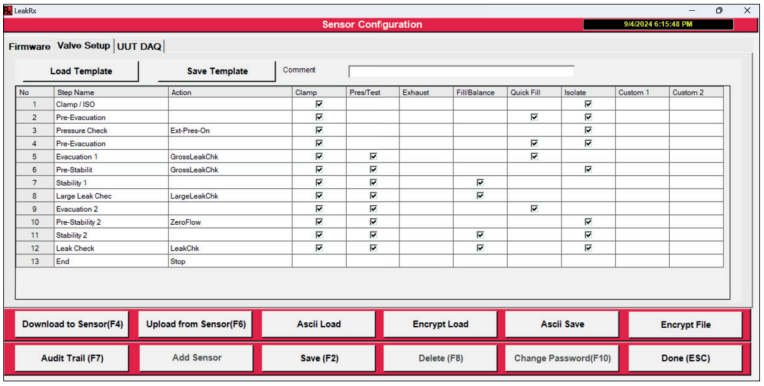
7.5 Sensor Configuration

[Firmware] tab



[Valve Setup] tab

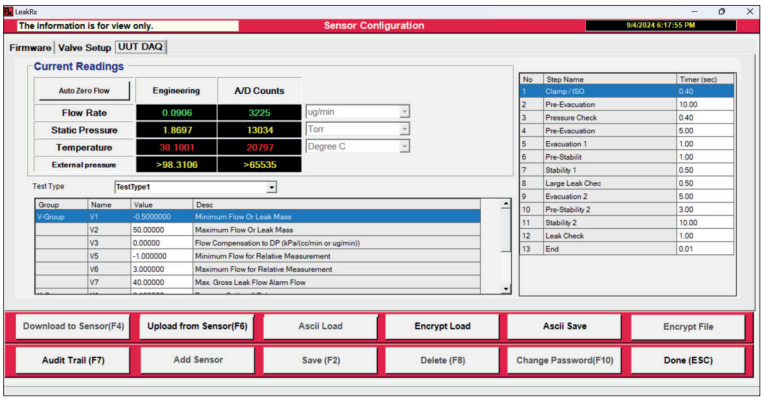
Boxes checked indicate when valve is energized.



[UUT DAQ] tab

A/D counts is digital counts from analog sensor.

Engineering is value in applicable units.

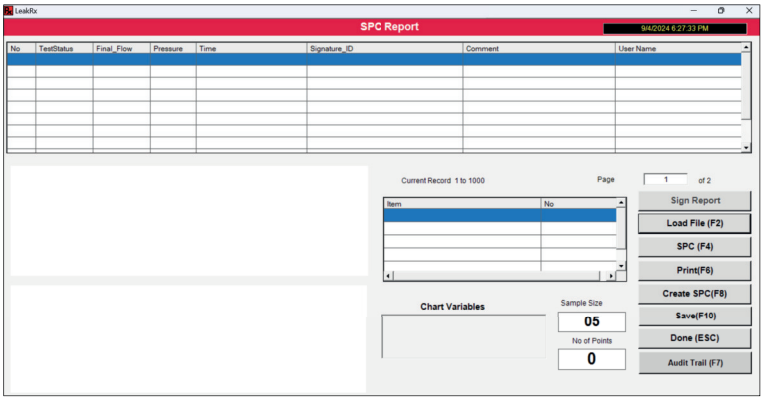


7.6 Reports

See LeakTek or LeakRx operating instructions for detail.

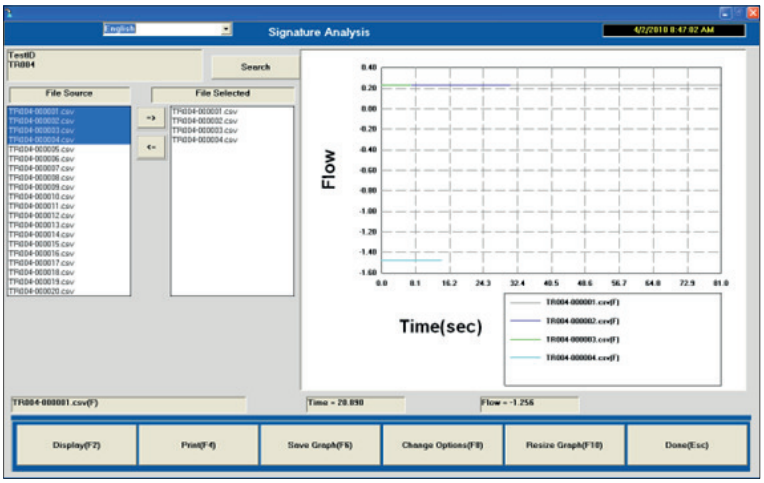
Allows to load and analyze test data files.

Allows to print any applicable test results.



7.7 Analysis

Allows to analyze and print multiple flow signatures.



Displays test signature curves of selected tests

In the Search section, two list boxes are used to select files.

The user can select from 1 to 5 files to display separately and simultaneously.

The Select All check box lists all file sources when it is checked. If this box is not checked, the search function is active and the source file is selected per the search criteria.

The user can also change the axis scales to analyze the signature process.

Files can be added or removed from the graph by double clicking the name in the left or right list box, or by selecting the name and then clicking the arrow buttons between the two list boxes.

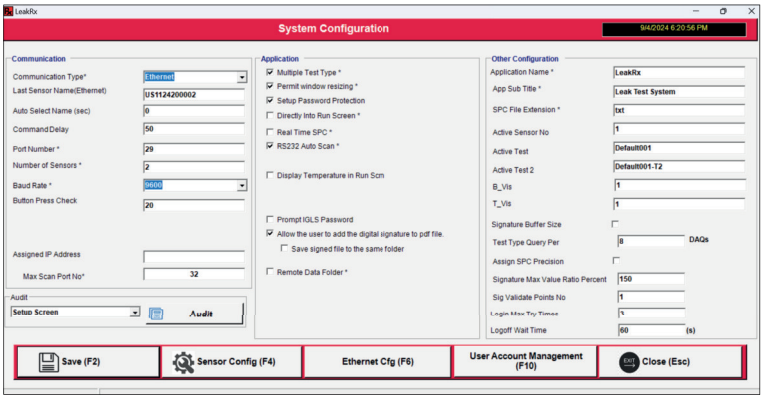
7.8 System

Reserved for Pfeiffer Vacuum personnel.

Allows to customize the software and the test unit.

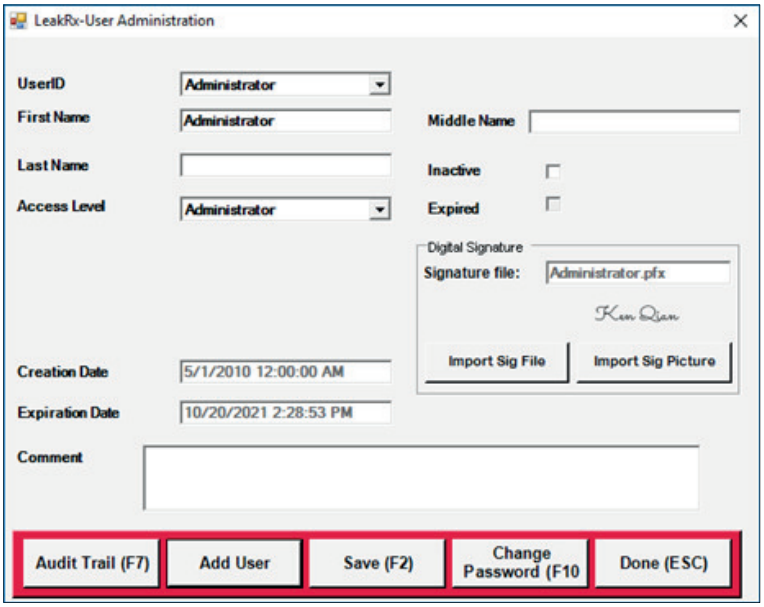
This screen is password protected

Some fields shown are accessible with Engineer or Administrator password (ex. Login Max Try Times).



[User Account Management (F10)] tab

Administrator required setup with password on first login with LeakRx



8 Testing

The equipment is designed for CCIT.

Typically, a fully closed container (examples: vial, syringe, bottle, bag, etc.) at barometric conditions is placed inside a vacuum chamber.

Any leak from the container into the vacuum chamber is extracted into the equipment.

For CCIT where the UUT is a sealed container at barometric pressure, UUT's with large leaks can be fully evacuated and therefore have exhibit no flow condition in final leak check. There are two initial opportunities ("Pressure Check" and "Large Leak Check") to ensure UUTs with large leaks are identified and abort test early.

The equipment runs the following sequence after the **[Start]** button is pressed (from software, front panel button or contact closure wired to the back panel D-connector).

8.1 Standard test sequence

Sequence

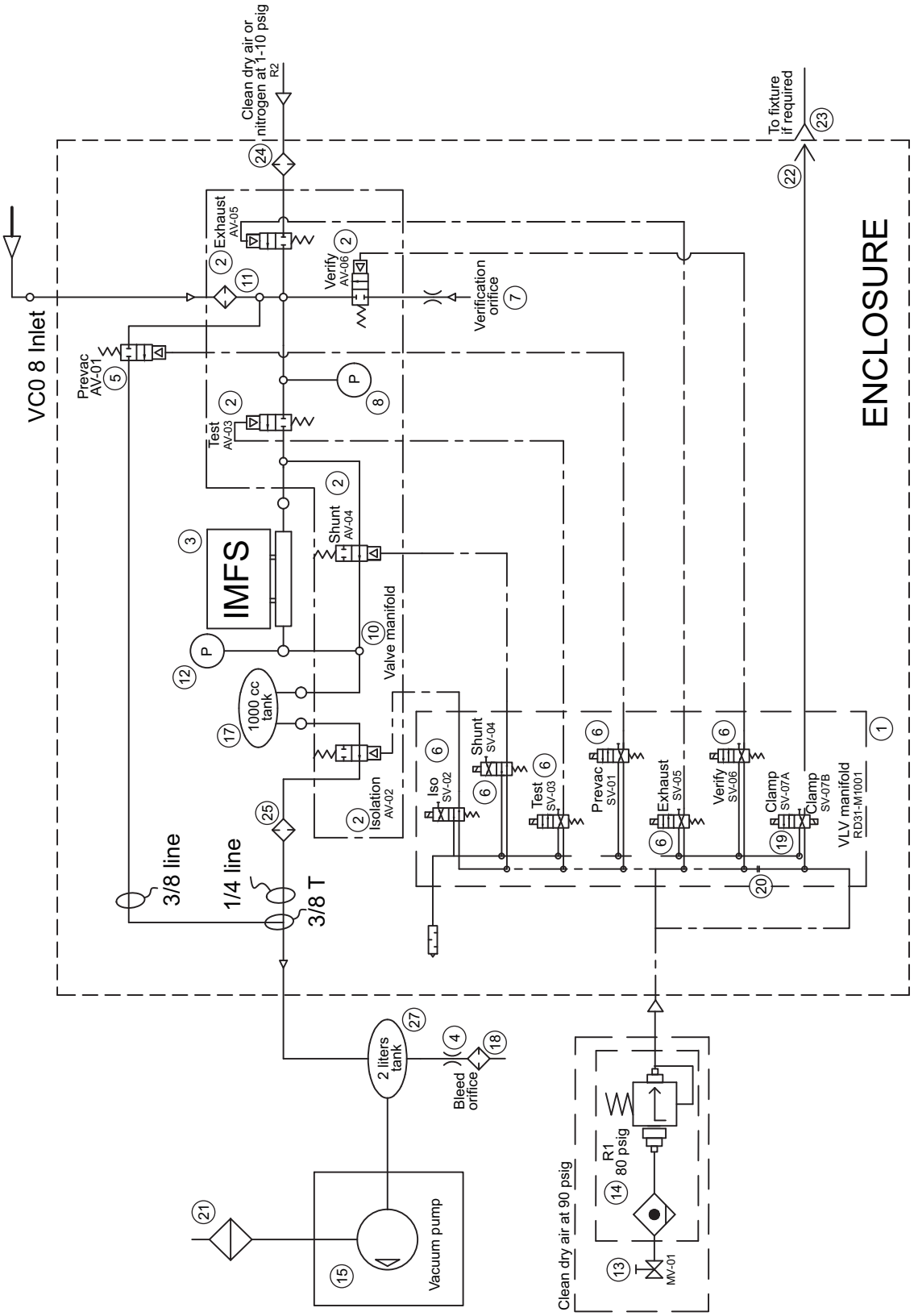
1. Clamp/Iso
   - If equipped, external valve for clamp/seal mechanism actuates.
   - Internal reservoir isolated to maintain vacuum setting during initial UUT evacuation.
2. Pre-Evacuation 1
   - Vacuum supply source connected directly to UUT.
3. Pressure Check
   - Initial pressure based check to detect gross leak (example: chamber lid not installed correctly). User set time for vacuum to reach user set pressure of vacuum pull down curve.
4. Pre-Evacuation 2
   - Vacuum supply source connected directly to UUT.
5. Evacuation 1
   - Internal reservoir open to vacuum source, IMFS active for balance of test steps.
6. Pre-Stability 1
   - Internal reservoir is vacuum supply source.
   - Balance vacuum level of UUT and internal reservoir.
7. Stability 1 (Measurement)
   - 100 % flow across sensor.
   - Flow develops between reservoir and UUT.
8. Large Leak Check
   - Second early test to detect large leak (example: very large defect in UUT) utilizing the sensor and higher limits A Large Leak Check button is available to the user on the bottom panel of the Run screen to view the large leak test settings. Large Leak Check flow test result is displayed in the Run screen.
9. Evacuation 2
   - Internal reservoir open to vacuum source.
10. Pre-Stability 2
    - Reservoir is vacuum supply source.
    - Balance UUT and internal reservoir
    - Relative Measurement

      At end of step, the internal reservoir and UUT are at same pressure and thus flow is zero. If relative measurement is enabled, the flow is zeroed for the current test in process, test result is relative to the zeroed flow condition. The End of Test result with reflect "RM" designation.
11. Stability 2 (Measurement begins)
    - 100 % flow across sensor.
    - Flow develops between reservoir and UUT.
12. Leak Test
    - If the UUT meets the test criteria (pressure, leak rate) within the set test time, the UUT has passed the test. All valves will be de-energized to deplete the pressure from the UUT and to

contain the internal pressure. The pass message will be displayed and the green "Pass" light will be indicated.
- If the UUT fails the test criteria at any point during the test cycle, the UUT has failed the test. If the test fails, the failure message will be displayed a red "Fail" light will be indicated.

13. End
    - Vacuum to UUT port closed.
    - End of test signal (poll results).
    - Resupply internal reservoir to user defined vacuum setting. Live flow reading (some fluctuation is reflected).

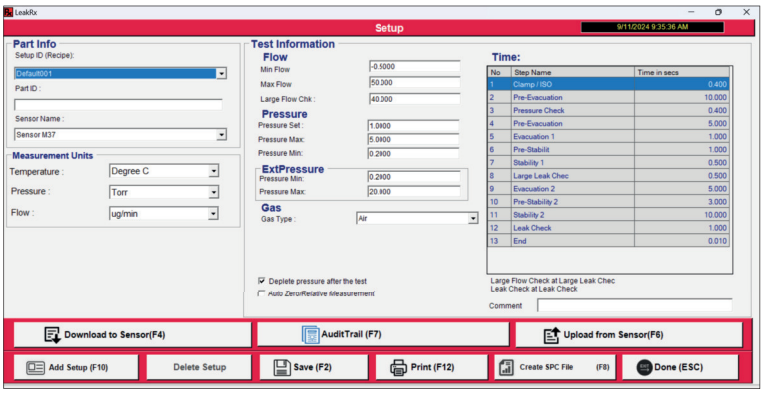
Pneumatic diagram



The user should be familiar with flow, pressure, and temperature measurement units before setting up the equipment.

It is the user's responsibility to properly define leak flow rates and tolerances for a specific application.

Test Pass/Fail criteria, stabilization, and test time are configurable via the software.



8.2 Setting parameter in new Setup ID (recipe)

1. Create new SetupID (recipe) and Input applicable Part Info (left side of above).
2. In Test information (center area of above).
   a. Flow
      i. Initially set Max flow at Full Scale of the sensor (typically 50 µg/min).
      ii. Initially set Min flow at -1 % of Full Scale of the sensor (example: for 50 ug/min full scale sensor, min flow would be -0.5 ug/min).
      iii. Initially Set Large Flow check high.
   b. Pressure (pressure at internal sensor)
      i. Set: target test pressure
      ii. Min: set near zero
      iii. Max: with a leak from the container into a conformal chamber (min volume), P increases slightly depending on leak rate and length of test.

      Set initially high, monitor and set with tolerance to avoid nuisance conditions. Refine with large part trial.
   c. ExtPressure (pressure at chamber)
      i. Min: set near zero
      ii. Max: initially set low
      iii. Pressure Check in Step 3 (see chapter "Standard Test Sequence").

      Time in previous Pre-evacuation step and ExtPressure Max limit influence the P Max result.

      Typically a 100T Full Scale sensor is utilized (see chapter "Standard test sequence": Pneumatic diagram, item ⑧). Target time so value is less than 50 % of external pressure sensor. By setting pressure low initially, a test will fail and show the pressure value it achieved. Use several good parts and turn on the verification orifice. Set Max pressure slightly above the max pressure from the tests.

      Go to Run screen to perform test. Change to Setup screen to modify test and then back to Run screen to confirm.

      Wait when switching between screens for PC/Sensor communications.
   d. Large Flow Chk in Step 8 (see chapter "Standard Test Sequence").
      i. Run similar test to set Large Flow limit.

      The Pre-evaculation of set 4 and the Flow limit influence the reading. During the test, the large flow limit will display on the screen temporarily, adjust test time and flow limit accordingly.

      After getting past the Large Leck Check of step 8, abort the test until parameters are set.
   e. Leak Chk in step 12 (see chapter "Standard Test Sequence").
      i. Similar test to step 8.

      Time Evacuation 2 (step 9) and Stability 2 (step 11) most influence the test result.

      Increasing the Evacuation step reduces the background of a master part.

      Use of a long Stability 2 time (step 11) and analyzing signature curves will indicate how much Stability 2 time can be reduced while obtaining acceptable spread between OK and NOK parts.

8.3 Verification procedure

Periodic verification is recommended during the normal operation of the equipment.

Procedure

1. Run the test with a known good UUT and the internal verification orifice open. This should Fail the test.
2. Run a similar good UUT without the internal verification orifice closed (off). This should Pass the test.
3. If this sequence does not give the intended results, the equipment (SpeedAir 3050, tooling and verification orifice) should be checked and verified.
4. The procedure should be repeated until intended results are obtained.

9 Shut down

9.1 Standard shutdown procedure

The system is sensitive to moisture. Long periods at atmospheric conditions can allow moisture to enter the system and any virtual leaks to re-presurrize.

If shutdown is completed properly with leak tight system, the system will remain under vacuum (without moisture) over several days (weekend).

1. Run a test with a blank or empty chamber and do not exhaust chamber.
2. Remove Incoming Air Supply via supplied shut off (relieves pressure from equipment).
   - **Do not shut off with ball valve.** This method does not relieve pressure.
   - All valves are air pilot normally closed, removing the pressure will cause them to close.
   - Shut off vent gas (N_2) off.
3. Turn off the equipment power.

Be sure to power on before restoring air and N_2 supply.

10 Decommissioning

10.1 Shutting down for longer periods

1. Shut down the equipment as per the standard shutdown procedure.
2. Disconnect the trolley mains power cable from any power sources (see chapter “Storage”).
3. Disconnect pneumatic inlet.
4. Disconnect CDA/N_2 venting supply.
5. Store the equipment in accordance with storage instructions (see chapter “Technical characteristics”).

10.2 Recommissioning

No special precautions

► Follow the installation procedure (see chapter “Commissioning”).

10.3 Disposal

In accordance with Directive on the treatment of waste electrical and electronic equipment, and Directive on the restriction of hazardous substances, end-of-life products can be returned to the manufacturer for decontamination and recovery.

Any obligation of the manufacturer to take back such equipment shall apply only to complete, unmodified, equipment, using Pfeiffer Vacuum original spare parts, sold by Pfeiffer Vacuum and including all assemblies and sub-assemblies.

This obligation does not cover the shipping cost to a reclamation facility or services provided, for which the customer will be invoiced.

Familiarize yourself with the service request procedure and fill in the declaration of contamination when returning products to our service centers (see chapter “Service solutions by Pfeiffer Vacuum”, page 42).

Environmental protection

The product and its components **must be disposed of in accordance with the applicable regulations relating to environmental protection and human health**, with a view to reducing natural resource wastage and preventing pollution.

Our products contain different materials which must be recycled (see chapter “Environmental conditions”).

11 Malfunctions

11.1 Troubleshooting guide

The following table summarizes common problems that may occur, and repair recommendations.

No.	Description	Possible Cause	Repair Action
1	No communication with PC and data saving	Communication problem	• Check 9-pin RS-232 cable between equipment and PC. • Check PC COM port settings. • Check SpeedAir 3050 address. • Power down the unit, wait 2 minutes before power up.
2	Test doesn't start	Damaged wiring Faulty control panel components	• Check for damage to internal wiring. • Consult Pfeiffer Vacuum.
3	"?" Symbol near the test status (e.g., "Idle")	Pressure is too high for this operating/calibration flow regime	• Check vacuum pump. • Compare pressure setting in "Torr" to the A4 value from Maintenance screen. A4 should be larger than your pressure setting.
4	Test fails with UnderPress message	Pressure is under the minimum pressure setting	• Check that vacuum controller and needle valve operating, or its filter are not clogged. • Check your set up with software.
5	Test fails with Gross Leak message	Pressure is over the maximum allowed pressure	• Check for gross leak, missing UUT that do not allow vacuum level to be reached at the given test time. • Check your set up of max. pressure or pre-Evacuation. Time using software.
6	Valves not working	Damaged wiring Bad valves Faulty control panel components	• Check for damage to internal wiring. • Check valves. Consult Pfeiffer Vacuum for replacement parts. • Consult Pfeiffer Vacuum.
7	Pressure sensor readings are incorrect	Measurement units are not set properly Pressure sensor has large offset Pressure sensor calibration coefficients corrupted Loose connection No power supply	• Verify measurement units using software. • Check pressure sensor calibration and verify proper calibration coefficients. • Check for 12 VDC power supply. • In case of large reading offset, typically pressure sensor was over-pressurized. • Contact Pfeiffer Vacuum.
8	Sensor shift of flow	Wrong units of measure Temperature variation Sensor tilted	• Check set up and units. Check that sensor installed in a flat/horizontal position. • Go to Maintenance screen and check A/D counts of Flow sensor. Tilt sensor to see if "zero" returns. • Perform auto zero but only after consulting with Pfeiffer Vacuum and if A/D counts are less than 200 counts for first Gen sensor or 3000 for second Gen sensor. • Consult Pfeiffer Vacuum.
9	Sensor flow reading high all the time, and between tests	Leak downstream to the sensor Evac valve not opening Pressure valve leak Sensor zero shift or unit has moved	• Isolate sensor by plugging the UUT outlet, check downstream fittings and tubing to the sensor. • Check/replace Test, Verification and/or Exhaust valve. • Check/replace Evac valve. • If high readings persist, check A/D counts and compare to original calibration. • Auto zero the sensor if A/D counts are under 200.

No.	Description	Possible Cause	Repair Action
10	Sensor flow reading is too low or negative (A/D counts is "0").	Leak through the evac line Leaking Evacuation valve External leak through the expansion tank or isolation valve Unstable supply pressure - pressure drops down Unit clogged	• Check/replace inlet filter. • Check supply pressure. • Isolate and check Evacuation/by-pass lines. • Check leak through Evacuation valve. • Check for expansion tank or isolation valve leak. • Verify calibration coefficients. • Check for leaks at the sensor outlet plugs and fittings. • Consult Pfeiffer Vacuum for internal cleaning instructions. • DO NOT AUTOZERO the flow sensor if flow or any A/D counts are "0".
11	Sensor flow, pressure and temperature readings do not make sense	Calibration scrambled Power supply damaged	• Verify power supply outputs. • Verify calibration data with original cal. sheet. • Check/increase buffer size. • Check that unit reacts normally (pressure flow readings vary with flow). • Recalibrate the unit.
12	Cannot pass verification test with the verification orifice	Upstream leak to the instrument Faulty pressure regulator Verification orifice plugged Leaking Evacuation valve Isolation valve is not closing during stability and test time Sensor measurement is incorrect	• Check for upstream and expansion tank connections. • Replace pressure regulator. • Plug the equipment output and repeat the test. • Externally connect to another verification orifice to verify that connected verification orifice is not plugged. If plugged, replace connected verification orifice. • See line no 2. Consult Pfeiffer Vacuum to replace defective valves. • See lines no 6 and 7.
13	Test starts/ stops by itself when connected to a remote PLC or PC control system	Current leakage into the opto-isolated inputs of the sensor	Check that start and stop signals are through dry contact relay. Install one if missing.
14	Sensor pressure or flow readings unstable	Incorrect remote I/O connections Unstable power supply Bad connection Upstream pressure fluctuation	• Disconnect I/O connector, to isolate for test equipment possible common-ground problems. • Check power supply. • Check equipment or sensor connections. • Check internal sensor connection. • Check upstream pressure, increase expansion tank size, and add an isolation valve if required.

No.	Description	Possible Cause	Repair Action
15	Inconsistent test performance - High part failure although verification passes	Pressure supply or pressure regulator is un-stable	• Use software and monitor test pressure at end of consecutive tests. Pressure should be stable within a few hundreths of a psi. If not, check the supply line, additional buffer tank may be required. Check for "cross talk" between adjacent pressure regulators, check/replace the pressure regulator.
16	Low flow or backflow failures	Improper test set up clamp/seals are moving during test, external leak into test cavity, or part volume is not stable during test	• Low flow failure is a result of airflow from the UUT into the expansion tank (back-flow) lower than min. allowed flow. • A factory built in backflow safeguard for back flow (redundant to the min flow) prevents to set up min. flow too low. If flow is under this value a "Backflow failure" occurs. • Re-verify that there is no upstream leak. • Check for external leak into test cavity (e.g., from air actuated expandable seals). • Make sure that part is stable and seals are not compressed during leak test, and volume does not contract during the stability and test time. Allow for proper seal stops and part support to overcome such cases. • Check your test setup and allow (for trouble-shooting purpose) longer Evacuation and Stability time. Run test with software and monitor the signature.

12 Maintenance

12.1 Maintenance frequency and responsibilities

Maintenance level 1 and 2 operations are described in this manual.

Level 3 maintenance operations require a technician from the Pfeiffer Vacuum Service network.

⚠ WARNING

Risk of erroneous readings (accepting NOK product)

The verification orifice is an integral part of the equipment.

► Under no circumstances should it be opened or tampered with.

⚠ WARNING

Risk of equipment damage and/or erroneous readings

The equipment should only be serviced by trained and authorized personnel.

► If for any reason, the equipment needs to be opened for troubleshooting or service, contact Pfeiffer Vacuum for authorization before opening.

If the equipment is not performing as expected, please contact Pfeiffer Vacuum.

Do not attempt to repair the equipment without first contacting Pfeiffer Vacuum, Pfeiffer Vacuum service technician or a Pfeiffer Vacuum authorized service professional.

Operation	Number of hours in use	Level [1]	Site [2]
Filters			
Test port filter checking	According to conditions of use	1	OS
Test port filter cleaning/replacement	According to conditions of use	1	OS
Exhaust valve filter checking	According to conditions of use	1	OS
Exhaust valve filter cleaning/replacement	According to conditions of use	1	OS
Sensor filter checking	According to conditions of use	2	OS
Sensor filter cleaning/replacement	According to conditions of use	2	OS
Vacuum pump			
Tip seal replacement	3 years	2	OS
Performance verification			
Verification	According to conditions of use	1	OS
Verification orifice			
Calibration	According to conditions of use	3	OS/WS
Sensor			
Calibration	Every year (recommended)	3	OS/WS
1) Maintenance level • 1: Operator (User) • 2: Technician with Pfeiffer Vacuum training • 3: Pfeiffer Vacuum maintenance technician		2) Maintenance site • OS: on customer site • WS: Pfeiffer Vacuum service center	

12.2 Filters maintenance

Pneumatic filter

The equipment is equipped with a filter at the pneumatic inlet.

► Clean and maintain the filter.

Sensor filter

The sensor is provided with an in-line filter. The filter is at the inlet of the sensor.

► Periodically check, clean, or replace this filter.

Test port filter

1. Periodically check, clean, or replace this filter.

12.3 Sensor periodic calibration

The sensor is a measuring device.

► Periodic calibration, typically annually, by authorized personnel and standards is recommended to meet end user quality control requirements.

12.4 Vacuum pump

See HiScroll 6 operating instructions for use and maintenance (see chapter "Applicable documents")

Tip seal

- If HiScroll 6 pump is serviced, ensure proper "AutoStart" function.
- Use buttons on HiScroll 6 to set AutoStart and verify pump is not in standby.

1. Apply power to the pump.
2. Press and hold the **On/Off** button for longer than 5 s. This switches on the auto start function: [P:034] = 1.

   The vacuum pump itself remains deactivated. In the event of a loss and return of power, the vacuum pump returns to the operating status which was established prior to the power failure. The command is acknowledged by the yellow LED flashing for 1 s after releasing the button.
3. Short press the **On/Off** button to turn the pump on: [P:010] = 1.
4. Verify correct operation by removing power from the pump, whether by unplugging the power cord from the pump or using the cart power switch if power from the cart, for approximately 5 s, and then power it back on. It should start back up automatically after approximately 4 s.
5. Verify that green LED below the **Standby** button is not illuminated or flashing.

   If it is illuminated or flashing, press it once to turn Standby off, and repeat steps 6 and 7.

   If it stays illuminated or flashing after repeating steps 6 and 7, press and hold the **Standby** button for 5 s, and repeat steps 6 and 7 a third time.

13 Service solutions by Pfeiffer Vacuum

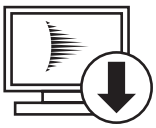
We offer first-class service
High vacuum component service life, in combination with low downtime, are clear expectations that you place on us. We meet your needs with efficient products and outstanding service.

We are always focused on perfecting our core competence – servicing of vacuum components. Once you have purchased a product from Pfeiffer Vacuum, our service is far from over. This is often exactly where service begins. Obviously, in proven Pfeiffer Vacuum quality.

Our professional sales and service employees are available to provide you with reliable assistance, worldwide. Pfeiffer Vacuum offers an entire range of services, from original replacement parts to service contracts.

Make use of Pfeiffer Vacuum service
Whether preventive, on-site service carried out by our field service, fast replacement with mint condition replacement products, or repair carried out in a Service Center near you – you have various options for maintaining your equipment availability. You can find more detailed information and addresses on our homepage, in the section.

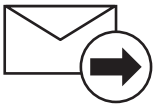
You can obtain advice on the optimal solution for you, from your Pfeiffer Vacuum representative.
For fast and smooth service process handling, we recommend the following:



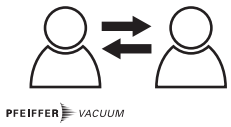
1. Download the up-to-date form templates.
   - Explanations of service requests
   - Service requests
   - Contamination declaration

a) Remove and store all accessories (all external parts, such as valves, protective screens, etc.).
b) If necessary, drain operating fluid/lubricant.
c) If necessary, drain coolant.

2. Complete the service request and contamination declaration.

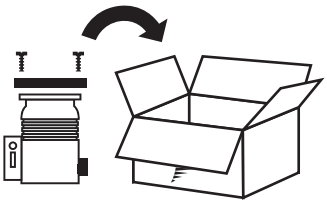


3. Send the forms by email, fax, or post to your local Service Center.

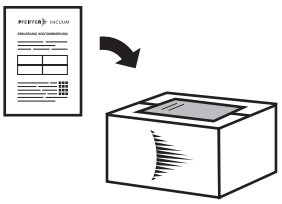


4. You will receive an acknowledgment from Pfeiffer Vacuum.

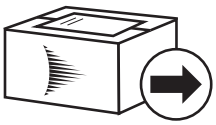
Submission of contaminated products
No microbiological, explosive, or radiologically contaminated products will be accepted. Where products are contaminated, or the contamination declaration is missing, Pfeiffer Vacuum will contact you before starting service work. Depending on the product and degree of pollution, **additional decontamination costs** may be incurred.



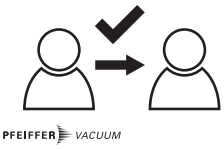
5. Prepare the product for transport in accordance with the provisions in the contamination declaration.
a) Neutralize the product with nitrogen or dry air.
b) Seal all openings with blind flanges, so that they are airtight.
c) Shrink-wrap the product in suitable protective foil.
d) Package the product in suitable, stable transport containers only.
e) Maintain applicable transport conditions.



6. Attach the contamination declaration to the **outside** of the packaging.



7. Now send your product to your local Service Center.



8. You will receive an acknowledgment/quotation, from Pfeiffer Vacuum.

Our sales and delivery conditions and repair and maintenance conditions for vacuum devices and components apply to all service orders.

14 Accessories

Accessory	Model	Part Number
Software	LeakTek	2000079216
	LeakRx	2000081383
Verification orifice	0.5 micron equivalent	2000222723
	1 micron equivalent	2000222724
	2 micron equivalent	2000222725
	5 micron equivalent	2000222727
	10 micron equivalent	2000222728
	15 micron equivalent	2000222729
	20 micron equivalent	2000222730
	30 micron equivalent	2000222731

15 Technical data and dimensions

15.1 Technical characteristics

Characteristics		SpeedAir 3050
Test method		Mass Extraction
Power		115 VAC - 50/60 Hz 220 VAC - 50/60 Hz
Flow sensor		IMFS (Intelligent Molecular Flow Sensor)
Sensitivity		tT 1 micron defect size
Operating temperature (min./max.)		15–45 °C (59–83 °F)
Operating humidity (min./max.)		30–80%
Test pressure range		1–20 Torr (1.3– 27mbar abs)
Pneumatic supply	Gas	Air (pilot operated valves)
	Quality	1.3.1 according to ISO 8573-1
	Pressure (min.–max.)	4.5–10 bar rel. (65–145 psig)
Nitrogen supply	Use	Recommended for chamber venting
	Nitrogen pressure (min.–max.)	140–690 mbar rel. (2–10 psig)
Operating system		Windows 10
User interface		10" Multi-touch Full HD color screen
LeakRx software		21 CFR Part 11 compliant
Stored test Setup ID (recipes)		Unlimited
Network connection		1 x LAN (RJ45)
Interfaces		USB, Wired Ethernet
Discrete inputs		Start, Stop, Test Type Change
Analog inputs		2 x 0–5 V
Discrete outputs		Clamp, Exhaust, Custom, Test Type, A/D
Analog outputs		2 x AO
Dimensions (L x W x H)	Display closed	922 x 601 x 1,129 mm (36 x 24 x 44 inch)
	Display open	922 x 601 x 1,397 mm (36 x 24 x 55 inch)
Weight (including trolley)		127 kg (280 lbs)
Noise level		< 53 dB(A)

15.2 Compressed dry air (CDA) characteristics

Composition	≈ 80 % N + ≈ 20 % O_2
Type	Quality 1.3.1. according to standard ISO 8573-1
Pressure	Minimum = $4.5 \cdot 10^3$ hPa (4.5 bar) relative (65 psig) Maximum = $10.0 \cdot 10^3$ hPa (10 bar) relative (145 psig)
Temperature	15–45 °C (stabilized temperature) [1)]
Tubing diameter	1/4" or 6 mm

1) For a higher temperature range, consult Pfeiffer Vacuum.

15.3 Venting gas characteristics

Type	CDA - Nitrogen
Purity	≥ Alphagaz 1 (Air Liquide) or N50
Residual concentration	< 5 ppm

1) For a higher temperature range, consult Pfeiffer Vacuum.

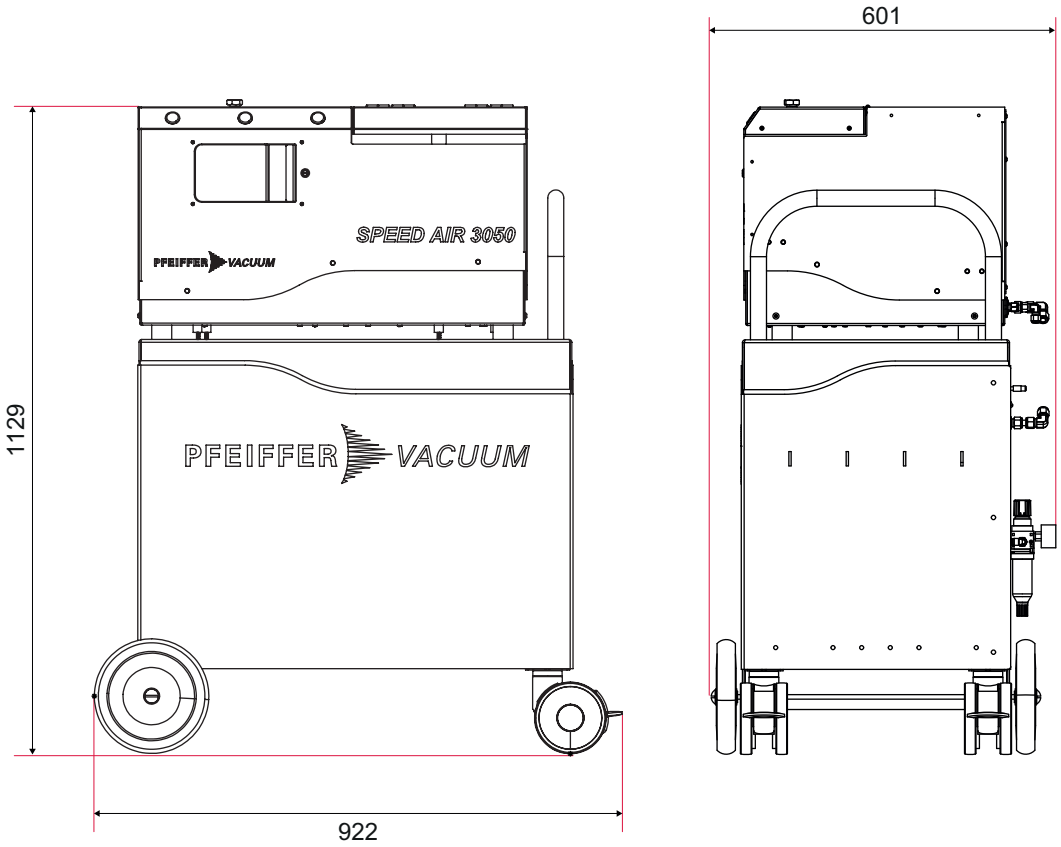
Pressure	Minimum = 138 hPa (0.14 bar) relative (2 psig) Maximum = 690 hPa (0.7 bar) relative (10 psig)
Temperature	15–45 °C (stabilized temperature) [1)]
Tube diameter	1/4" or 6 mm
1) For a higher temperature range, consult Pfeiffer Vacuum.	

15.4 Environmental conditions

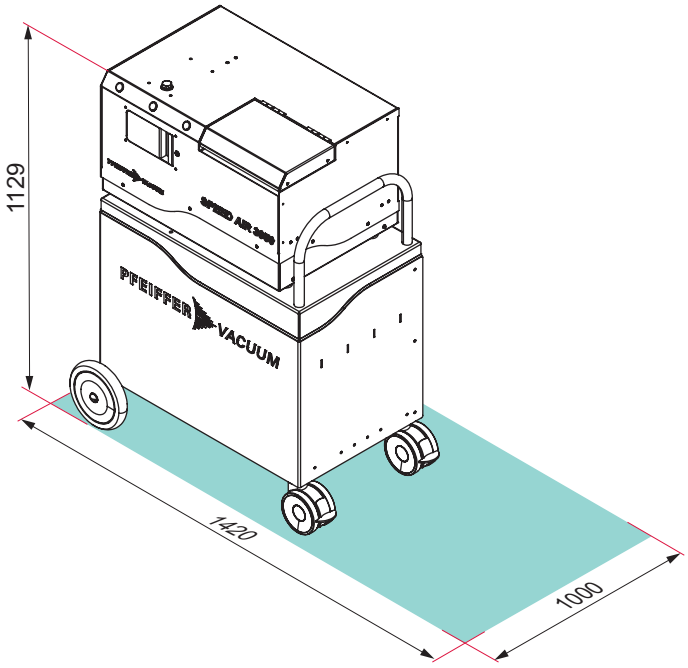
Use	Indoor, clean, dust-free room Not use in wet or condensing environments
Installation altitude	Up to 2000 m
Protection rating	IP20
Ambient operating temperature	10–45 °C (stabilized temperature) [1)]
Storage temperature	5–55 °C
Hygrometry	80 % for temperatures up to 31 °C and decreasing linearly to 50 % relative humidity at 40 °C
Transient overvoltage protection	Category II IEC overvoltage category II standard
Pollution degree	Level 2
1) For a higher temperature range, consult Pfeiffer Vacuum.	

15.5 Dimensions

Dimensions in mm



Maintenance space required



16 Appendix

16.1 Calculations

16.1.1 Density

$$D = \frac{P + Q \times V_3}{G_1 \times (T + 273.15)}$$

D	Density of the gas in mg/cc
R	Constant of the gas (for example, Air = 287)
T	Temperature of the gas in °C
Q	Volumetric flow in cc/min. (mL/min)
V_3	Flow compensated pressure coefficient (see chapter "Command parameters")
Z	Gas compressibility coefficients

16.1.2 Flow measurement

Mass flow measurement for the transitional and molecular flow regime

$$\frac{dM}{dt} = C_1 + C_2x + C_3x^2 + C_4x^3$$

x	Count reading from the capacitance sensor
Q	Volumetric flow measurement in cc/min. (mL/min)
dM/dt	Mass flow in µg/cc (micro-gram/cc)
C_1, C_2, C_3, C_4	Flow coefficients (see chapter "Command parameters")
B_3, B_4	Temperature/Viscosity compensation flow coefficients (see chapter "Command parameters", default is "0")
H_3, H_4	Pressure compensation flow coefficients (see see chapter "Command parameters", default is "0")
T	Temperature in °C
P	Pressure in kPa

16.1.3 Mass flow to volumic flow

$$Q = \frac{dM / dt}{\rho}$$

dM/dt	Mass flow in µg/cc (micro-gram/cc)
Q	Volumetric flow in cc/min. (mL/min)
ρ	Density in µg/cc

16.1.4 Mass extracted

$$M = \int_{t_0}^{Ttest} \frac{dM}{dt} \times dt$$

M	Mass extracted
dM/dt	Mass flow in µg/cc (micro-gram/cc)
t_0	Starting time of the test step
T_{test}	Ending time of the test step

16.1.5 Temperature calculation

$T = B_2 + B_1x$

T	Temperature in °C
B_1, B_2	Temperature coefficients (see chapter "Command parameters")
x	Count reading from the temperature sensor

16.1.6 Pressure calculation

$P = H_2 + H_1x$

P	Pressure in kPa
H_1, H_2	Pressure coefficients (see chapter "Command parameters")
x	Count reading from the pressure sensor

16.2 Command parameters

- All calibration coefficients are in the unit of °C, flow base unit or kPa if applicable.
- Density is in the unit of µg/cc.
- Time is in the unit of 10 ms.
- All configuration coefficients are in the selected flow unit or kPa if applicable, except for item 5.
- If X6 is set to 0, RS-232 data acquisition response is in the selected unit.

  If X6 is set to other than 0, RS-232 data acquisition response is in °C, base flow unit or kPa.

A Group

Command	Type	Description
A1	Float	Analog output full scale corresponding flow in selected flow unit
A2	Float	D/A calibration, Count/kPa
A3	Float	Backflow if count reading in DP is less than A3
A4	Float	Barometric condition of the pressure in kPa
A5	Float	Minimum pressure for volume flow sensor or Maximum pressure for mass flow sensor

B Group

Command	Type	Description
B1	Float	Temperature calibration slope (C/Count)
B2	Float	Temperature calibration offset (C)
B3	Float	Temperature compensation flow coef, 2nd order
B4	Float	Temperature compensation flow coef (Linear)
B5	Float	Calibrated temperature in °C

C Group

Command	Type	Description
C1	Float	Offset flow coef (cc/min or µg/min)
C2	Float	First-order flow coef (cc/min/count or µg/min/count)
C3	Float	Second-order flow coef (cc/min/count2 or µg/min/count2)
C4	Float	Third-order flow coef (cc/min/count3 or µg/min/count3)
C5	Float	Lo offset flow coef (cc/min or µg/min)
C6	Float	Lo first-order flow coef (cc/min/count or µg/min/count)
C7	Float	Lo second-order flow coef (cc/min/count2 or µg/min/count2)
C8	Float	Lo third-order flow coef (cc/min/count3 or µg/min/count3)

Command	Type	Description
C9	Float	Percent divider % (such as 10)
CA	Float	Smooth % (such as 1)
CB	Float	Calibrated gas constant
CC	Float	Calibrated gas viscosity

D Group
For adaptive flow test

Command	Type	Description
D1	Float	Buffer time in % of the test period
D2	Float	Safety multiplier = 2 to 6
D3	Float	Test start leak window Max in multiplier of V2 (1.2)
D4	Float	Test start leak window Min in multiplier of V2 (0.8)
D5	Float	Alpha (curve) (0-1)

G Group

Command	Type	Description
G1	Float	Universal constant of the gas (287 for air) Necessary if density is used in calculation
G2	Float	Viscosity at 0 °C
G3	Float	Viscosity change per °C
G4	Float	Density of the gas at standard barometric condition in µg/cc, used for standard flow unit such as SCCM, etc
G5	Float	Sensor alpha (kPa/(cc/min)) G5 = (DP range) / (Sensor full scale) · 0.24884

H Group

Command	Type	Description
H1	Float	Pressure calibration slope (kPa/count)
H2	Float	Pressure calibration offset (kPa)
H3	Float	Pressure compensation flow coef (2^{nd} order)
H4	Float	Pressure compensation flow coef (Linear)
H5	Float	Calibrated pressure in kPa
H6	Float	Pressure calibration slope (kPa/Count)
H7	Float	Pressure calibration offset (kpa)

K Group

Command	Type	Description
K1	Float	Pressure setting for leak test mode (kPa)
K2	Float	Pressure upper limit (kPa)
K3	Float	Pressure lower limit (kPa)
K5	Float	Pressure setting for leak test mode (kPa) for large leak check with dual pressure settings
K6	Float	Pressure upper limit (kPa) for large leak check with dual pressure settings
K7	Float	Pressure lower limit (kPa) for large leak check with dual pressure settings
K9	Float	Pressure lower limit (kPa) for external pressure switch
KA	Float	Pressure higher limit (kPa) for external pressure switch

L Group

Command	Type	Description
L1 … LE	String	Up to 15 characters per label

M Group

Command	Type	Description	Value
M1	Long	This is not saved in the memory.	-
		Calibrate the LCD	M1;1
		Activate the LCD	M1;2
		Deactivate the LCD	M1;3
		Change the test type	M1;6
		Start test	M1;8
		Stop test	M1;9
M2	Long	Pass sound period (x 10 ms) Set 0 to disable	-
M3	Long	Fail sound period (x 10 ms) Set 0 to disable	-
M4	Long	Stop sound period (x 10 ms) Set 0 to disable	-
M5	Long	Automatically deactivate to screen saver The timer setting after Idle condition (x 10 ms) Set 0 to disable	-
M6	Long	The setting is based on the combination of the following setting.	-
		Display/Hide the second pressure	0x400
		Switch the internal pressure and external pressure	0x200
		Alternative location	0x100
		Temperature reading	0x08
		Enable remote command start/stop 0: Disable 1: Enable	0x20
		Enable DIO start/stop 0: Enable 1: Disable	0x10
		[Stop] button	0x01
		[Start] button	0x04
		[Type] button	0x02
M7	Long	Brightness	1–255

O Group

Command	Type	Description	Value
O1 … OE	Integer	The last byte is configured as follows.	-
		Clamp	0x80
		Pres/Test	0x40
		Exhaust	0x20
		Evac/Balance	0x10
		Pre-Evac	0x08
		Isolate	0x04
		Customer1	0x02
		Customer2	0x01

P Group

Command	Type	Description
P1	Float	PID proportional coefficient
P2	Float	PID integral coefficient
P3	Float	PID differential coefficient
P4	Float	Flow setting for flow control mode in selected flow unit

S Group

Command	Type	Description
S1	String	Serial Number: Up to 14 characters are allowed to enter. For example: Serial number XX XX XXX XXX X XXX XX① XX② XXX③ XXX④ X⑤ XXX⑥ ① = Release of month i.e. 06 = June ② = Release of year i.e. 04 = 2004 ③ = 3digit serial number valid from 001 to 999 i.e. 022 ④ = Maximum flow i.e. 090 = 90 ,120 = 120, 12H = 1200, 12K = 12000 ⑤ = Flow unit i.e. C = CCM, L = LPM, U = ug/min, M = mm^3/m ⑥ = Maximum pressure in psia i.e. 500 = 500 psia, 12H = 1200 psia, 12K = 12000 psia
S2	String	Read only Return version number such as 020000 for version 2.0.0

T Group

All T group settings are defined as long integer (32 Bit).

Command	Type	Built-in timers	Customized timers
T1	Integer	Evacuating delay time in 10 ms	Step timer in 10 ms
T2	Integer	Stability delay time in 10 ms	Ditto
T3	Integer	Test time in 10 ms	Ditto
T4	Integer	Clamping delay time in 10 ms	Ditto
T5	Integer	N/A	Ditto
T6	Integer	N/A	Ditto
T7	Integer	N/A	Ditto
T8-TE	Integer	N/A	Ditto

U Group

Command	Type	Description
U1	Integer	Address 1-9
U2	Integer	Mode 4th byte Sensor type: ● Conventional instrument: 0 ● Adaptive instrument: 1 ● Flow controller: 2 ● Mass extraction method: 3 ● Steady state predictor: 4 3rd byte 0x0 0 1 1 0 0 1 1 0x0 0 1① 1② 0③ 0 1④ 1⑤ ● ① Bit 0 ● ② Bit 1: Reference flow function ● ③ Bit 2: Quick reference flow function ● ④ Bit 4: When '1', sensor is configured for 4th analog input ● ⑤ Bit 5: PID pressure sensor selection; 0 = internal pressure sensor, 1 = external pressure sensor 2nd byte 0x 1 1 1 1 1111 0x 1① 1② 1③ 1④ 1111⑤ ① Vacuum testing message ● 1 - Vacuum ② Digital input pulse/level ● set to 1 if level detection is desirable ③ Relative measurement ④ Flow calibration ● one set of calibration: 0 ● two set of calibration: 1 ⑤ Valve control ● standard: 0x0 (disable C1, X2, X3, XA) ● customized: 0x1 - 0xF 1st byte Bit 0: Measurement unit ● Mass flow base: 1 µg/min as base unit ● Volume flow base: 0 cc/min as base unit Bit 1: Gas compensation ● Gas compensation: 1 ● No coef compensation: 0 Bit 2: 3rd test type on Bit 3: 3rd and 4th test type on
U3	Integer	Temperature unit 0 = Degree Celsius (°C) 1 = Degree Fahrenheit (°F)
U4	Integer	Pressure unit 0: kPa-a 1: kg/c 2: psia 3: inHg 4: inH_2O 5: psig 6: Torr 7: kPa-g 8: bar-a

Command	Type	Description
U5	Integer	Flow unit High nibble ● 0: cc ● 1: mm^3 ● 2: liter ● 3: gal ● 4: gram ● 5: µg XXXX ● 6: µg XXXX Lower nibble ● 0: sec ● 1: min ● 2: hour ● 3: SCCM, etc 16 x High nibble + Low nibble Besides XXXXXX (*x) ● 7x16+3: SCCM ● 8x16+3: SLM ● 9x16+3: SCFM ● 7x16+4: SCCSe-6
U6	Integer	0: one string of response to SQ1 command 1: two string of response to SQ1 command
U7	Integer	Baud Rate ● 0 and else: 9600 ● 2: 19200 ● 4: 38400 ● 12: 115200 The parameter takes effect after the power reset of the sensor.
U8	Integer	Hold value time in U8 x 10 ms XXXXXX (*x)
U9	Integer	Set U9 = 0 to disable special features ● 1: disable relative measurement ● 2: disable mass extraction test ● 3: disable early detection for adaptive Test
UA	Integer	Start cycle counter. Cycle number can be shown on System and Maintenance screens. XXXX
UB	Integer	Reference flow function flag. 1 Byte Within each byte of the above value the bit positions are numbered as shown: 7 6 5 4 3 2 1 0 Byte 0 Reference flow activate ● 0 = Reference flow disabled from setup ● 1 = Reference flow enabled from setup Byte 4 ● 0 = TT1 reference flow activated if it is enabled ● 1 = TT1 reference Fflow deactivated Byte 5 ● 0 = TT2 reference flow activated if it is enabled ● 1 = TT2 reference flow deactivated Byte 6 ● 0 = TT3 reference flow activated if it is enabled ● 1 = TT3 reference flow deactivated Byte 7 ● 0 = TT4 reference flow activated if it is enabled ● 1 = TT4 reference flow deactivated

V Group

Command	Type	Description
V1	Float	Min. flow alarm for leak test mode in cc/min, µg/min or selected unit based on X6
V2	Float	Max. flow alarm for leak test mode in cc/min. or selected unit based on X6 For mass extraction method, max. leak alarm for leak test mode in cc, µg, or selected unit based on X6
V3	Float	Flow compensation to DP in kPa/(cc/min) or kPa/(µg/min)
V5	Float	Min. flow alarm for relative measurement baseline flow in cc/min, µg/min or selected unit based on X6
V6	Float	Max. flow alarm for relative measurement baseline flow in cc/min. or selected unit based on X6
V7	Float	Large leak flow alarm flow in cc/min. or selected unit based on X6

X Group

The following conditions must be met for the sensor to function properly.

- X1 < X3 < XA < X2
- XB < X9 < X3
- 1 < X3
- 1 < XB

Command	Type	Description
X1	Integer	Pressure switch on check step No Lowest byte = Step No 2nd lowest<>0, advance to the next step once the PS is on
X2	Integer	Pressure switch off check step No Lowest byte = Step No 2nd lowest<>0, advance to the next step once the PS is off
X3	Integer	Leak check step
X4	Integer	Buffer size: valid from 4 to 100
X5	Integer	Enable flag: deplete the pressure after the test failure
X6	Integer	Default unit is used if X6 <>0 Flow in cc/min or µg/min, pressure in kPa and temperature in °C
X9	Integer	Flow baseline Step No
XA	Integer	Stop test step No
XB	Integer	Large leak test step No Lowest byte = Step No 2nd lowest<>0, the steps before and on large leak are set based on K5 and check against K6 and K7.
XC	Integer	Basic check Each bit of the integer representing the step in which the basic check is enforced. The basic check verifies the sensor is not saturated and pressure is not out of settings (P_{Hi} and P_{Lo}). "XC" ● If XC was set such as 0xFF, the gross leak check is disabled. ● Any basic step check after leak check step is ignored. Example of setting: XC=0x06 in step 2 and step 3 the basic check is enforced.

Command	Type	Description
XD	Integer	External pressure on step No Lowest byte = Step No 2nd lowest<>0, advance to the next step once the external pressure is in range.
XE	Integer	External pressure off step No Lowest byte = Step No 2nd lowest<>0, advance to the next step once the external pressure is out of range.

Y Group

Command	Type	Description
Y1	Float	Reference flow the 1st point time parameters
Y2	Float	Reference flow the 2nd point time parameters
Y3	Float	Reference flow the 3rd point time parameters
Y4	Float	Reference flow the 4th point time parameters
Y5	Float	Reference flow the 5th point time parameters

Z Group

Command	Type	Description
Z1	Float	Reference flow the 1st point flow parameters
Z2	Float	Reference flow the 2nd point flow parameters
Z3	Float	Reference flow the 3rd point flow parameters
Z4	Float	Reference flow the 4th point flow parameters
Z5	Float	Reference flow the 5th point flow parameters

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EC Declaration of Conformity

This declaration of conformity has been issued under the sole responsibility of the manufacturer.

Declaration for product(s) of the type:

Speed Air S3050 instrument

We hereby declare that the listed product satisfies all relevant provisions of the following **European Directives**.

Machinery 2006/42/EC (Annex II, No. 1 A)
Low-voltage 2014/35/EU
Electromagnetic Compatibility 2014/30/EU
Restriction of Hazardous Substances 2011/65/EU

Harmonized standards and national standards and specifications which have been applied:

UL 61010-1:2012 Ed.3+R:19Jul2019
CSA C22.2#61010-1-12:2012 Ed.3+U1;U2;A1
IEC 61010-1:2010
IEC 61010-1:2010/AMD1:2016
47 CFR, Part 15 Subpart B, §15.107 and §15.109, Class A
ICES-003, Issue 7 Updated 2020
EN 61326-1:2013
IEC 61326-1:2020 Class A and Basic Immunity

The person authorized for compiling the technical file is Mr. Bill Hathaway, Pfeiffer Vacuum Inc., 4037 Guion Lane, Indianapolis, IN 46268 USA.

Signature : Signed by: Jason Wartell 13AAB156807242C...

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Jason Wartell
Vice President of Systems & Supply Chain

Date 11/27/2024 | 8:09 AM PST

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