

Leak Detector
HELiOT 900

Operations Manual

Please read this manual before using the equipment.
Store it carefully in a readily accessible place.

The contents of this manual cover equipment with the
following serial numbers and software versions

Serial Number: 0101 or higher

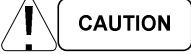
Software Version: 1.69_383 or higher

ULVAC, Inc.

<http://www.ulvac.co.jp/>

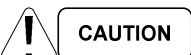
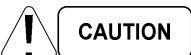
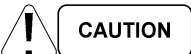
Safety Symbols

The following safety symbols are used in order for the operator to understand items which must be observed in this operations manual and the equipment's warning notices. The language used in the symbols is classified as follows.

	This symbol indicates the imminent possibility of death or series injury to the operator if the equipment is incorrectly used. If the work is carried out disregarding this warning, there will be a possibility of serious damage to human life or to the manufacturing facility (including this equipment).
	This symbol indicates the possibility of death or series injury to the operator of the equipment if it is incorrectly used. If the work is carried out disregarding this warning, there will be a possibility of damage to human life or to the manufacturing facility (including this equipment).
	This symbol indicates the possibility of the operator receiving a moderate injury or serious damage to the equipment or possibility of incorrect operation if the equipment is incorrectly used.

Prior to Use

Thank you for purchasing our ULVAC equipment. On receipt of the equipment, please verify that the model ordered is correct and check for any damages caused during shipment.

	Read this manual before installing, operating, inspecting or maintenance of the equipment and fully understand the safety precautions, specifications, and operating procedures regarding the equipment.
	When unpacking or moving the equipment, do not incline more than 30 degrees. Maintain a horizontal position during installation. Failure to do so may result in oil leaks or damage to the equipment.
	The copyright of this operations manual is held by ULVAC, Inc. No portion of this manual may be reproduced without acceptance of ULVAC, Inc. Also, it is prohibited to disclose or transfer this operations manual to any third parties without the written consent of ULVAC, Inc.
	Please note that the information within this operations manual is subject to change without any notice for changes in specifications and modifications of the equipment.

Safety Precautions

 DANGER	Power Shutdown When installing the equipment and removing the external panels for inspection and replacement of parts, turn off the MAIN POWER switch and disconnect plug from the outlet before servicing. Possibilities of electric shock and damages to the equipment due to high voltage areas.
 DANGER	Fore Pump Exhaust Vent Do not block the fore pump exhaust vent. It may explode to cause a serious damage to human life or to the manufacturing facility when fore pump exhaust vent is pressurized
 DANGER	Handling of Hydrogen Gas Risk of explosion when hydrogen is mixed with 4% of air or over. Please read carefully MSDS to ensure the safety instructions of hydrogen gas and its mixture gas before handling the gas.
 DANGER	Power Supply Cable Always verify that the power supply cable included with the unit exceeds the unit's rating before use. Risk of fire from using a power supply cable below the unit's rating.
 WARNING	Input Power Supply Voltage Use $\pm 10\%$ of rated voltage indicated on the rating plate for input voltage. See section 1-2 for the rated current. Before supplying power, always verify voltage, and permissible current of the supply side. There is a possibility of serious damage to human life or manufacturing facility in case of supplying voltage outside of the rating.
 WARNING	Handling of Test Ports. When the equipment is in operation or during testing, do not remove the blank flange or test subject and Sniffer unit from the test port or vent the test port to atmospheric pressure by any other method other than by the method indicated in this manual. There is a risk of damaging the equipment.
 CAUTION	Grounding In order to prevent earth leakage, always ground the equipment with a class 1 ground. When used in Europe and North America, it is class I equipment, therefore always ground the equipment with earth.
 CAUTION	High Temperature Warning The pump, analyzer tube, and solenoid valve are extremely hot immediately after stopping. When servicing/replacing parts, wait for 15 minutes or more after stopping and then proceed carefully with the work. Risk of injury from burns and the possibility of damage to the equipment.
 CAUTION	Vibration Prohibited Do not expose the equipment to vibrations from surrounding machinery or impacts. Risk of damaging the equipment.
 CAUTION	Load on Test Port When connecting pipe fitting to the test port, do not place loads over 50N, 5kg's, 10lbs. Risk of damaging the equipment.
 CAUTION	Ensure Ventilation In order to cool the interior of the main equipment, an intake fan is installed on the left panel and an exhaust fan is installed on the right panel. Maintain spacing of 200 mm or more between all panels. Obstructing the vents increases the internal temperature of the equipment to create a risk of damaging the equipment.

Handling Precautions

 CAUTION	Contact to Vacuum Components The internal components in the unit's pump system have undergone precision cleaning. Do not touch with bare hands during maintenance. Risk of reducing performance of the equipment.
 CAUTION	Assembling of TABLET and Main Unit The indicator and the main unit are to be used as assembled for its shipment. The correct composition is essential for proper functioning of the equipment and may lead to damage.
 CAUTION	Activation Without Sensitivity Calibration Activation of the equipment without sensitivity calibration, regardless of the condition of the main unit, may lead to large difference in measurement values due to use of past calibrated data without any modifications. In order to maintain higher reliability, sensitivity calibration is recommended.
 CAUTION	Prohibit Spray of He to Vent Port Vent Port injects He unpolluted gas such as air and nitrogen to vacuum component system via vent valve. When He is sprayed to vent ports, the vacuum component system gets polluted by He and may lead to significant loss of precision in the measurement.

Notes

 CAUTION	List of Service Desks Please be aware that service desks listed are subject to change without notice.
 CAUTION	Disposal When disposing of the unit or a portion of the unit, refer to local laws and ordinances. When toxic gas is used the unit must be disposed through an industrial disposal specialist. The cost incurred to the disposal will be covered by the customer.
 CAUTION	2.4GHz Portable Wireless Device This unit employs 2.4GHz Portable Wireless Device compatible to IEEE 802.11b/g/n standard. Refer to nation/local laws for use.

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1. HELIOT 900 Series Specifications and Configurations

HELIOT 900 Series Leak Detector detects leakage of Helium He/H_2 by using principles of magnetic deflection mass spectrometer.

1-1 General Specifications

1-1-1 Common Specifications

Item		Specifications
Detectable gas		Helium ^4He , Hydrogen $^2\text{H}_2$ (*1)
Minimum detectable leak (^4He) (*2)		$< 5 \times 10^{-13} [\text{Pa} \cdot \text{m}^3/\text{s}]$
Inlet pumping speed for ^4He	ULTRA FLOW	$> 5 [\text{l}/\text{sec}]$
	FINE FLOW	$> 1 [\text{l}/\text{sec}]$
Startup time		2min(when no calibration) , 5min (when calibration)
Stop time		1[min]
Inlet port flange		NW25 (ISO)
Input power supply		AC 100-120[V] or AC 200-240[V] (50/60Hz)
Environmental condition		Usage for indoor
Operating temperature range		10-40[°C]
Operating humidity limit		35-85[%RH](with no condensation)
Storage temperature limits		10-55[°C]
Safekeeping humidity range		35-85[%RH](with no condensation)
Standards		RoHS
Over voltage category		Cat. II (IEC60664-1)
Height condition		Equal or less than 1000m sea level
Pollution Degree		2(IEC60664-1)
Noise level		$\leq 70 \text{ dB(A) } 1\text{m}$
Application standards		CE
Input/output		- External input/output control (approx. 20 types of signals) Test start/stop signal input, unit startup/stop signal input...etc. - Analog output : Output the leak rate and Pressure at 0 to 10 voltage. - Serial interface (RS232C/RS485) Printer output, Control by external interface
Test modes		Auto mode, Ultra flow, Fine flow, Gross flow, sniffer flow 5 selectable. Optional sniffer units are required for sniffer flow.
Valve operation		Internal valves: full automatic control. External valves: Valve output for external calibration leak valves installed externally (24V) is also full automatic control.
Sensitivity calibration		- Automatic calibration execution at instrument start (with calibration leak temperature compensation and time compensation functions). - Sensitivity check function (sensitivity value can be managed) - Sensitivity calibrate function via external leak calibration (Recommend to use the external calibrated leak of $1.0 \times 10^{-7} [\text{Pa} \cdot \text{m}^3/\text{s}]$ or more when the volume of the measurement tool is large.)

1-2 Common Specification

1-2-1 Base Type (901W1/901D2)

Type which small fore pump is on board type. Also prepared a Low height cart as an option.

Model	901W1	901D2 ^(*)
Vacuum exhaust system fore pump (50Hz/60HZ)	Rotary pump 30/36 [ℓ/min]	Scroll pump 90/108 [ℓ/min]
Dimensions	480×320×506 [refer to outside diagrams except for sections 1-4-1,1-4-4]	
IP Protection grade	IP30	
Weight (with floor cart)	33 (46) [kg]	37 (50) [kg]
Power consumption	600 [VA]	500 [VA]

1-2-2 Mobile Type (904W2/904D3/904D4)

Type which big pump is on board in the mobile cart.

Model	904W2	904D3 ^(*)	904D4 ^(*)
Vacuum exhaust system fore pump (50Hz/60HZ)	Rotary pump 135/162 [ℓ/min]	Scroll pump 250/300 [ℓ/min]	Scroll pump 500/00 [ℓ/min]
Dimensions	660×444×991 [refer to outside diagrams except for sections 1-4-3]		
Weight	79 [kg]	74 [kg]	96 [kg]
Power consumption	1100 [VA]	650 [VA]	1150 [VA]

1-2-3 Sniffer unit Specification (Optional)

Sniffer measurement method is possible by using sniffer unit (optional) in all models.

Model	AS9	BS9	BT9
Detectable gas	Helium ⁴ He ^(*)		
Flow rate	<0.03 [ℓ/min]	Approx. 3 [ℓ/min]	
Sniffing inlet port	Handy probe		φ6mm hose joint
Tube	1-10 [m]		
Dimensions	[refer to outside diagrams except for sections 1-4-5,1-4-6,1-4-7,1-4-8]		
Weight	Approx. 0.2 kg	Approx. 2.0 kg	
Sensitivity calibration	Prepared separately from the unit, calibration using the external calibration leak (optional) or reference concentration gas (known He concentration). Atmosphere can also be used as 5 ppm He reference concentration gas.		

1-3 Specifications by display unit

1-3-1 Tablet Type

Controller unit	7 inch color touch panel tablet Wireless standard : IEEE 802.11 b/g/n Radio Act acquired : Telec (Japan), CE (Europe), FCC (U.S.A)	
Operation range	Wire	Cable length:2m(standard)
	Wireless ^(*)	40m ^(*)
Battery lasting time	3 - 6 hours ^(*)	
Language	English, Japanese, Korean, Simple Chinese, Traditional Chinese, German, Spanish, Russian	

1-3-2 Panel Mount Type(-P)^(*)

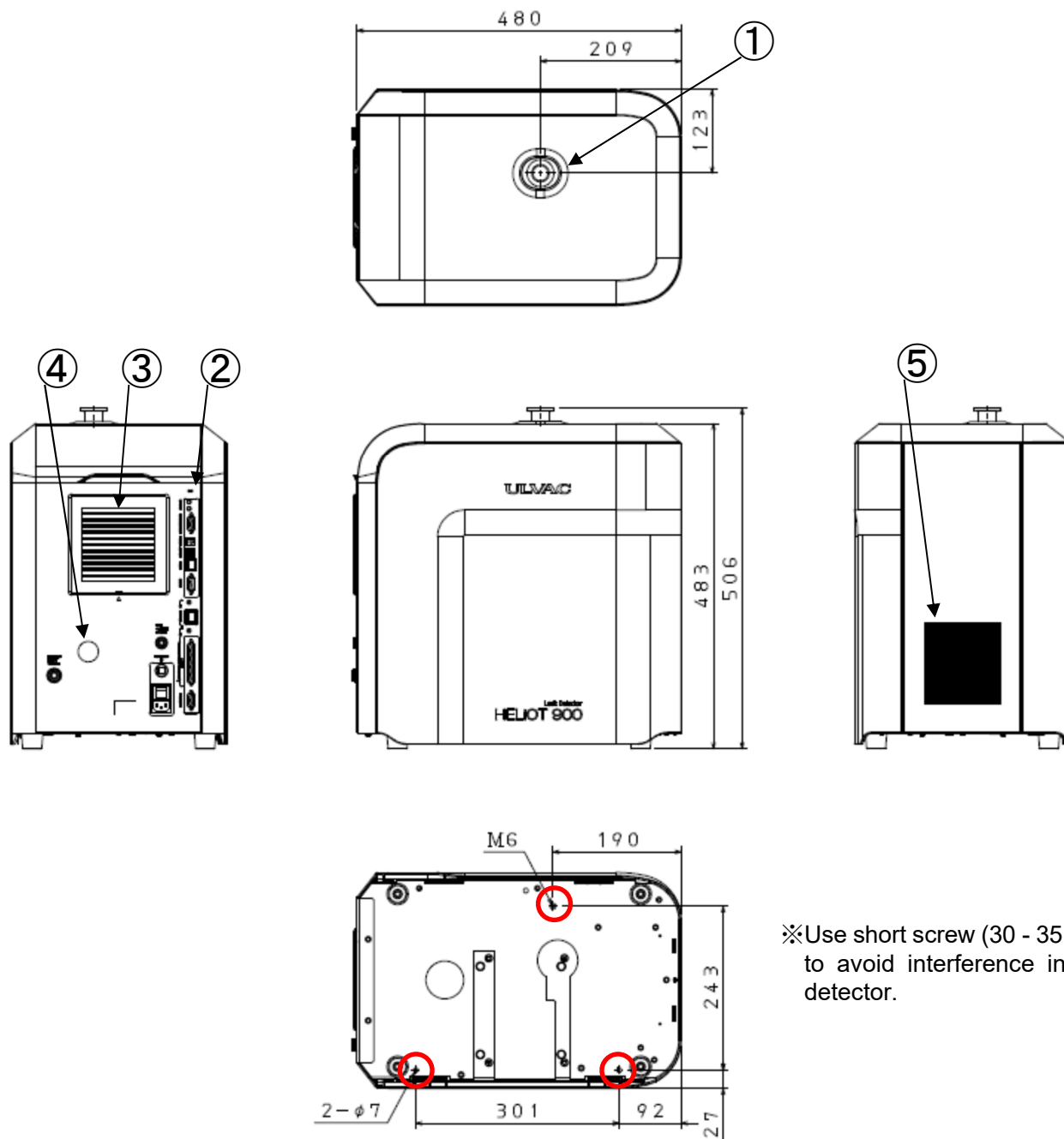
Controller unit	4.3 type TFT color LCD
Dimensions	W124.9 × H90.4 × D38.8
Operation range	Cable length: 2.5m,5m,10m or 15m
Language	English, Japanese, Korean, Simple Chinese, Traditional Chinese

1. HELIOT 900 Series Specifications and Configurations

- (*1) In order to reduce He back ground residues in the main unit right after activation or depending on the customer's conditions of use, it may need several hours of warm up operation.
- (*2) The minimum detectable leak rate is defined as 1σ (one sigma) standard deviation value of the leak rate measurements collected over a 10 second time period with the unit operating in ULTRA flow test mode, with the leak rate filter setting on SLOW, and with a blank flange connected to the test port.
- (*3) It depends on operational environment.
- (*4) It may differ depending on communication condition, brightness of the screen or volume.
- (*5) Under the environment of high He concentration ($>1000\text{ppm}$), due to characteristics of pump configuration, the back ground becomes high and the minimum detectable leak rate may largely increase.
- (*6) Specification by Sniffer method. No hydrogen can be measured.
- (*7) Cycle test cannot be selected with Panel Mount type.
- (*8) The wireless communication of this unit uses the frequency band of channel 6 ($2.437\text{ [GHz]} \pm 11\text{ [MHz]}$). Therefore, if there are devices that use the same frequency band nearby, wireless communication may not possible due to wave interference from those devices.

1-4 HELIOT Configuration (drawing)

1-4-1 Base Type 901W1/901D2



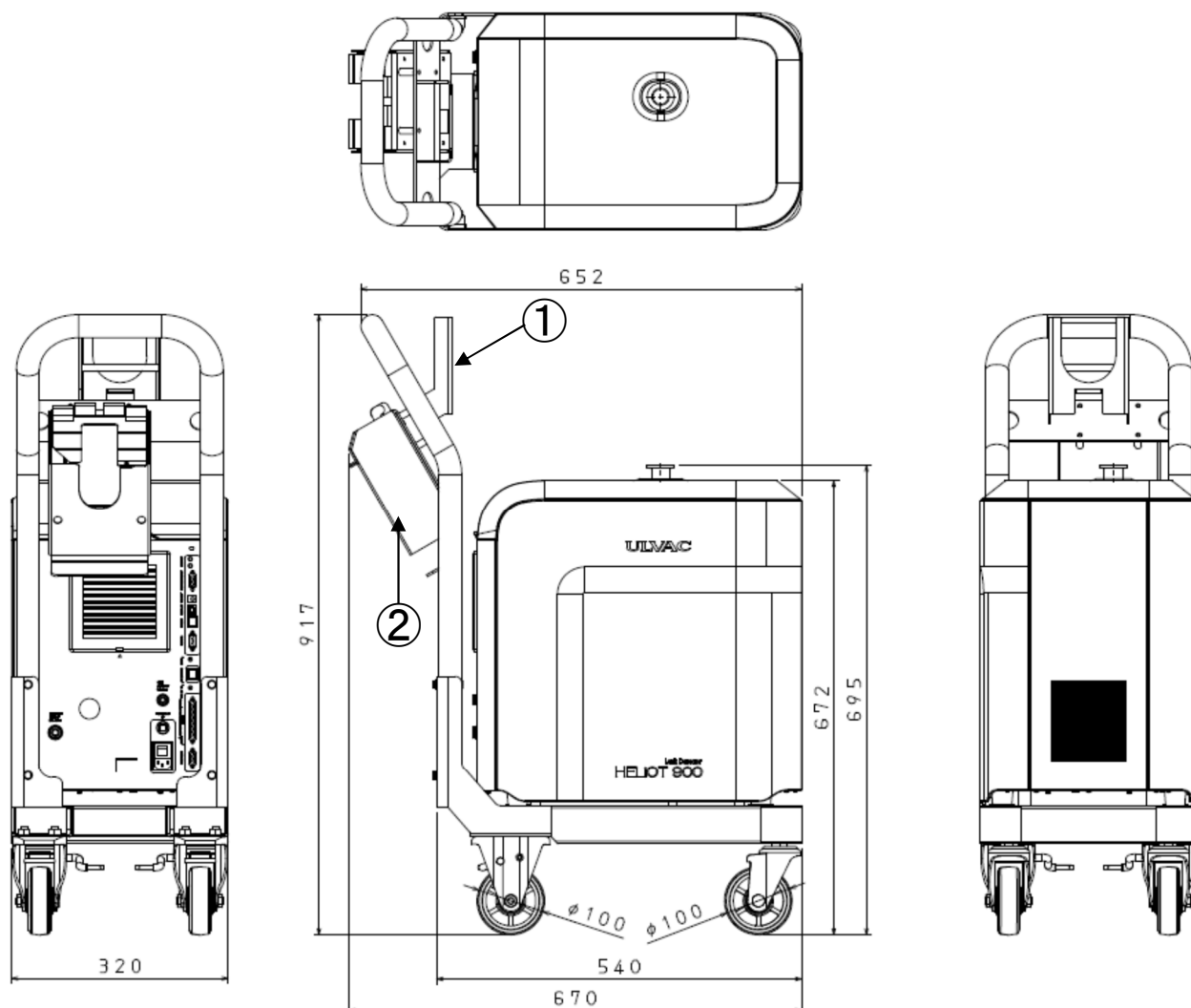
※Use short screw (30 - 35 , M6)
to avoid interference in side
detector.

No.	Name	Function
1	Test port	Connects to the test subject or sniffer unit. (NW25)
2	Connector panel	Contains the main breaker, power supply connector, and external input/output connectors. See 1-7 for details.
3	Fan	Fan for suction (filter attached).
4	Oil view port	A view port to check the oil condition of the rotary pump. (901D2 will blank)
5	Fan	Fan for cooling exhaust.

1-4-2 External view Low cart.

External view 901W1 and 901D2 low cart. (Optional)

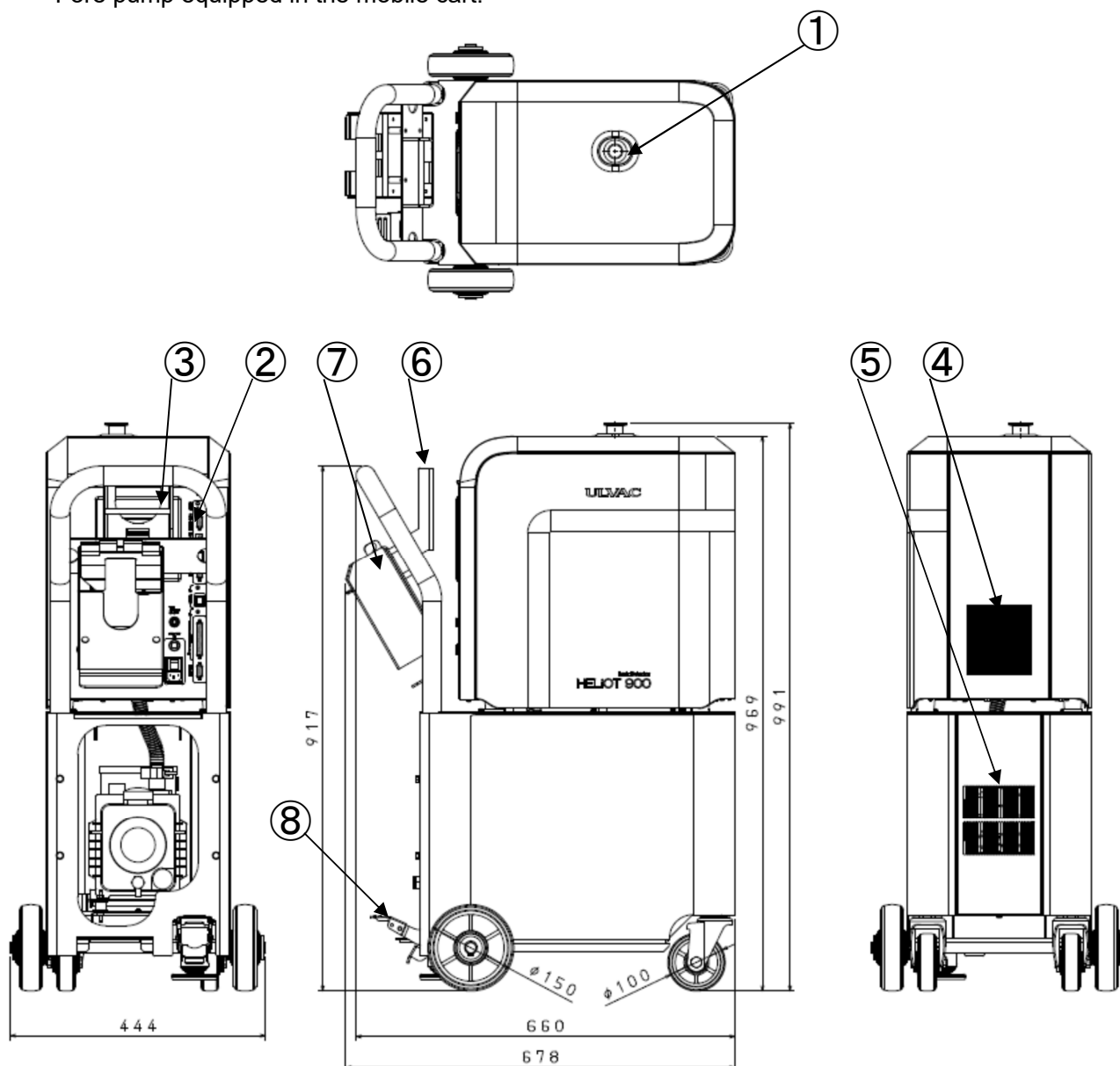
Front wheels are free, rear are with lock function ring.



No.	Name	Function
1	Tablet holder	Holder to fix the tablet position.
2	Controller storage BOX	Optional controller storage box.

1-4-3 Mobile Type (904W2/904D3/904D4) High cart

Fore pump equipped in the mobile cart.

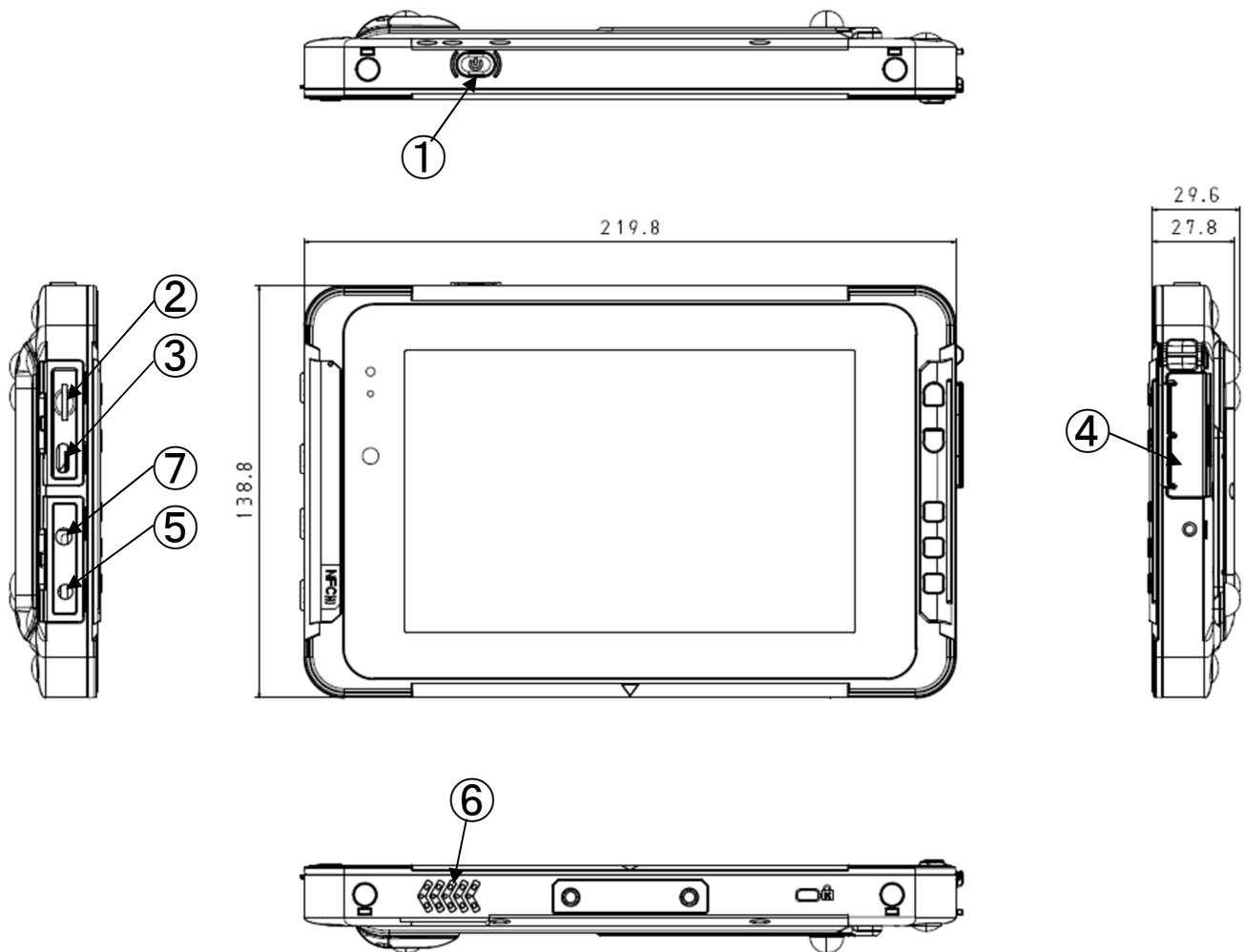


No.	Name	Function
1	Test port	Connects to the test subject or sniffer unit. (NW25)
2	Connector panel	Contains the main breaker, power supply connector, and external input/output connectors. See 1-7 for details.
3	Fan	Fan for suction (filter attached).
4	Fan	Fan for exhaust.
5	Fan	Fan for suction.
6	Tablet holder	Holder to fix the tablet position.
7	Controller storage BOX	Optional case for storing the tablet. (Option)
8	Stopper	A stopper that can fix the leak detector in a simplified manner.

1-4-4 Display unit

1-4-4-1 Tablet type

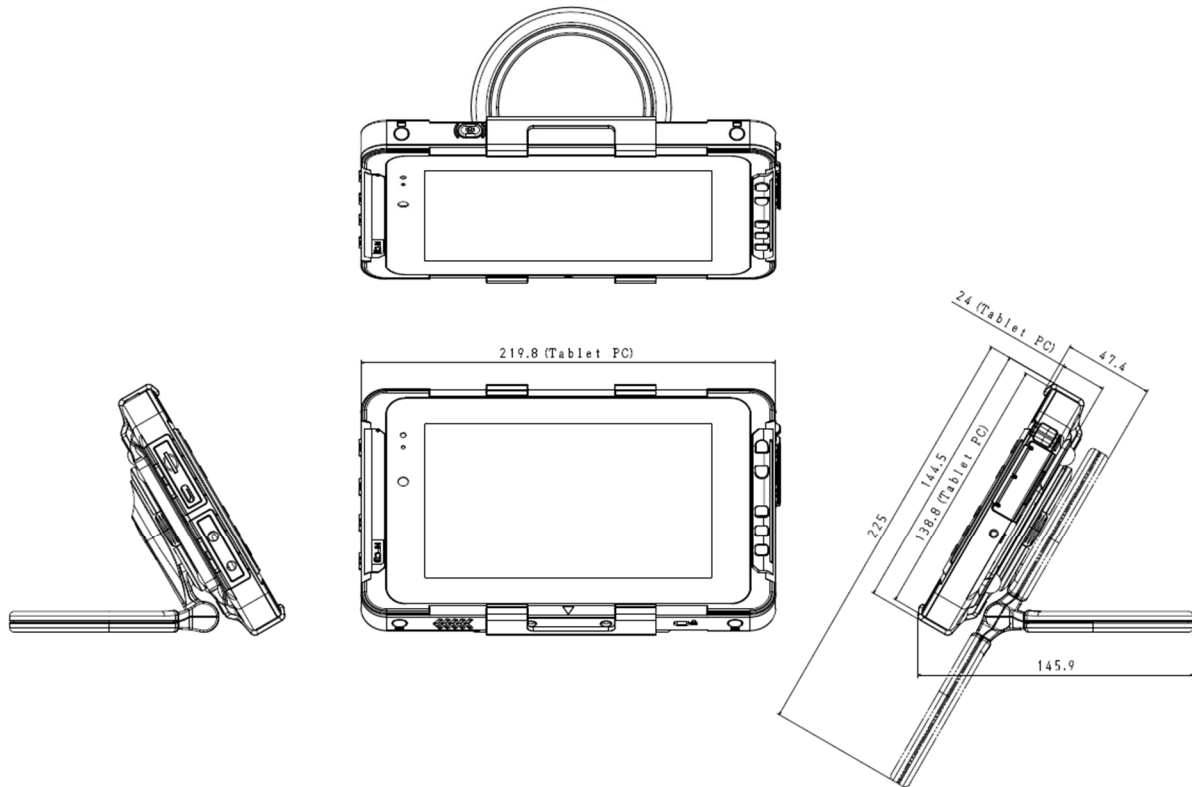
1-4-4-1-1 Tablet type appearance



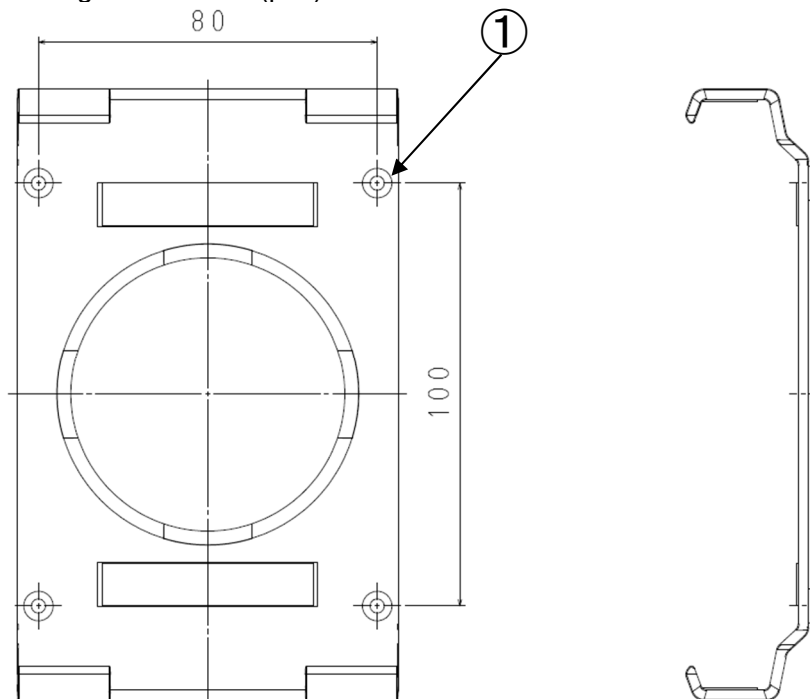
No.	Name	Function
1	Tablet power switch	Turn ON/OFF the power switch of the tablet. To turn on the power supply of the tablet, press power supply button for 2 seconds. To start the tablet from sleep mode, press power supply button for 0.5 seconds. If the tablet does not respond, keep the power supply button pressed and turn OFF the power supply mandatorily.
2	microSD card slot	MicroSD card of 8G bytes can insert. An activation data, error, each setting and test data will be logged in the microSD.
3	USB Type-C connector	This 1.7m connection cable is used to connect the HELIOT main unit to the Tablet for wired connection.
4	USB Type-A connector	This 4.7m connection cable is used to connect the HELIOT main unit to the Tablet for wired connection.
5	DC input jack	Use for power wiring connection of HELIOT with the tablet by attached Cable or to supply a direct power from the AC adaptor.
6	Speaker	Speaker
7	φ3.5mm ear phone jack	Jack to connect the ear phone or speaker. The integrated speaker will automatically turns off when the phone jack is connected.

1-4-4-1-2 Tablet Stand

All models operate with common tablet type computer.
The screen allows automatic rotation of 180 degrees.



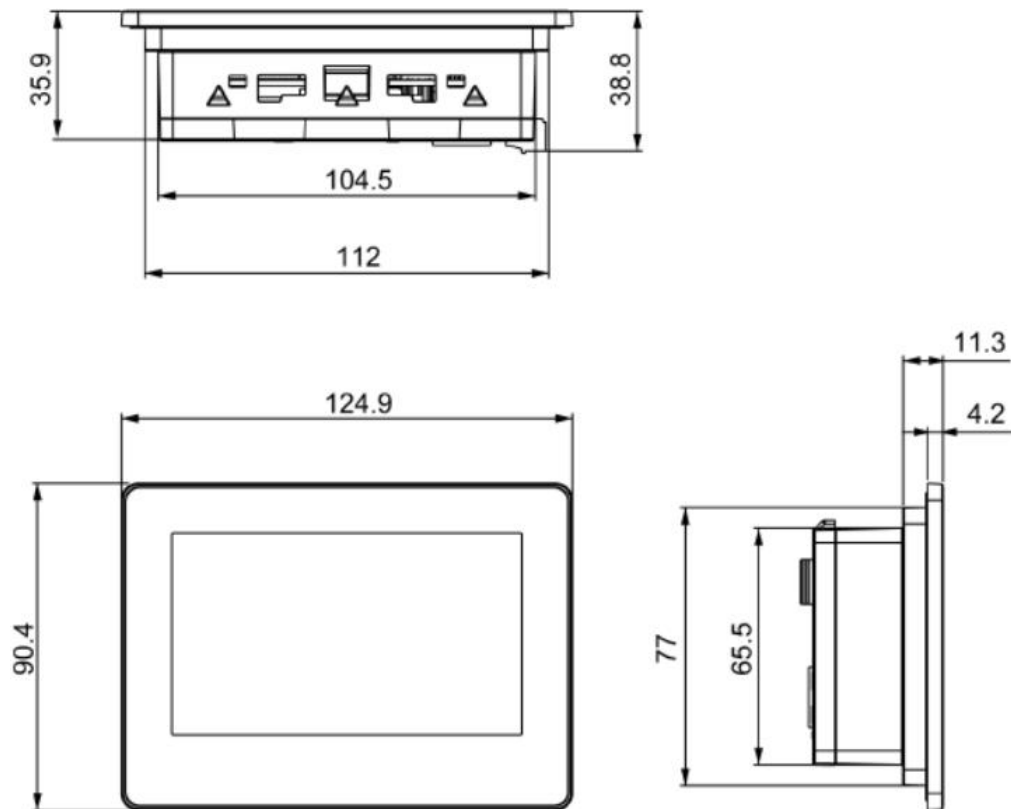
Handle is fixed to the plate. Before fixing the tablet stand with screws, remove the handle and use the fixing hole. Fixing will be with 4(pcs) flat head M3 screws.



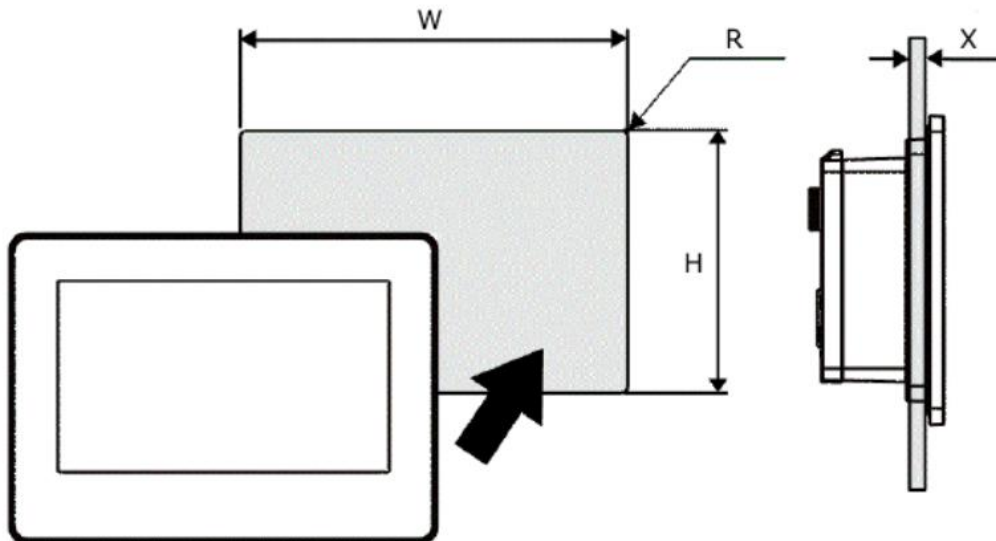
No.	Name	Function
1	Holes for securing panels	Counter sinking treated for M3 counter sunk screw. Provided for securing to your panels. M3 counter sunk screw

1-4-4-2 Panel Mount type (-P)

1-4-4-2-1 Panel Mount type appearance

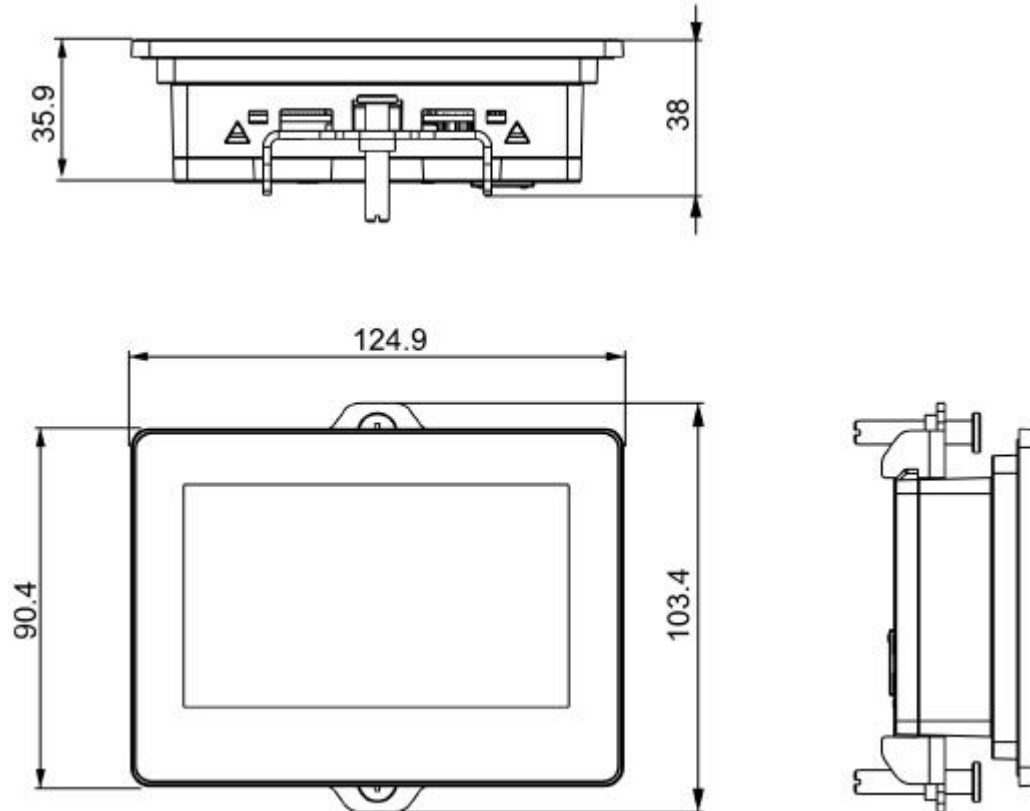


1-4-4-2-2 Panel cutout dimensions

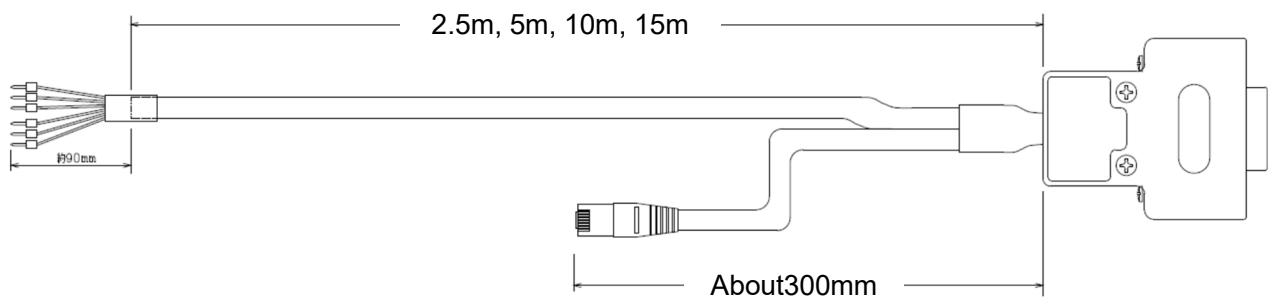


W	H	X	R
112.5mm(+1/-0)mm	77.5mm(+1/-0)mm	1.5~6mm	Max 3mm

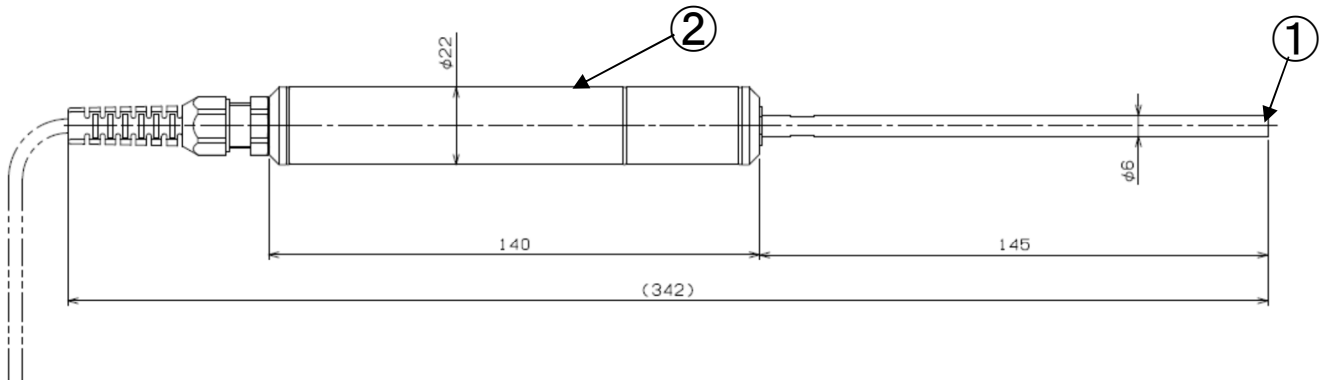
1-4-4-2-3 Appearance with mounting bracket



1-4-4-2-4 Communication cable



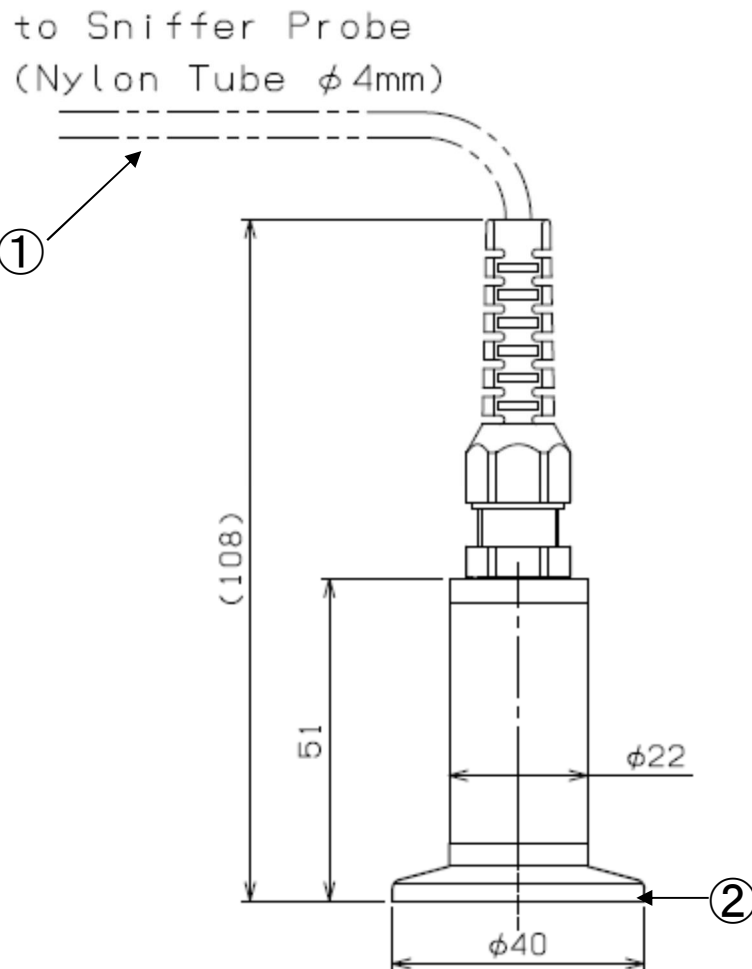
1-4-5 Sniffer Probe for AS/BS (Optional)



to Heliot900
TESTPORT/Booster Pump Unit
(Nylon Tube φ4mm)

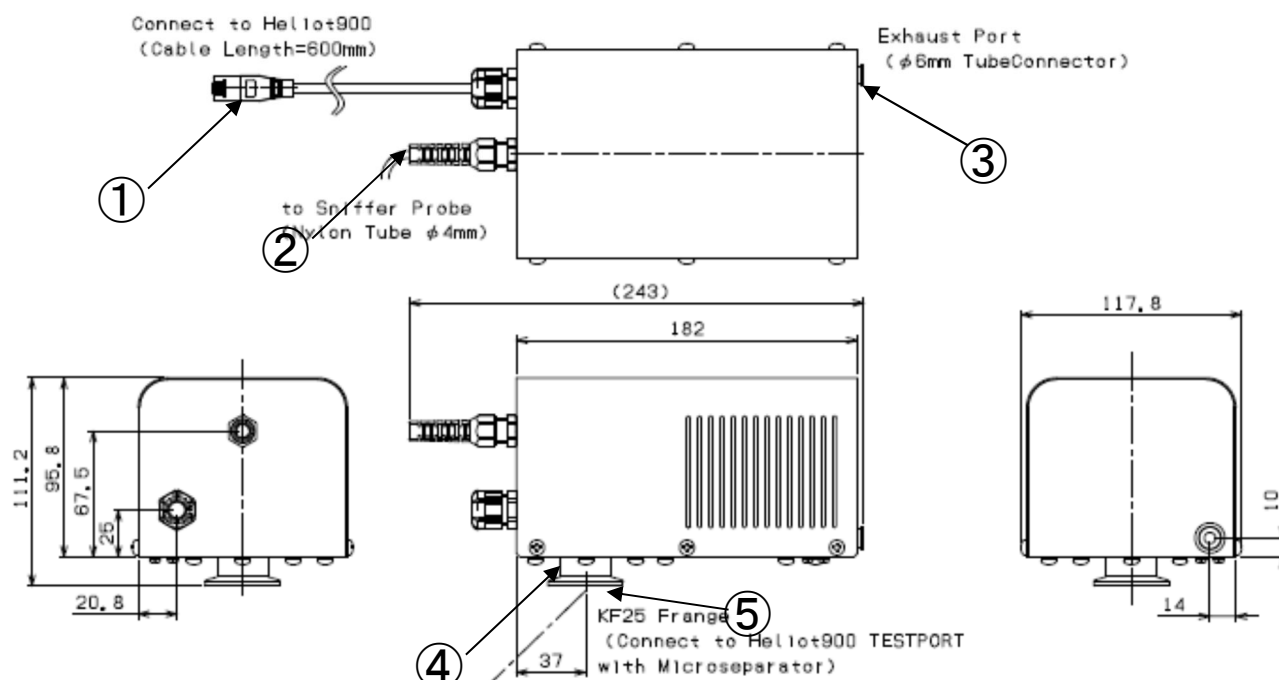
No.	Name	Function
1	Sintered filter	Filter to prevent contamination of dirt.
2	Grip	The probe grip.

1-4-6 Sniffer Unit AS (Optional)

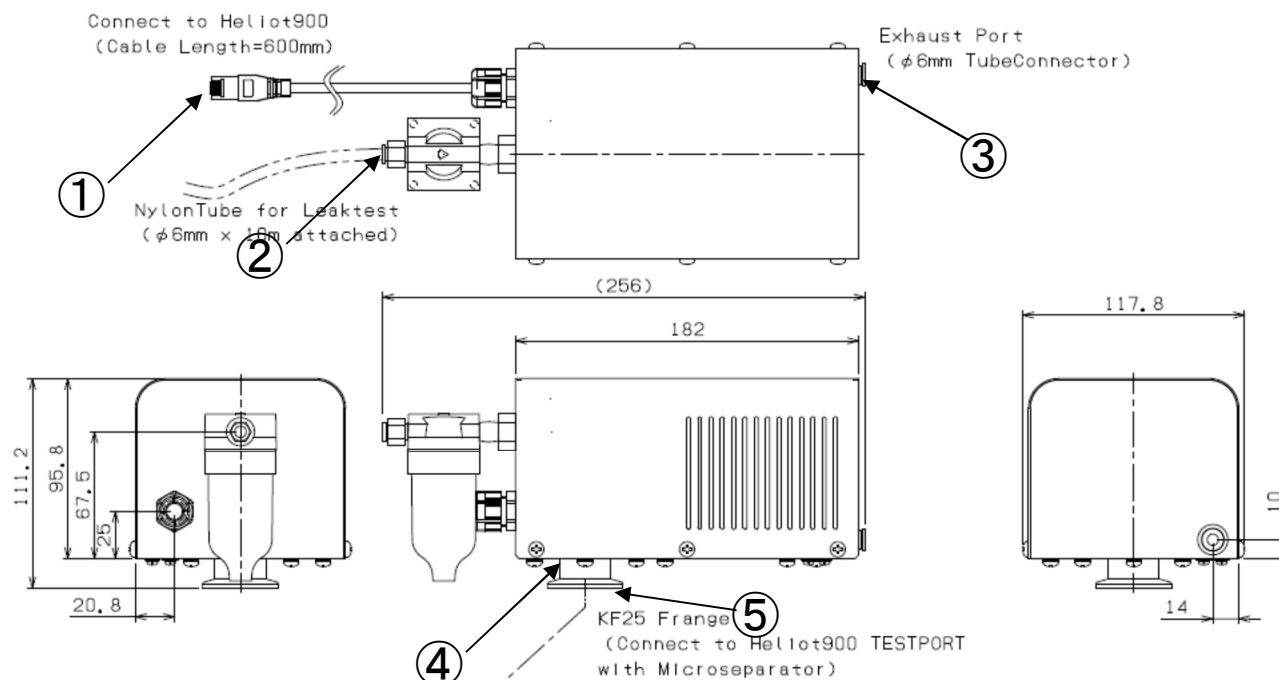


No.	Name	Function
1	Probe connection port	Used for installing Sniffer probe of Section 1-4-5.
2	Test port connection flange	Flange for connecting to the test port. (NW25)

1-4-7 Sniffer Unit BS (Optional)

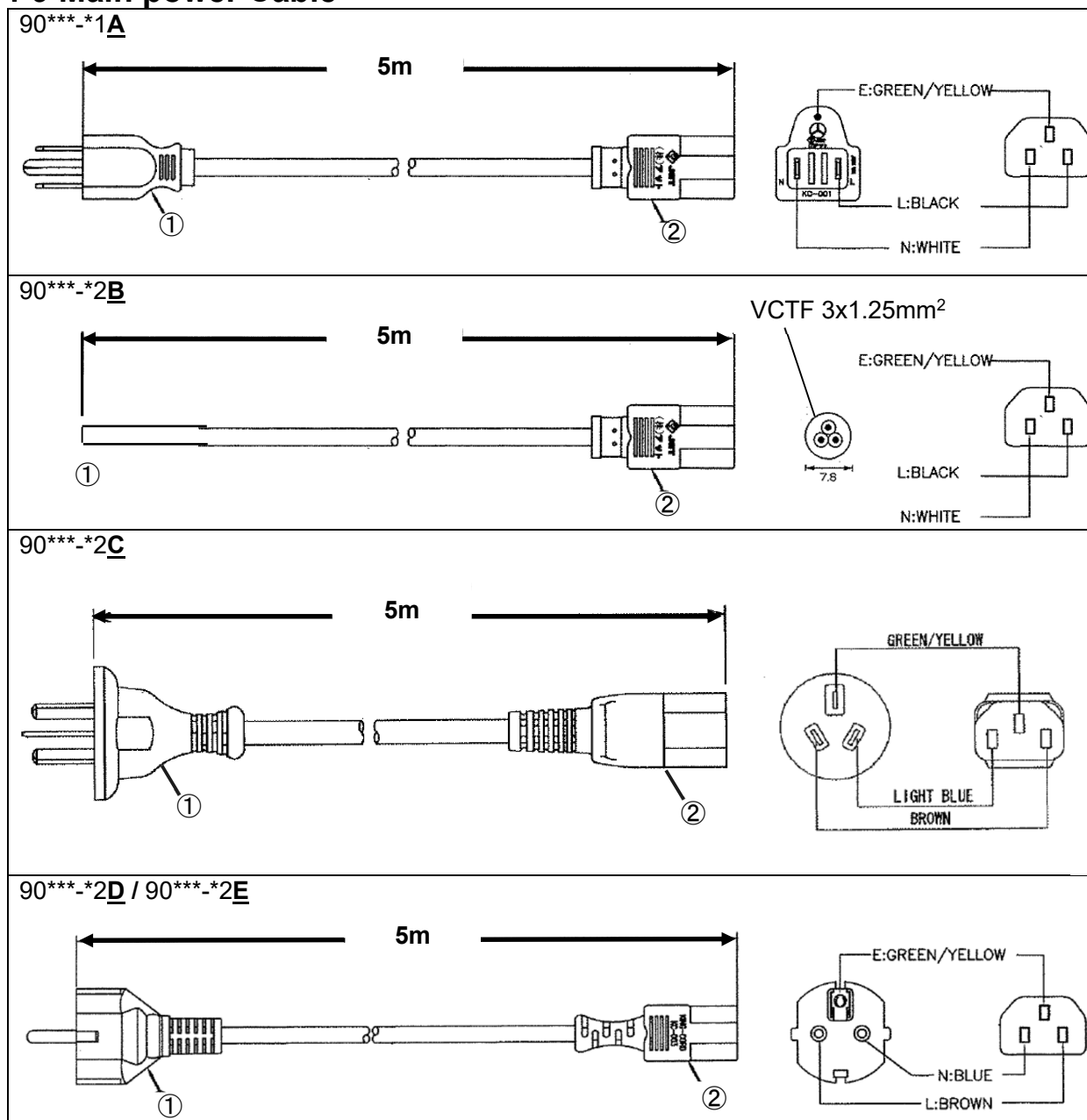


1-4-8 Sniffer Unit BT (Optional)



No.	Name	Function
1	Cable	Cable to connect the main leak detector and sniffer unit.
2	Probe connection port	Used for installing Sniffer probe of Section 1-4-5. Not removable.
3	φ6 joint	A joint where exhaust the suction gas.
4	Test port flange	Flange for mounting the sniffer unit to the test port.
5	Microseparator	A membrane that maintains the pressure differential between the atmosphere and test port flange. Model: MS-80

1-4-9 Main power Cable



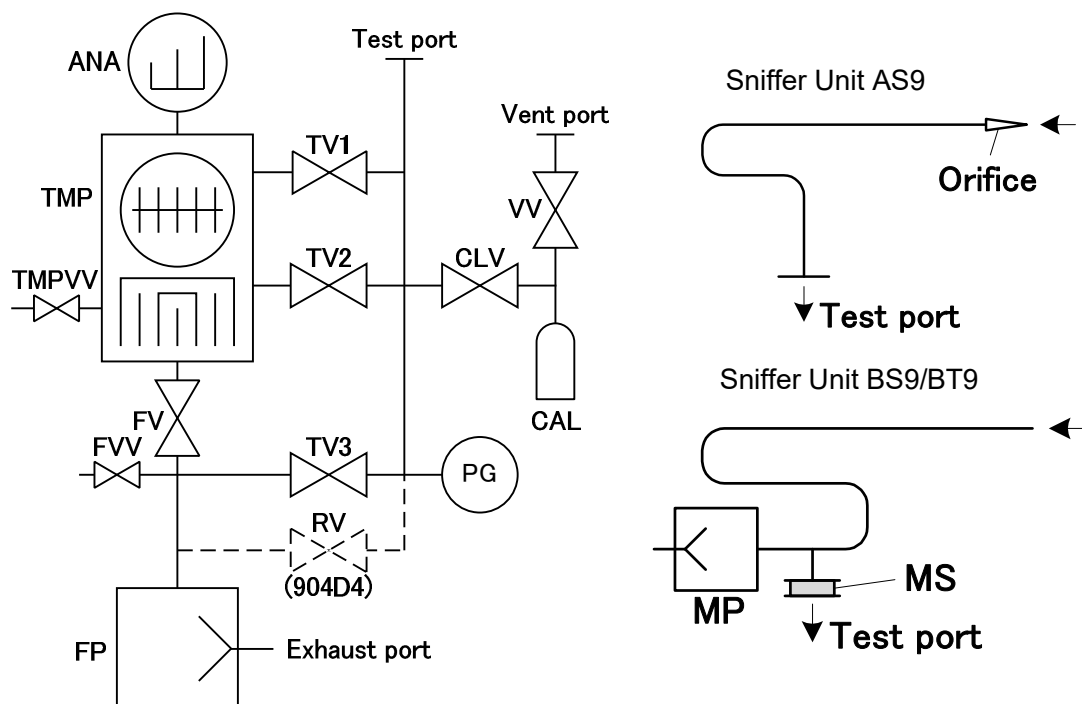
Applicable Model	Safety Standard / Nation *	Rated voltage/ Rated current
90***-1A	JIS/Japan (PSE), UL/America, CSA/Canada	AC125V / 15A
90***-2B	JIS/Japan (PSE), UL/America, CSA/Canada	AC250V / 15A
90***-2C	GB/China (CCC)	AC250V / 10A
90***-2D	KS/Korea	AC250V / 10A
90***-2E	VDE/Germany, KEMA/Netherlands, CEBEC/Belgium, oVE/Austria, SEMKO/Sweden, DEMKO/Denmark, FIMKO/Finland	AC250V / 10A

* Please purchase a power cable that applied to your nation's standard, rated voltage and rated current when your nation's standard is not included above

No.	Name	Function
1	Plug	Connect to your electric socket.*
2	Connector	Connect to the connector panel of HELIOT.

* Power cable attached to 90***-2B is cut without plug connection.

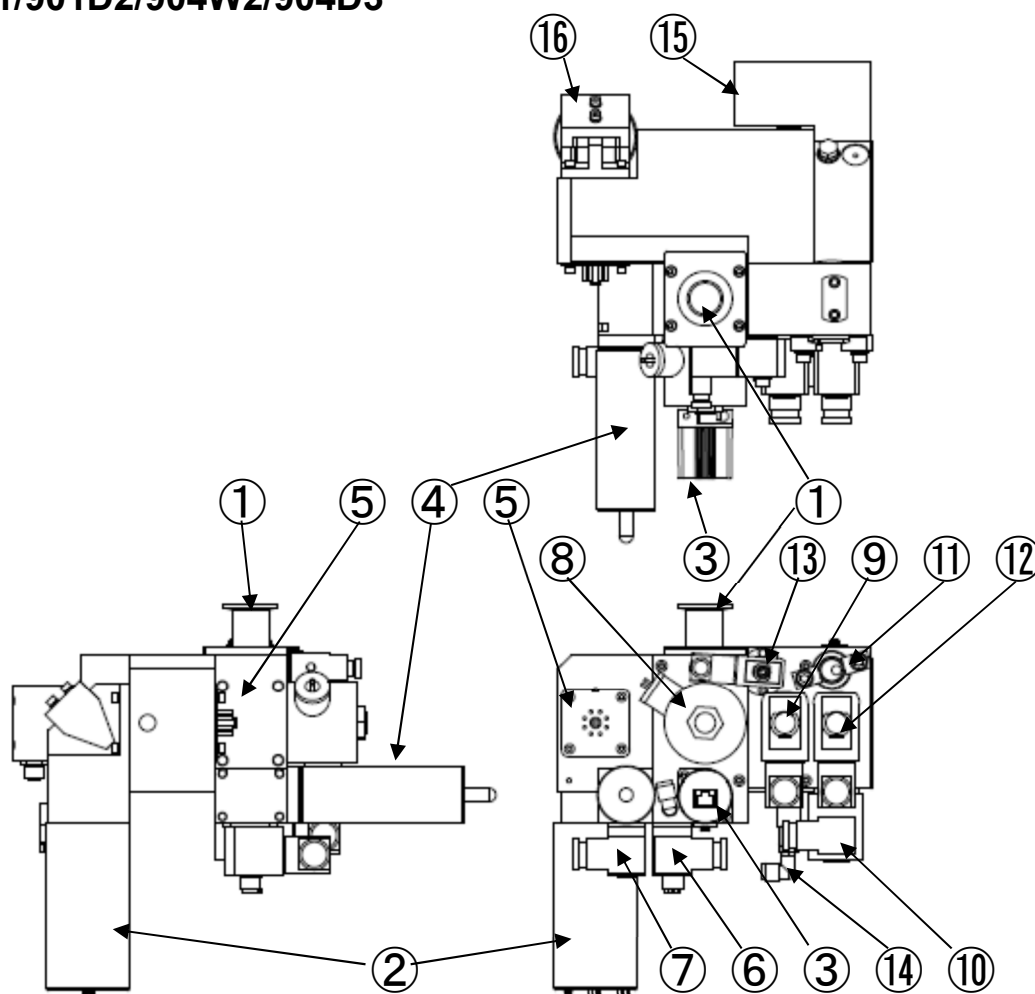
1-5 Vacuum System Diagram



Symbol	Name	Function
TP	Test port	Connects to the test subject or sniffer unit. (NW25)
CAL	Internal calibration leak	Calibration leak of 10^{-8} [Pa·m ³ /s] Calibrated by using the set calibration leak.
CLV	Calibration leak valve	Valve that opens when measuring the calibration leak.
VV	Vent valve	Valve that vent the test port.
PG	Pirani vacuum gauge	Observing the test port pressure. Using ULVAC's vacuum gauge (Pirani SPU, Sensor head WP-01)
TV1	Test valve 1	Opens when Ultra flow is used.
TV2	Test valve 2	Opens when Fine flow is used.
TV3	Test valve 3	Opens when Gross flow is used.
RV	Roughing valve	Valve is open at the next timing. - During the roughing in the internal of the test subject, - At the gross test - At fine test It is a valve installed only in 904D4.
ANA	Analyzer tube	90 degrees magnetic field deflection mass spectrometer. 2 filaments (Ir/Y ₂ O ₃) at the Ion-source on board to this analyzer.
TMP	Turbomolecular pump	Pump to exhaust air at test port and analyzer. Pump with He exhaust speed of 31 [ℓ/s].
TMPVV	TMP vent valve	Vents the turbo molecular pump when the instrument stops.
FV	Fore line valve	Fore line valve for Turbo molecular pump which closes during test port roughing.
FVV	Fore line vent valve	Vents the fore line when the instrument stops and at clean up timing.
FP	Fore pump	Functions as a roughing pump for the test port and auxiliary pump for the turbo molecular pump.
MP	Diaphragm pump	Small diaphragm pump, used for probe suction
MS	Microseparator	Creates a pressure differential.
SP	Sniffer probe	Takes in atmosphere during Sniffer method test.

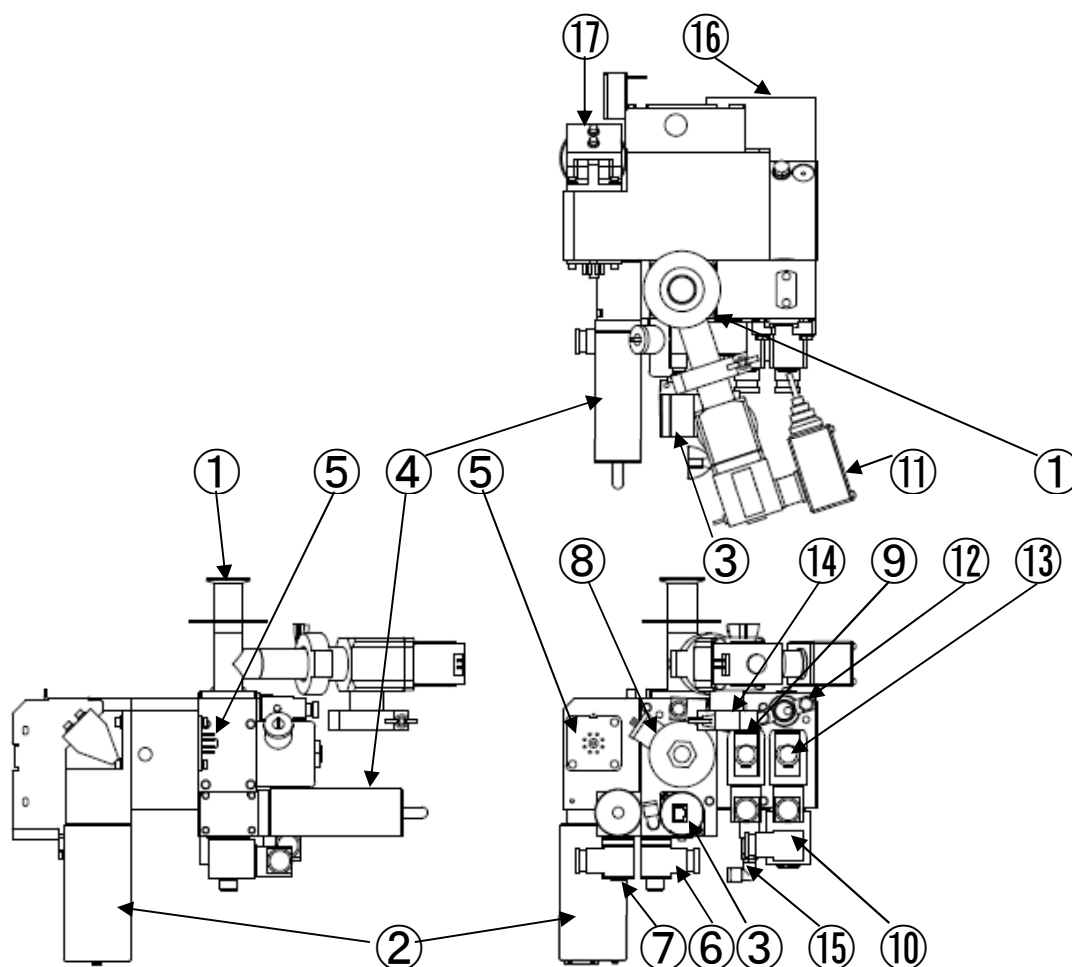
1-6 Turbo Molecular Pump Unit

1-6-1 901W1/901D2/904W2/904D3



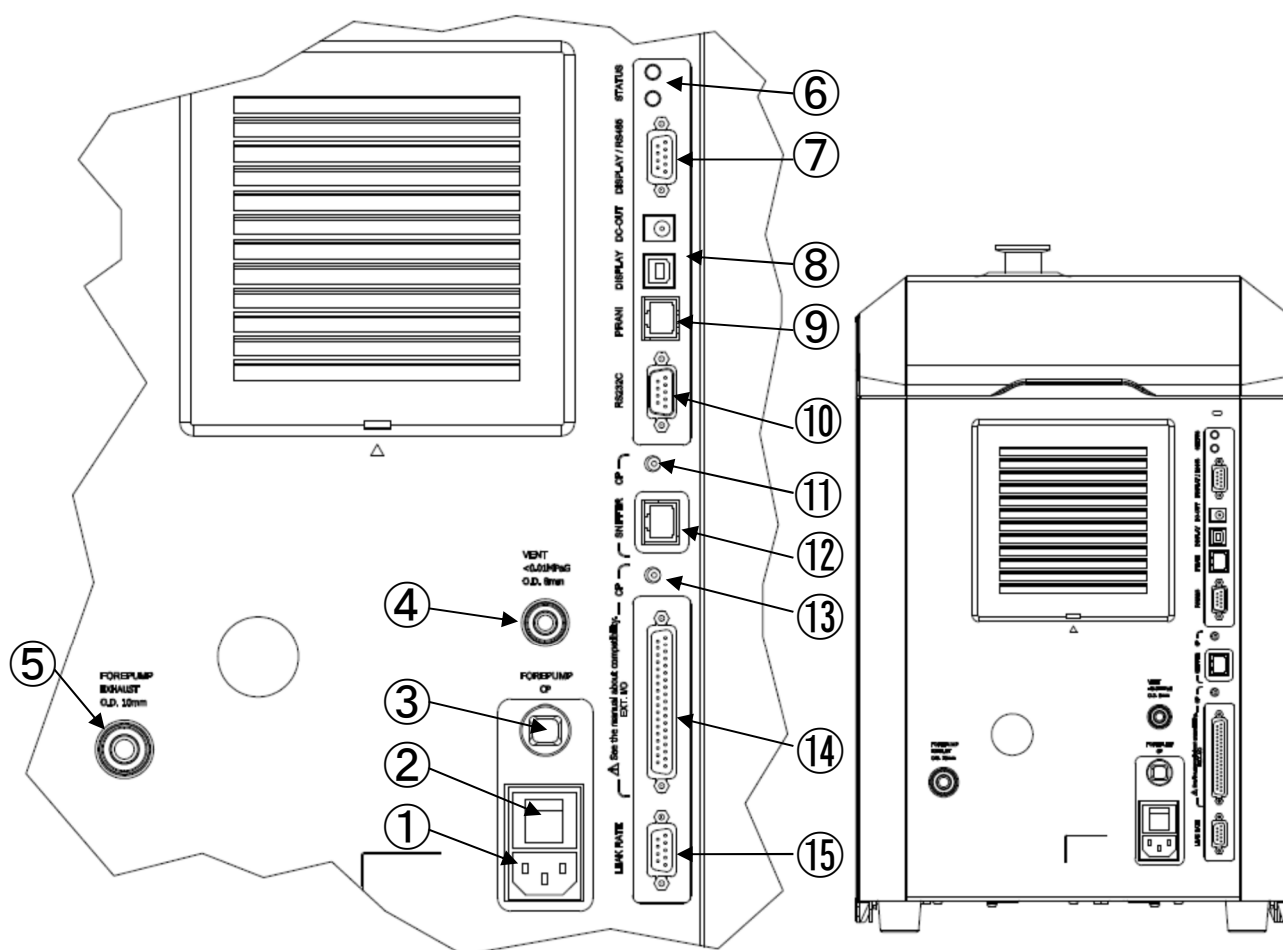
No.	Name	Function
1	Test port	Connects to the test subject or sniffer unit. (NW25)
2	Collector assy	Employs circuit to amplify the detected ion current.
3	Pirani vacuum gauge	Observing the test port pressure. Using ULVAC's vacuum gauge (Pirani SPU, Sensor head WP-01)
4	Internal calibration leak	Calibration leak of 10^{-8} [Pa·m ³ /s] Calibrated by using the set calibration leak.
5	Ion source	Ion source. Two Ir/Y ₂ O ₃ filaments are mounted at Ion source of analyzer.
6	Vent valve	Valve that vent the test port.
7	Calibration leak valve	Valve that opens when measuring the calibration leak.
8	Test valve 1	Opens when Ultra flow is used.
9	Test valve 2	Opens when Fine flow is used.
10	Test valve 3	Opens when Gross flow is used.
11	Fore line pipe connection port	Connects fore line piping.
12	Fore line valve	Fore line valve for Turbo molecular pump which closes during test port roughing.
13	Fore line vent valve	Vents the fore line when the instrument stops and at clean up timing.
14	TMP vent valve	Vents the turbo molecular pump when the instrument stops.
15	TMP controller	Employs drive circuit of turbo molecular pump.
16	Magnet	Magnet to build magnetic field inside the analyzer tube.

1-6-2 904D4



No.	Name	Function
1	Test port	Connects to the test subject or sniffer unit. (NW25)
2	Collector assy	Employs circuit to amplify the detected ion current.
3	Pirani vacuum gauge	Observing the test port pressure. Using ULVAC's vacuum gauge (Pirani SPU, Sensor head WP-01)
4	Internal calibration leak	Calibration leak of 10^{-8} [Pa·m ³ /s] Calibrated by using the set calibration leak.
5	Ion source	Ion source. Two Ir/Y ₂ O ₃ filaments are mounted at Ion source of analyzer.
6	Vent valve	Valve that vent the test port.
7	Calibration leak valve	Valve that opens when measuring the calibration leak.
8	Test valve 1	Opens when Ultra flow is used.
9	Test valve 2	Opens when Fine flow is used.
10	Test valve 3	Opens when Gross flow is used.
11	Roughing valve	Valve is open at the next timing. - During the roughing in the internal of the test subject, - At the gross test - At fine test
12	Fore line pipe connection port	Connects fore line piping.
13	Fore line valve	Fore line valve for Turbo molecular pump which closes during test port roughing.
14	Fore line vent valve	Vents the fore line when the instrument stops and at clean up timing.
15	TMP vent valve	Vents the turbo molecular pump when the instrument stops.
16	TMP controller	Employs drive circuit of turbo molecular pump.
17	Magnet	Magnet to build magnetic field inside the analyzer tube.

1-7 Connector Panel



No.	Name	Function
1	AC INPUT connector	Connect the power supply cable to the main unit body.
2	MAIN POWER Switch	Main power switch.
3	FORE PUMP Circuit protector	Shuts off the power when a fore pump malfunction occurs.
4	VENT PORT	Port to supply gases (example : Nitrogen, Dry air...etc.) to the HELIOT. The tubing size of $\phi 8$. Pressure to be adjusted under 0.01MPa. A filter of 5 μ m is included.
5	PUMP EXHAUST	Exhaust port of fore pump is connected in 901W1/D2. The port tube size is $\phi 10$. Be careful not to block the port.
6	STATUS	LED which shows the status of HELIOT. Red : Error , Blue flashing : Start up, Blue light on (solid) : Ready / testing

1. HELIOT 900 Series Specifications and Configurations

No.	Name	Function
7	DISPLAY/RS485	Please connect the cable of panel mount type. Use to connect by RS485 communication. (D-sub9 male, Inch screw #4-40)
8	DISPLAY/DC-OUT	Please connect when tablet specification is wired.
9	External Pirani vacuum gauge connector	Unused.
10	RS232C communication connector	Use to connect the HELIOT with Thermal printer (PRI-T9) by RS232C or RS485 communication. (D-sub9 male, Inch screw #4-40)
11	SNIFFER PUMP circuit protector	Shuts off the power to sniffer unit B*9* membrane pump when a malfunction occurs. 1A included.
12	SNIFFER connector	Used to connect the connection cable to the sniffer B*9* unit. (RJ-45 male) Please connect the cable of panel mount type.
13	EXT.I/O circuit protector for protecting power supply output	At the using of EXT.I/O, it shuts off the power to PLC when a malfunction occurs. (such as over current flow of more than 2A).
14	EXT.I/O connector	Enables external control and output of set points. (D-sub37 female, Inch screw #4-40).
15	LEAK RATE connector	Outputs voltage that corresponds to the leak rate. (D-sub9 female, Inch screw #4-40).



WARNING

Fore Pump Exhaust Vent

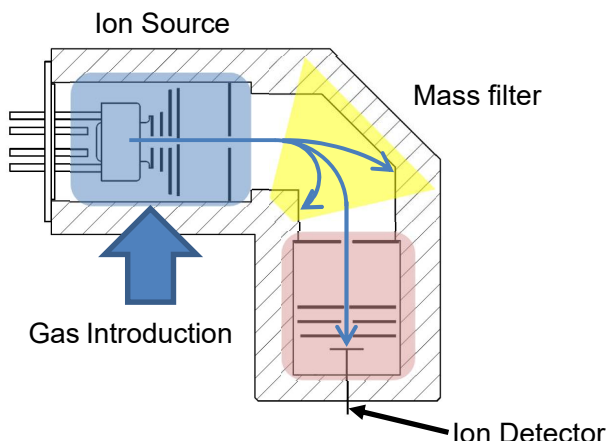
Do not block the fore pump's exhaust vent. It may explode to the manufacturing facility when fore pump exhaust vent is pressurized

1-8 Measurement principle

1-8-1 Ion Current

HELIOT is a leak detector which detects ion current of helium or hydrogen by using principles of magnetic deflection mass spectrometer.

Ion current is measured by the analyzer part of HELIOT.

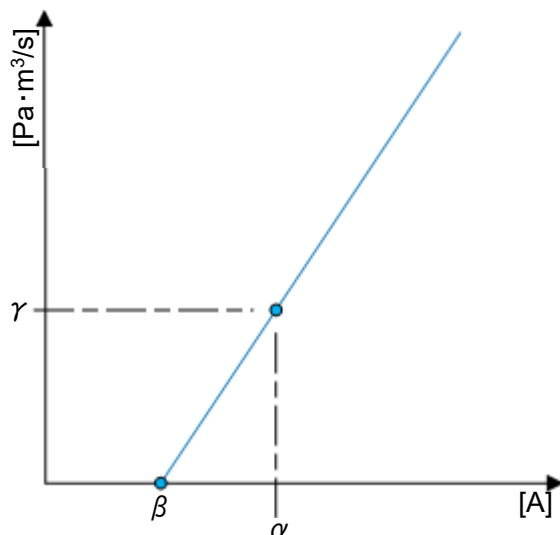


- ① **Ion source :**
Thermal electrons are generated heating the filament. Generated electrons collide with gas molecules, which are introduced to the analyzer part and then induce ionization. Produced ions gain energy from the electric field to which an accelerating voltage is applied and travel into a molecule fragmentation part. A component called "ion source" unit is available as an ion source.
- ② **Mass filter :**
Ions emitted from the ion source travel through the magnetic field which is generated by the magnet of the mass filter. Trajectory of moving ions depends on their mass-to-charge ratio (M/z). A radius of trajectory of ions with small mass-to-charge ratio is small, and that of ions with large mass-to-charge ratio is large.
- ③ **Ion Detector :**
There are slits to pass only helium ions (or hydrogen ions) to the ion detection electrode (an ion collector). Helium ions, which passed through slits, reach to the ion collector and are measured as ion current.

1-8-2 Sensitivity Calibration (Leak Rate)

To measure leak rate, it is necessary to associate the detected ion current [A] with the leak rate [$\text{Pa} \cdot \text{m}^3/\text{s}$].

HELIOT performs this operation by using a known calibrated leak. The process is called sensitivity calibration.



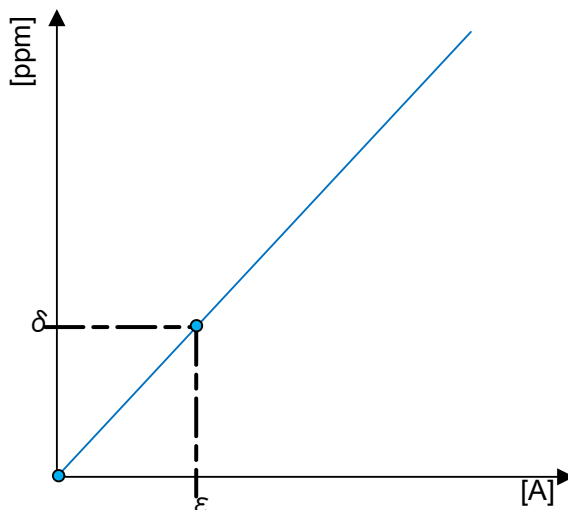
【Relationship between leak rate and ion current】

In the process of sensitivity calibration, the ion current α when intake of known calibrated leak γ is executed, and the ion current β when CLV is closed (background), are measured. A line connecting these two points, $(\beta, 0)$ and (α, γ) , shows the relationship between the ion current value and the leak rate.

※ Although there is not any introduced helium during measurement of the ion current β , the ion current value is not 0[A] because there is residual helium gas. When the ion current β is measured, the value is measured as 0 [$\text{Pa} \cdot \text{m}^3/\text{s}$]. Therefore, the ion current β is called zero point. Although zero point is measured as an initial value at sensitivity calibration, this value changes depending on the settings of the equipment. See Section 8-3 for details.

1-8-3 Sensitivity Calibration (Concentration)

Sensitivity calibration, which is executed when setting Sniffer concentration, is a measurement of helium concentration. Sensitivity calibration is the relationship between the ion current value ε (ε, δ) when intake of standard gas δ [ppm] is executed, and the origin of a graph (0, 0).



【Relationship between concentration and ion current by Sniffer method】

1-8-4 Sensitivity Value

Sensitivity value is a gradient of the graph shown in Section 1-8-2 and is given by the following equation.

$$\text{Sensitivity Value [Pa} \cdot \text{m}^3/\text{s}] = \frac{\gamma [\text{Pa} \cdot \text{m}^3/\text{s}]}{\alpha[A] - \beta[A]} \times 1 \times 10^{-16} [A]$$

Since HELIOT900 has a resolution of 1×10^{-16} [A] in a microcurrent detection circuit, sensitivity value is defined as a value which is multiplied by 1×10^{-16} [A]. Sensitivity value can be checked with [MENU] → [Information] → [Startup DATA].

When sensitivity value is low (sensitivity is good): It shows the state in which value α is large and HELIOT detects large ion current.

When sensitivity value is high (sensitivity is poor): It shows the state in which value α is small and HELIOT detects small ion current only.

2. Set Up

2-1 Unpacking

- 1) Check for any damages to each equipment or outside damage made to the package as soon as you receive the unit even if the equipment is not used right away.
- 2) Check the quantity of components. (The table below corresponds to the standard specification and optional components.)

Tablet type specification list

Name	Type/Specification	Quantity
HELIOT main unit		1 pc
Tablet		1 pc
Controller cable, 1.7m set	CONT-SET-CABLE-L1.7-710RK	1 set
Tablet fixing disc		1 pc
Main power cable	Cable length 5m	1 pc
Operation manual (CD)		1 pc

Panel mount type specification list

Name	Type/Specification	Quantity
HELIOT main unit		1 pc
Touch panel display		1 pc
DC Power supply connector		1 pc
COM I/F connector		1 pc
Installation fastener		2 pc
Main power cable	Cable length 5m	1 pc
Operation manual (CD)		1 pc

List of Optional Components

Name	Type/Specification
Sniffer unit AS9	
Sniffer unit BS9/BT9	
Microseparator	MS-80
Floor cart (for 901)	CART-91
Controller storage box	CARTBOX-9
Carry case (for 901)	CASE-91
Oil mist trap (for 904W2)	OMTW2
Controller cables, 4.7 m sets	CONT-SET-CABLE-L4.7-710RK
Controller charger	
Touch pen	PSA-TPA1
Security wire set	AL-29ALM-SLE-1P
Dial lock for security	ESL-NK03
Membrane type calibration leak	CLM-07*/CLM-08*/CLM-09*/CLM-10*
External calibration leak	CLC-04A/CLC-05A/CLC-06A
RT angle manual valve	VLH-SB025KF
Helium spray gun	AG50
Connector set	CONNECTOR-91
Panel Mount type cable	PLC-CABLE-L** The cable length is in*



CAUTION

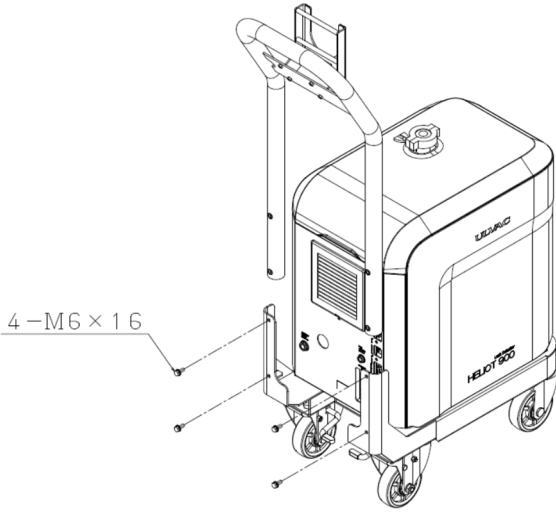
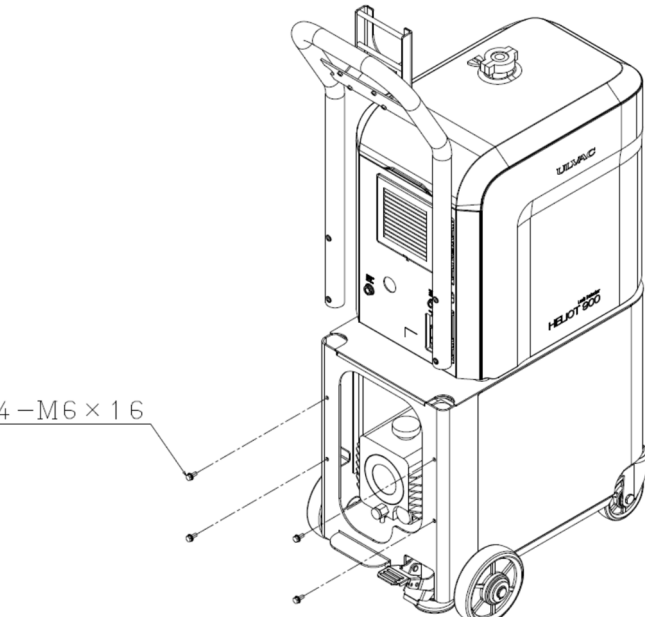
Hold Horizontally

Do not incline more than 30 degrees when unpacking or moving the equipment and maintain horizontal position during installation.

Failure to do so may result in oil leaks or damage to the equipment.

2-2 Assembling/Moving/Installation

2-2-1 Assembling

1) Low cart with handled fixed.	2) High cart with handle fixed.
 4 - M6 × 16	 4 - M6 × 16

- 1) Push in the handle from the top.
- 2) Secure the handle at 4 places with attaching bolts (M6x16)

2-2-2 Moving/Installation

- 1) Hold the base of the unit when lifting up the portable type. Risk of damage to resin panel when excessive force is applied.
- 2) Use a platform truck when moving portable type (901W1/901D2).
- 3) Install the main equipment on a flat and smooth horizontal surface.
- 4) Make sure not to expose the equipment to vibrations or impacts from the surrounding area.
- 5) When installing HELIOT on a surface such as on a rack, make sure the weight of the equipment is supported by the entire base of the unit
- 6) For portable type with floor cart (optional), make sure the rear casters are locked. As for mobile type (904W2/904D3/904D4), make sure the stopper is locked.
- 7) Install so that the connector of power supply cord is easily accessed.

 WARNING	Power Shutdown When installing the equipment and removing the external panels for inspection and replacement of parts, turn off the MAIN POWER switch and disconnect plug from the outlet before servicing. Possibilities of electric shock and damages to the equipment due to high voltage areas.
 CAUTION	Do Not Lift The construction of this equipment does not provide any eyebolts for cranes. Do not use lifting equipment for transport. Risk of damage to the equipment.
 CAUTION	Watch Your Step Mounting with floor cart, when moving 904W2/904D3/904D4, there is a danger of crushing your feet. Keep your feet away from the wheels when moving.
 CAUTION	Vibration Prohibited Do not expose the equipment to vibrations from surrounding machinery or impacts. Risk of damaging the equipment.
 CAUTION	Ensure Ventilation In order to cool the interior of the main unit, an intake fan is installed on the left panel and an exhaust fan is installed on the right panel. Maintain spacing of 200 mm or more between all panels. Obstructing the vents increases the internal temperature of the equipment and may damage the equipment.
 CAUTION	Caution to Moisture Do not use over water or any environment where water drops (water or any liquid). Possibilities of electrical leak and damage to the equipment.
 CAUTION	Ambient Temperature Operate between ambient temperature of 10°C to 40°C of usage environment

2-3 Connection of Test Port

2-3-1 Vacuum Method

- 1) Connect the attached blank flange (NW25) to the test port.
- 2) Fix firmly with the clamp. (attached when shipped)

2-3-2 Sniffer Method

- 1) Connect the attached Sniffer unit to the test port. When connecting the Sniffer unit BS9/BT9 to the test port, connect with the microseparator. The microseparator is to be attached with the top surface as shown in the photo on the right.
- 2) Fix firmly with the clamp.
- 3) When employing Sniffer method with the Sniffer unit BS9/BT9, connect cable from the Sniffer unit to the connector of the connector panel.



 CAUTION	Pipe Connection When installing pipings or Sniffer unit, check if the flange sheet surface or O-ring are free from scratches and dirt and ensure that it is properly connected. Risk of malfunction if leakage occurs. Additionally, use alcohol to clean any sweat or grease present. Risk of malfunction and possibility of causing damage to the parts.
 CAUTION	Load on Test Port When connecting pipe fitting to the test port, do not place loads over 50N, 5kg's, 10lbs. Risk of damaging the equipment.
 CAUTION	Foreign substances in Test Port Do not allow any foreign substances such as dirt to enter the test port. Risk of serious impact to the equipment such as leakage and damages to the Turbomolecular pump.
 CAUTION	Use of Blank Flange at Startup (Vacuum Method) Install blank flange to the test port at the time of start up. Starting the equipment with pipings and testing unit connected may result in abnormal operation
 CAUTION	Use of Sniffer Unit (Sniffer Method) Install the Sniffer unit to the test port at the time of startup. If Sniffer unit B is used, connect cable to connector panel. The Sniffer unit will not operate and cause abnormal operation if it is not connected.
 CAUTION	Microseparator (Sniffer Method) When connecting Sniffer unit B to the test port, make sure that the auxiliary microseparator is securely connected as an O-ring. If used without connecting the microseparator, it may lead to damage of the equipment. The microseparator has a proper installation orientation. Pay special attention to the correct orientation when installing.
 CAUTION	Sniffer Probe (Sniffer Method) Special care is needed for handling of the Sniffer unit. The probe may be damaged if excessive force is applied.

2-4 Electrical Connections

- 1) Make sure the MAIN POWER switch on the main unit is OFF
- 2) Connect the power supply cable to the AC INPUT connector on the main unit's connector panel.
- 3) Plug in the power cable to the correct source. In order to prevent earth leakage, always ground the equipment with class 1 equipment.

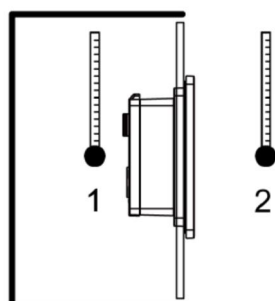
 WARNING	Power Shutdown When installing the equipment and removing the external panels for inspection and replacement of parts, turn off the MAIN POWER switch and disconnect plug from the outlet before servicing. Possibilities of electric shock and damages to the equipment due to high voltage areas.
 WARNING	Verification of Power Supply voltage The rated voltage of the equipment corresponds with the local power supply voltage must be verified before connecting the equipment to power supply. The rated voltage of this equipment can be found on the name plate of back panel of the equipment. The setting of this power supply voltage cannot be changed.
 WARNING	Power Supply Cable Always verify that the power supply cable included with the unit exceeds the unit's rating before use. Risk of fire from using a power supply cable below the unit's rating.
 WARNING	Input Power Supply Cable Use $\pm 10\%$ of rated voltage indicated on the rating plate for input voltage. See section 1-2 for the rated current. Before supplying power, always verify voltage, and permissible current of the supply side. There is a possibility of serious damage to human life or manufacturing facility in case of supplying voltage outside of the rating.
 CAUTION	Grounding In order to prevent earth leakage, always ground the equipment with a class 1 ground. When used in Europe and North America, it is class I equipment, therefore always ground the equipment with earth.
 CAUTION	Electrical Connections Connect all electrical wirings after completing installation.

2-5 Installing the display with panel mount specification

	Power Shutdown When installing the equipment and removing the external panels for inspection and replacement of parts, turn off the MAIN POWER switch and disconnect plug from the outlet before servicing. Possibilities of electric shock and damages to the equipment due to high voltage areas.
	Grounding In order to prevent earth leakage, always ground the equipment with a class 1 ground. When used in Europe and North America, it is class I equipment, therefore always ground the equipment with earth.
	Electrical Connections Connect all electrical wirings after completing installation.

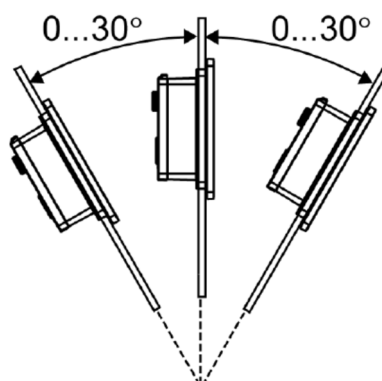
2-5-1 Installation Requirements

- 1) Check that the installation wall or cabinet surface is flat, in good condition and has no jagged edges. Metal reinforcing strips may be attached to the inside of the wall, near the panel cutout, to increase its rigidity.
- 2) Decide on the thickness of the enclosure wall 1.5~6 mm, based on the level of strength required. Even if the installation wall thickness is within the recommended range for the "Panel Cutout Dimensions", depending on wall's material, size and installation location of this product and other devices, the installation could warp. To prevent warping, the installation surface may need to be strengthened.
- 3) Use this product after confirming that ambient operating temperature(0~50°C) and ambient operating humidity (10~90%RH, no condensation, wet-bulb temperature 39°C) are within the range of those specified. When using this product assembled in a case or an enclosure, both temperatures of inside the panel and the display surface side are the ambient operating temperature.

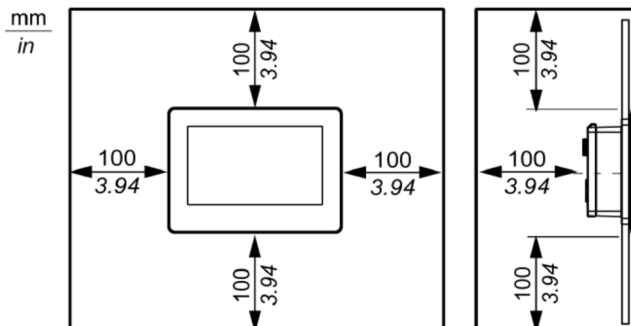


1: Cabinet interior
2: Panel face

- 4) Be sure that heat from surrounding equipment does not cause this product to exceed its standard operating temperature.
- 5) When installing this product in a slanted position, the product face should not incline more than 30°.

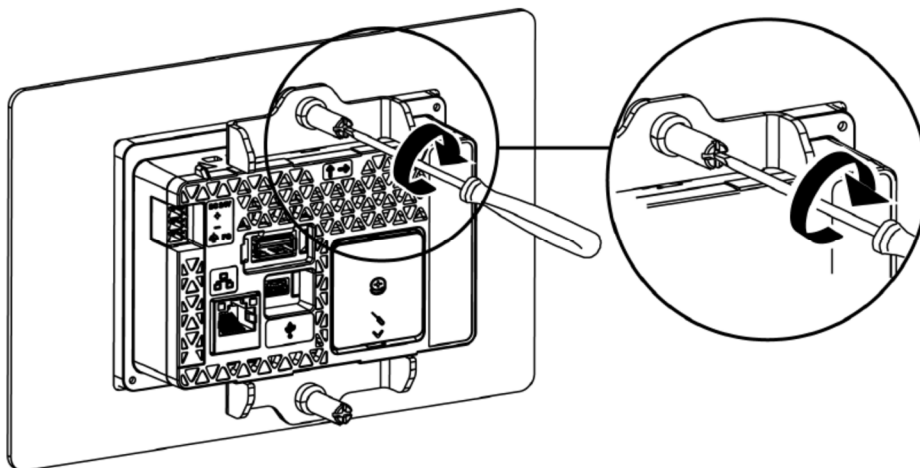


- 6) When installing this product in a slanted position with an incline more than 30° , the ambient temperature must not exceed 40°C . You may need to use forced air cooling (fan, A/C) to ensure the ambient operating temperature is 40°C or less.
- 7) For easier maintenance, operation and improved ventilation, install this product at least 100mm away from adjacent structures and other equipment as shown in the following illustration:



2-5-2 Panel Mounting Procedure

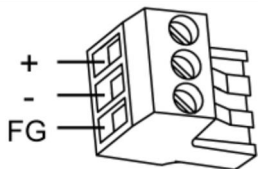
- 1) Place this product on a clean and level surface with the screen facing down.
- 2) Check that this product's gasket is seated securely into the bezel groove, which runs around the perimeter of the display panel frame. Always use the installation gasket, since it absorbs vibration in addition to repelling water. For the procedure on replacing the installation gasket, refer to Replacing the Installation Gasket.
- 3) Based on this product's panel cutout dimension, open a mount hole on the panel and attach this product to the panel from the front side.
- 4) Insert the installation fastener hooks into the insertion slots on this product. In a clockwise direction, tighten the installation fastener's screws with a screwdriver. There are two insertion slots on both the top and bottom of this product. The necessary torque is $0.35 \text{ N}\cdot\text{m}$. If you exceed the recommended torque when tightening the installation fastener's screws, the front of this product may become distorted.



2-5-3 Wiring Principles

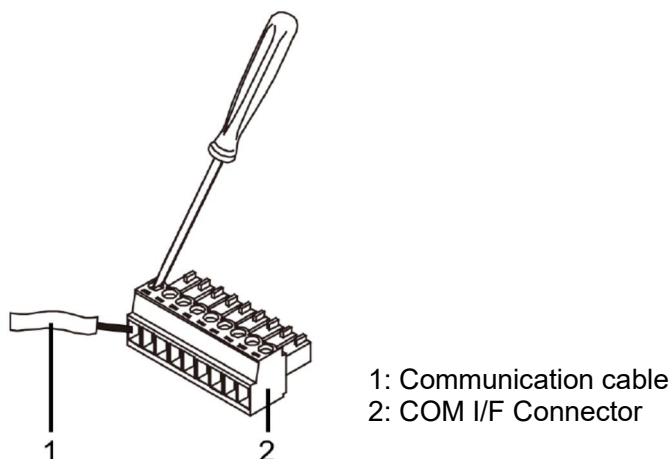
2-5-3-1 Connecting the DC Power Cord

- 1) Confirm the power cord is not connected to the power supply.
- 2) Check the rated voltage and remove the "DC24V" sticker on the DC power supply connector.
- 3) Strip the membrane of the power cord, and connect them to the power connector.
Use a flat-blade screwdriver (Size 0.4 x 2.5) to tighten the terminal screws.
The torque require to tighten these screws is 0.22 to 0.25 N•m.
- 4) Reattach the power connector (plug).

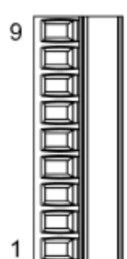
	Connection	Wire
	+	+
	-	-
	FG	FG

2-5-3-2 How to connect com i/f connector

- 1) Use a flat-blade screwdriver (Size 0.4×2.5) to loosen the terminal screws.
- 2) Strip the communications cable, and attach it to the terminal connector.



- 3) Use a flat-blade screwdriver to tighten the terminal screws on the terminal connector from step 2). The torque required to tighten these screws is 0.196 N•m.
- 4) Insert the connector to this product's serial interface.

	Connection	Wire
	8	RD
	9	SD
	5	SG

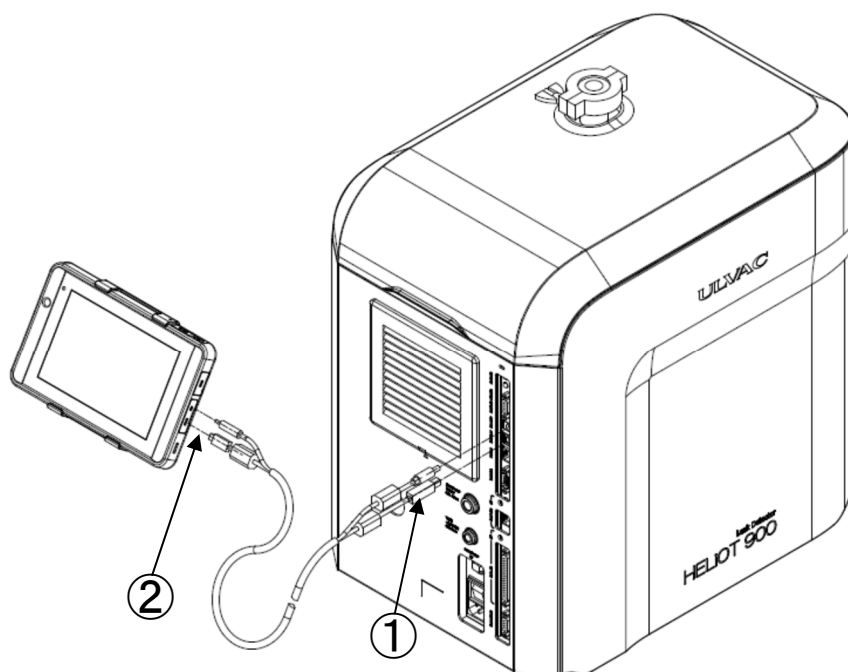
2-6 Storage

Be aware of the following items when storing HELiOT 900.

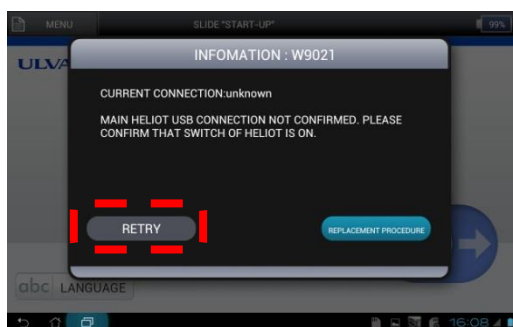
- Store in an ambient temperature between 10°C to 40°C, ambient humidity between 35 to 85 %. There are components that may cause malfunction within the equipment.
- Do not store in dirty or dusty locations. If dirt or dust penetrates inside the unit, there is a risk of short circuit in the electrical system.
- If dirt or dust penetrates inside the test port or stay on sheet surface of the valve and results in leakage of the equipment. This may lead to decrease in reliability of measurement value and abnormal completion of startup. Additionally, store the equipment with a blank flange installed to the test port. Failure to do so may lead to failure of the pump used in the equipment.
- In case that Tablet controller doesn't recharge more than 2 months, Date and time can be initialized. If date and time is initialized, User needs to set date and time according to date (5-2_9)) and time setting procedure (5-2_9)).
Provided that Tablet controller was initialized, please recharge a tablet controller according to recharge procedure (3-3_2)) and Leak detector does not implement calibrated leak correction so that User needs to set up date and time.
- When the equipment does not startup properly, you may need to repeat startup several times.

3. Connection of Main Unit and Tablet

3-1 Wire Connection



- 1) Connect the accompanying cable to DISPLAY and DC-OUT of the main unit connector panel.
- 2) Connect the accompanying cable to Mini USB connector and DC input jack of the tablet.
- 3) Turn ON the MAIN POWER of main unit connector panel (Section 1-7) and power switch (Section 1-4-4-1-1 1)) of tablet. The software activates in approximately 60 seconds and initial screen displays.
- 4) If the screen below is displayed, press **RETRY** button and then execute the connection again.

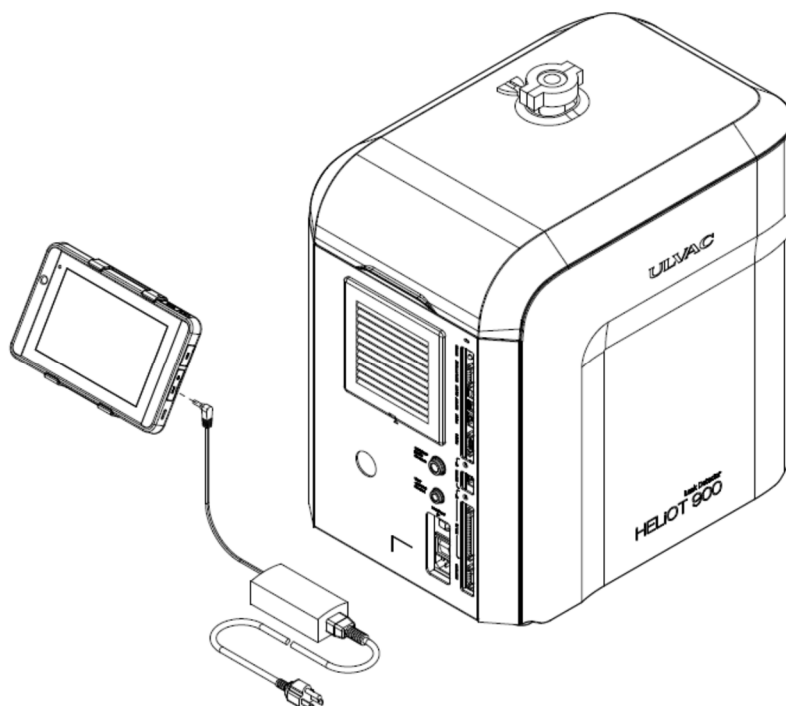


Non-wireless Option:

Be aware that when **ON** is set in [INDICATION/MESSAGE] → [ANDROID] → [Wi-Fi] setting screen and cable which connects the tablet and the main unit is disconnected, radio waves for wireless communication will be emitted.

When **OFF** is set, radio waves will not be emitted from the tablet even if the cable is disconnected. Use in **OFF** mode in case radio waves are restricted.

3-2 Wireless Connection

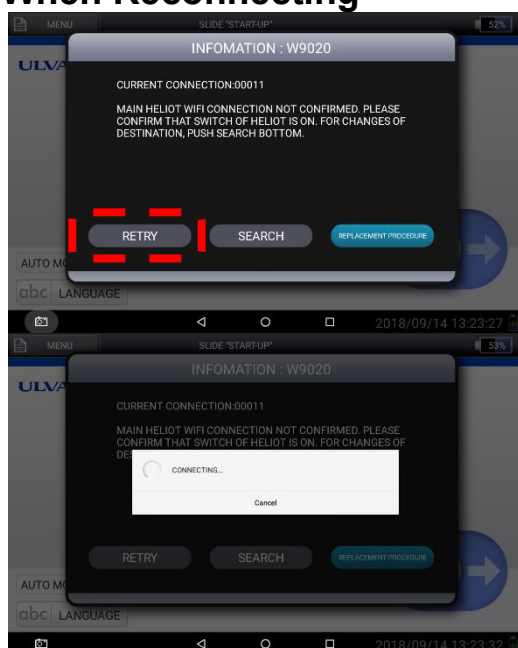


2.4GHz Band Wireless Equipment

This equipment is installed with 2.4GHz band wireless function compatible to standard IEEE 802.11b/g/n. Refer to nation/local laws for use.

- 1) When using the tablet while charging, connect to DC input jack through optional controller charging unit.
- 2) Turn ON the MAIN POWER of main unit connector panel (Section 1-7) and power supply (Section 1-4-4-1-1) of tablet. The software activates in approximately 60 seconds and initial screen displays.

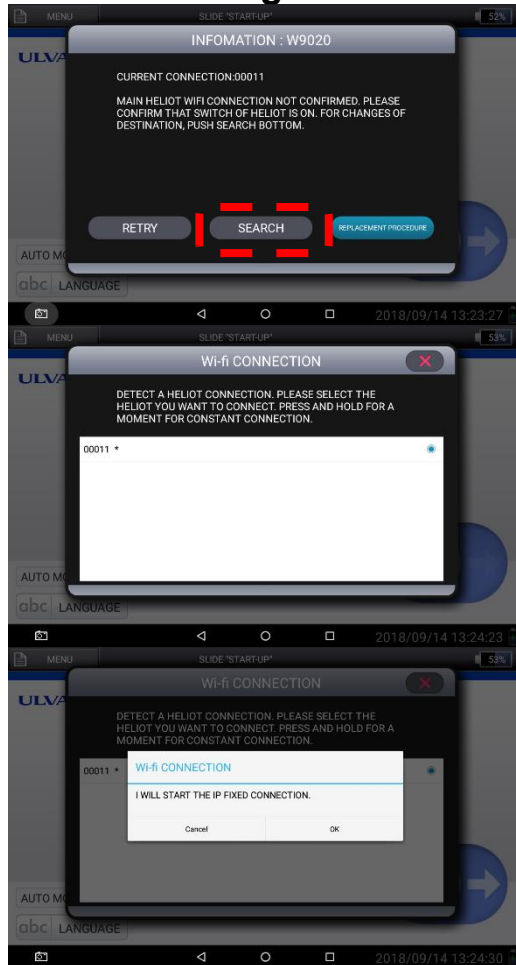
3-2-1 When Reconnecting



- 3) When reconnecting with the equipment, press the **RETRY** button in the photo on the left screen and execute reconnection.

- 4) When executing 3) "CONNECTING" screen displays.
- 5) Initial screen displays when connection is completed.
- 6) In case of connection failure, verification of connection point of the equipment and resetting of connection point is required. (Section 3-2-2)

3-2-2 When Resetting Connection Point



3) In case of failure in modifying equipment's connection point and connection using **RETRY** button, press **SEARCH** button and check if there are any equipment available for connection.

4) When **SEARCH** is executed "Searching Connection Point" displays on the screen and if there are any equipment available for connection afterwards, the left screen displays.

5) If the connection is for single use, select equipment's serial number. If connection is always a priority (fixed), long press.

6) If selection is made in 5), left screen displays and when the connection is completed, it displays the initial screen.

3-3 Tablet controller charge

Tablet controller has two kind of batteries.

- 1) Battery for tablet controller operation
This battery can be recharged if power is provided from charging connector during tablet controller turn power On or Off.
- 2) Battery for date and time
This battery can be recharged regardless of tablet controller turn power on or off if power is provided from charging connector during tablet controller turn power on, or from remaining battery of tablet controller.
Provided date and time was initialized, remaining battery amount is 0%.
This battery is needed more than 60 hours for full charge.

4. Operation Overview

4-1 Power Supply ON – Testing – Stopping / End test

HELIOT can be divided into 5 modes of “Preliminary mode”, “During activation”, “Standby/Test” “Under Stop” and “Error”. The explanations of the operation are given as follows.

4-1-1 Power Activation

Turn on the MAIN POWER of main unit connector panel (section 1-7) and tablet power supply (Section1-4-4-1-1_1)). The tablet will complete the software in about 60 seconds and initial screen displays after long press of the power supply switch.



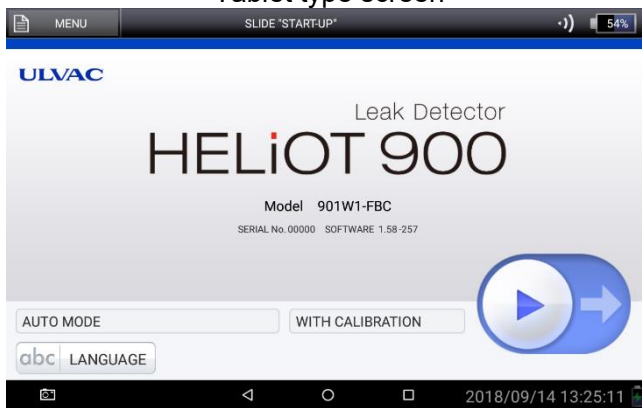
CAUTION

Input Switch

Press the tablet switch with pad of your finger. Pressing with finger nails or sharp objects may cause damage.

4-1-2 Preliminary Mode

Tablet type screen



Panel mount type screen



English is set at the time of shipment from manufacturer. To change language, press **LANGUAGE** to show the language window and select your choice of language.

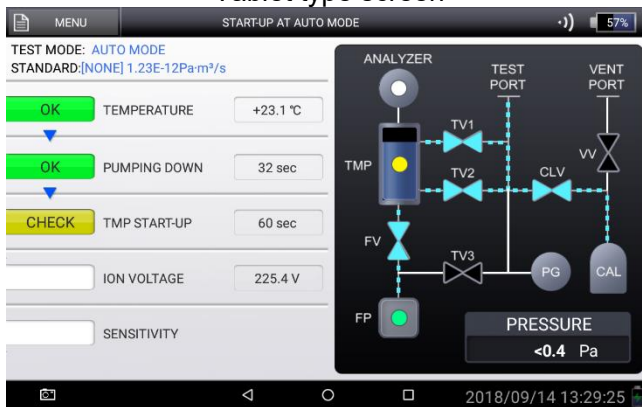
For tablet specification, (Japanese, English, German, Simple Chinese, Korean, Traditional Chinese, Spanish, Russian) can be selected. For panel mount specification, (Japanese, English, Simple Chinese, Korean, Traditional Chinese) can be selected.

Slide the start button  (tablet specification) or press **START-UP** (panel mount specification) to start.

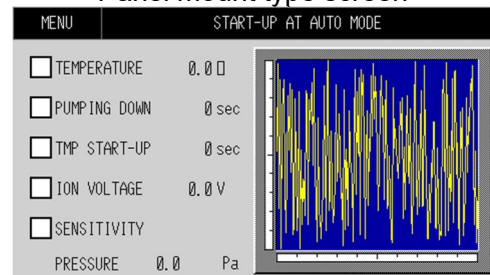
*When employing Sniffer method, set the test mode as Sniffer (**) using [MENU] – [SETTINGS] – [GENERAL]. For details refer to setting method Section 5-1_2).

4-1-3 During Activation

Tablet type screen



Panel mount type screen



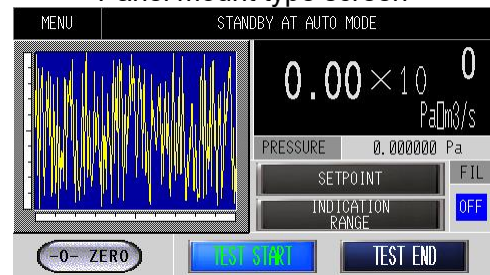
To ensure the equipment has no abnormality, the following sequence is followed. Verification of internal temperature of the equipment – exhaust system (roughing) – exhaust system – (TMP) – adjustment of analyzers – sensitivity calibration – startup completion. After startup completion, it changes to test screen. For details refer to section 7.

4-1-4 Standby/Test

Tablet type screen

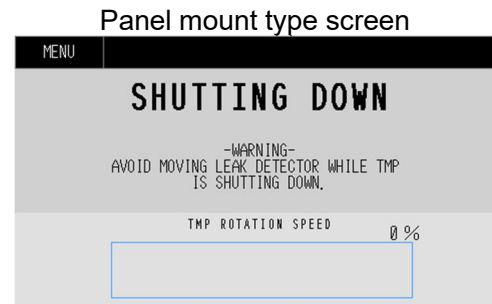
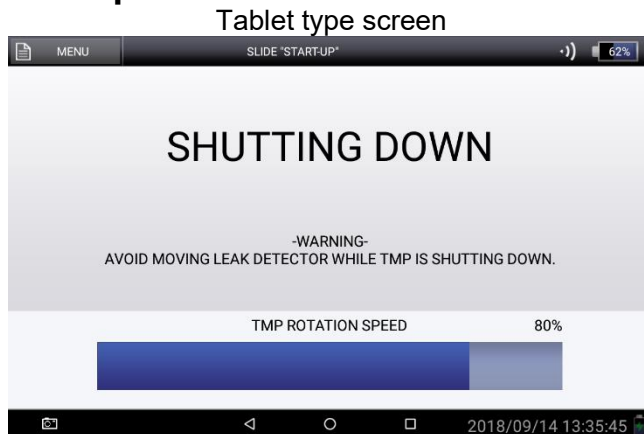


Panel mount type screen



Connect test port to test units under standby mode. Slide test start button  (tablet specification) or press **TEST START** (panel mount specification) to begin roughing. When it reaches to a specific pressure, measurement begins. Slide test end button  (tablet specification) or press **TEST END** (panel mount specification) to end measurement.

4-1-5 Stop



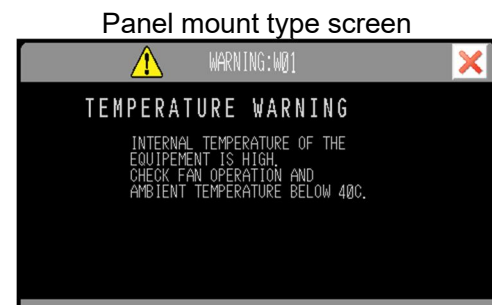
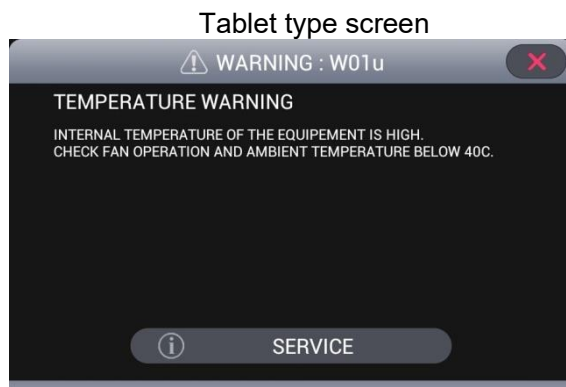
By pressing [MENU] – [SHUTDOWN] and **YES**, Turbomolecular pump showing its rotation speed displays on the stop screen. In about 1 minute, the stop mode completes to change to preliminary screen.

WARNING

Before changing to the preliminary screen, do not move the main unit or expose to vibrations or impacts.

	Stop Execution To stop the equipment, use Tablet, EXT.I/O and serial communication to execute stop
	During Stop When the stop operation is executed, the Turbomolecular pump rotation speed is displayed. Before changing to the preliminary screen, do not move the main unit or expose to vibration or impact. Risk of damaging the equipment.

4-1-6 Errors



Error screen is displayed when any abnormal condition arises. Depending on the error the equipment recovers from the error or automatically stops.

	Errors In the event of an error, release error mode after checking the error message. See the troubleshooting section and service/repair as necessary.
--	--

4-1-7 Power Supply OFF

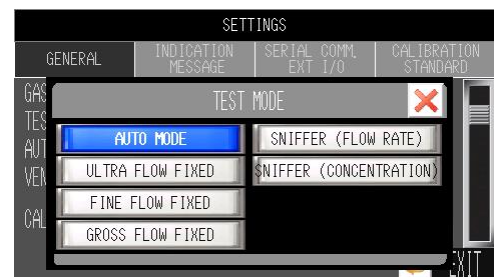
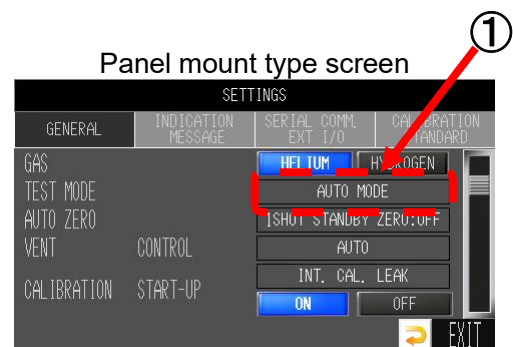
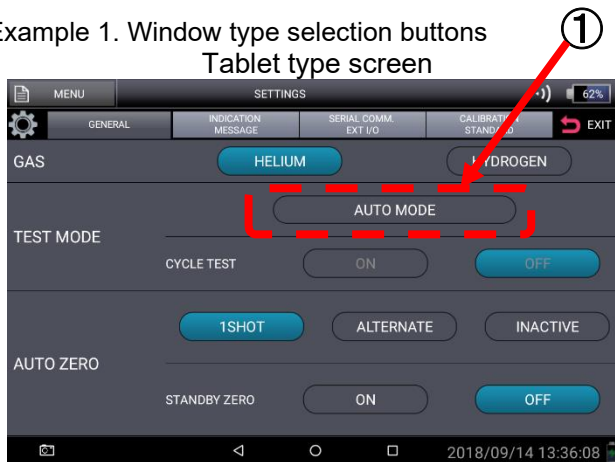
Switch OFF the MAIN POWER of main unit connector panel (Section 1-7).

Press power supply button (Section 1-4-4-1-1_①) of tablet for 3 seconds to display the pop up and then shut down. And by pressing the power supply button for 1 second, it goes to the sleep mode.

4-2 Window Screen Operations

Window screen operation is required in modification of setting screen. The following illustrates a few basic examples.

Example 1. Window type selection buttons



The screen above shows **AUTO MODE** as an example. To start, press the button and the window screen (Lower screen) displays. Select and press one of the buttons from the multiple buttons displayed in the window screen, which then closes the window screen to complete the selection.

Example 2. Window type numeric keypad buttons



Numeric input items such as 2) shown above, have these numbers entered with the window numeric keypad buttons. First press the display, then the numeric keypad appears as per the photos above. Use this numeric keypad to input numeric values. (The right photo shows the order to which you press 3, 5, 0, ., 0, 7). After entering the numbers, press **ENT**. If you cannot press **ENT**, your input of numeric values are incorrect. Be aware that if **X** is pressed without pressing **ENT**, the value will not be set.

This completes the setting and closes the numeric keypad buttons.

Example 3. Window type numeric keypad buttons (panel mount specification)



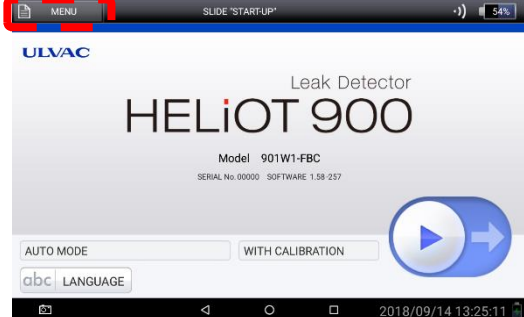
Numeric input items such as ③ shown above are entered on the window type numeric keypad screen. First, press the display, then the numeric keypad appears as per the photos right above. Enter numeric values using the keypad, then press **ENT** (the numeric keypad will close.) After changing all setpoints, press **OK** shown on the left screen to complete the numeric value input. Be aware that if **x** is pressed without pressing **OK**, the value will not be set.

4-3 MENU Screen

Switch ON the MAIN POWER of main unit connector panel (Section 1-6). Then the MENU screen will be accessible during the following modes: initial screen, startup, after completion of startup, testing.

Depending on the condition of the equipment valid buttons will vary

1) Preliminary mode screen



Long press **MENU** for 3 seconds. (Tablet vibrates)
(Startup and test screens and all the other screens have the **MENU** on the same position.)

2)-1 MENU (Initial screen)



2)-2 MENU (Standby)



2)-3 MENU (Testing)



2)-4 MENU (startup)



1) SETTINGS: Changes to setting screen (Section 5)

In SETTINGS mode [General] – [Operation lock] - **ON** - changes to 3). pass word input screen

In SETTINGS mode [General] – [Operation lock] - **OFF** changes to General screen. (Section 5-1)

2) INFORMATION: Changes to information screen. (Section 6)

3) LANGUAGE: Changes to language change screen.

4) OPERATIONS MANUAL: Displays operations manual. It is a function of tablet specification. Panel mount specification does not have the function.

5) NETWORK: Detects connecting point of wireless LAN. (Section 3) It is a function of tablet specification. Panel mount specification does not have the function.

6) CAL.START: Repeats sensitivity calibration. (Section 8-6)

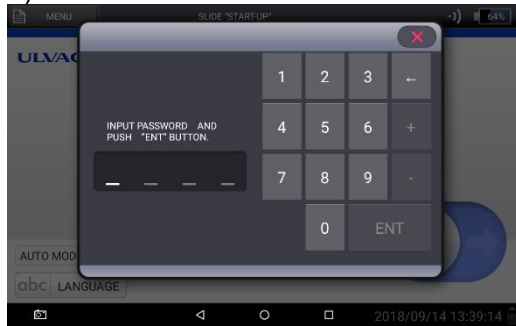
7) CAL.CHECK: Automatically checks calibration leak. (Section 8-7)

8) CLEAN UP: Executes clean up. (Section 8-5)

9) SHUTDOWN: Executes equipment stop. (Section 4-1-5)

10) S/N: Displays serial No. of the connected main unit.

3) Password



Input password using numeric keypad.

(Initial value of password is 0000)

Press **ENT** after entering numeric value. Pressing **X** before pressing **ENT** will return to a screen before pressing MENU.

If password is correct, the screen changes to setting modification screen.

If password is incorrect, it returns to a screen before pressing MENU and indicates as PASSWORD ERROR.

If password is forgotten, entering password 9999 will change to setting screen. Then check the password.

5. SETTINGS

This Section explains various setting that can be changed according to your work conditions. The set value entered are recorded in the main unit of the equipment, therefore, once the equipment is set, it will also operate under the same conditions each time it is used.



CAUTION

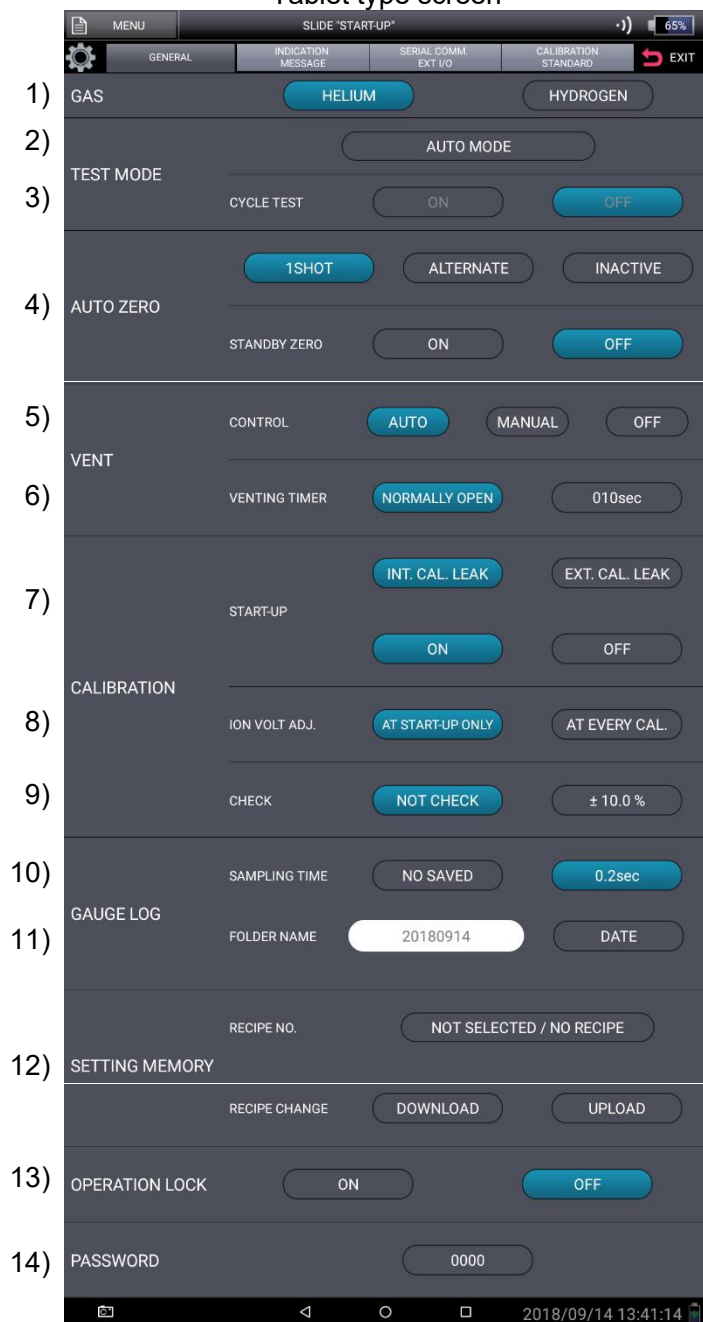
Input Switch

Press the tablet screen with pad of your finger. Pressing with finger nails or sharp objects may cause damage.

5-1 GENERAL

General screen displays first on the modification set screen.

Tablet type screen



Panel mount type screen



1) [GAS]

Select HELIUM (He) or HYDROGEN (H₂).

After completion of startup, settings cannot be changed.

- 2) [TEST MODE]
Select the test mode used for measurement. Refer to Section 8-3 for difference of test flow.
- 3) [TEST MODE / CYCLE TEST]
Test 1 cycle (roughing, B.G. monitor, He spray signal/HeV output/up to judgment of acceptance) can be automatically performed.
Refer to Section 8-3-1 for details.
It is a function of tablet specification. Panel mount specification does not have the function.
- 4) [AUTO ZERO]
Settings of operation during measurement of zero point (Section 1-8-2). Refer to Section 8-4 for details.
- 5) [VENT / CONTROL]
The following explains setting of Vent control method after completion of testing.
When in [AUTO] mode, vent is executed immediately after completion of testing. Therefore, atmosphere is injected into chambers connected to the test ports.
When in [MANUAL] mode, test start/stop button switches with vent button after completion of testing. Testing is completed however, vent valve will not open. Therefore, chambers connected to the test port maintain vacuum.
When in [OFF] mode, control of any vent valve is not executed. (Vent valve will never be opened) If the chambers connected to the Test Ports need to maintain vacuum even after the completion of testing, select [MANUAL] or [OFF]. Except when cycle test is used, it will be [AUTO] on a mandatory base. Refer to Section 8-3-1 for cycle test. When controlling the equipment under EXT.I/O (Section 11-1), set at automatic vent.
- 6) [VENT / VENTING TIMER]
Sets vent opening time.
When in [NORMALLY OPEN] mode, close vent control is not executed, but maintains open status until test start.
When time is set, after the set time has passed, close the valve. (Vent delay timer)
It is a function of tablet specification. Panel mount specification does not have the function.
- 7) [CALIBRATION / START-UP]
Selection of calibration leak used at the time of startup and set the condition of sensitivity calibration.
When [INT. CAL. LEAK] is selected, the calibration leak installed in the equipment is used for startup of the equipment.
When [EXT. CAL. LEAK] is selected, the calibration leak prepared at the outside of the equipment is used to start the equipment. When external calibration leak is selected, external calibration leak valve setting will be required.
When Sniffer (concentration) is selected in the test mode of 2), buttons are switched to [ATM], [STD. GAS]. Select startup method of Sniffer method
Additionally, in [ON] mode, sensitivity calibration is executed at the time of startup.
When in [OFF] mode, it starts without executing sensitivity calibration. The startup will complete within a few minutes, however the sensitivity applies data of the previous sensitivity test, therefore, there is a risk of obtaining unsuitable data. After completion of the startup, it is recommended to verify if the appropriate measurement value has been obtained, e.g. by testing in calibration leaks. Even if [OFF] is selected, sensitivity calibration may execute under the following conditions.
 - When there is no sensitivity data.
 - When error occurred at the last startup
 - When filament break occurred.

**CAUTION****Startup Without Sensitivity Calibration**

Irrespective of the equipment's condition, startup without sensitivity calibration uses previous calibration data without any change which may cause large tolerance in measurement value. In order to obtain more reliable data, it is recommended to execute sensitivity calibration.

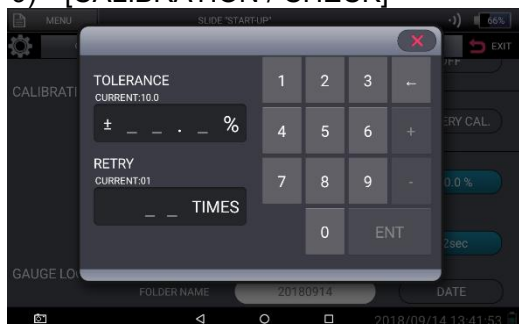
8) [CALIBRATION / ION VOLT ADJ.]

Accelerated voltage adjustment condition is set.

When in **AT START-UP ONLY** mode, the accelerated voltage adjustment is limited to execution period of sensitivity calibration only.

When in **AT EVERY CAL.** mode, accelerated voltage adjustment is executed during startup/sensitivity re-calibration and during all sensitivity calibration

9) [CALIBRATION / CHECK]



When in **NOT CHECK** mode, startup is completed without sensitivity check.

When **±10.0%** is selected, after completion of sensitivity calibration, calibration check by recalibration leak measurement is executed. If sensitivity is not found in [TOLERANCE] of the setting window on the left, repeats sensitivity calibration with the number of times set in [RETRY] until it becomes within [TOLERANCE].

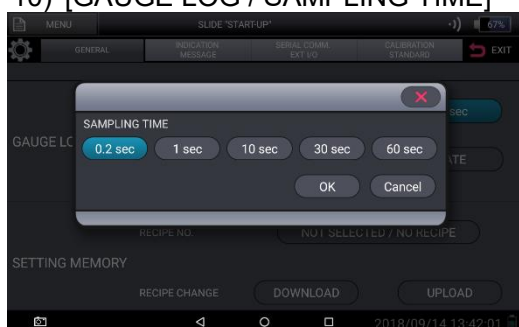
Irrespective of within/outside the [TOLERANCE], result of the measured tolerance is displayed after completion of start up. Check the display and determine whether to continue or stop the equipment and restart.

Additionally, if sensitivity recalibration is executed during with-sensitivity check mode, it always executes calibration check and if it is within [TOLERANCE], returns to test mode without executing sensitivity calibration. If not in [TOLERANCE], as in the startup, executes sensitivity calibration and then, re-execute the check.

* Cannot be used when in Auto mode, Sniffer flow, hydrogen measurement mode and external calibration leak setting.

It is a function of tablet specification. Panel mount specification does not have the function.

10) [GAUGE LOG / SAMPLING TIME]



When **NO SAVED** is selected, measurement data will not be saved.

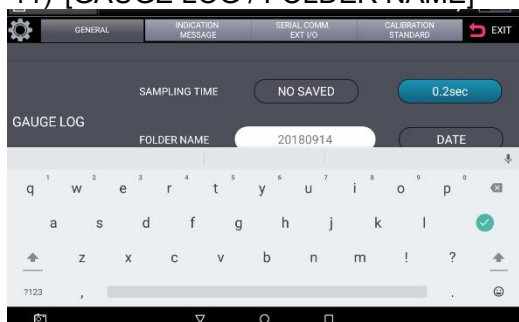
When **0.2sec** is selected, the setting window on the left is displayed.

It is possible to set the interval at which the measurement data is saved.

Select any interval.

It is a function of tablet specification. Panel mount specification does not have the function.

11) [GAUGE LOG / FOLDER NAME]



When edit section in white is selected, keyboard comes up. Input folder name to save the gauge log file.

Max. 20 single-byte alphanumeric characters can be input as folder name.

Press **DATE** to reset the folder name to initial setting.

It is a function of tablet specification. Panel mount specification does not have the function.

12) [SETTING MEMORY / RECIPE. NO. / RECIPE CHANGE]

Executes Memory/Setting of setting details.

Maximum of 5 setting patterns can be controlled under RECIPE No. from 1 to 5. It would be useful when different settings are required for inspection line. To store setting details, install recipe number under RECIPE No. and press **UPLOAD** of setting data. For SETTING past settings stored, select the recipe number that you want to SET with RECIPE NO. and press **DOWNLOAD** of data setting.

Recipe is stored in micro SD card, then insert it into the micro SD card slot.

If no micro SD card is found in the micro SD card slot, error will show when setting and storing. It is a function of tablet specification. Panel mount specification does not have the function.

13) [OPERATION LOCK]

If this setting is made **ON**, it will neither be possible to change display range on the test screen nor to operate auto zero.

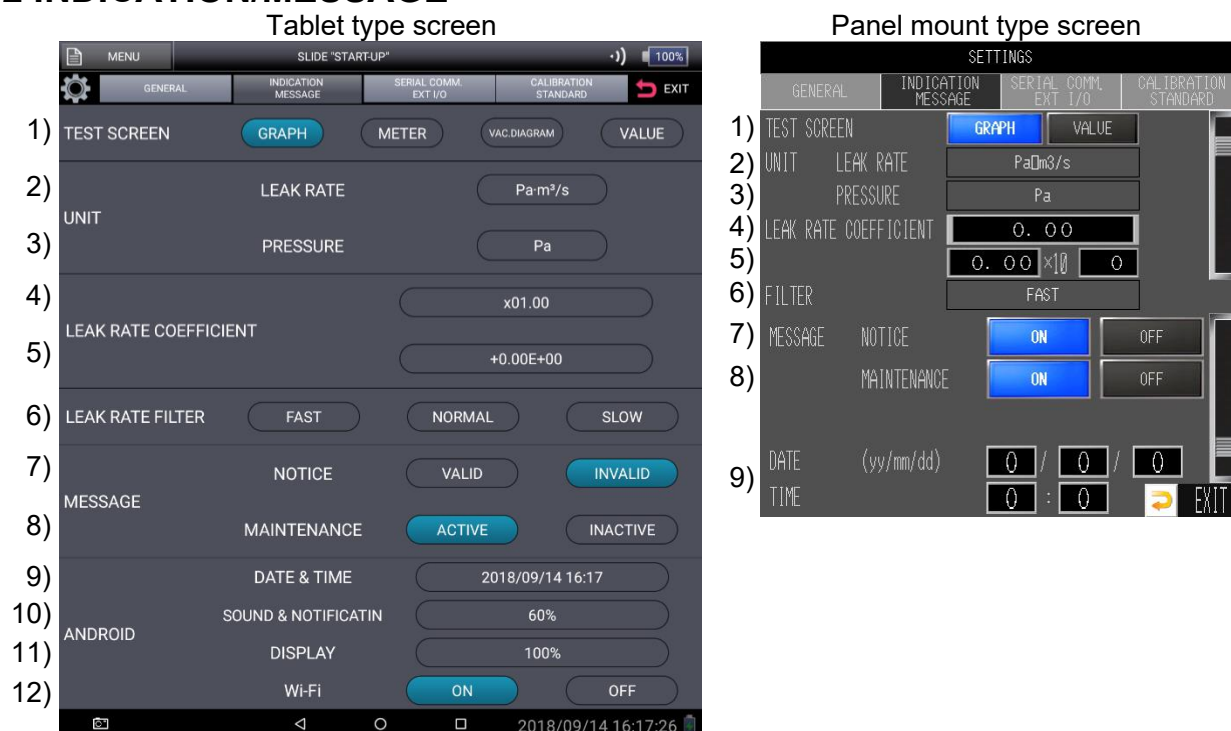
Additionally, in order to avoid change of setting contents by error, a screen to input password will be shown before moving on to setting modification screen.

14) [PASSWORD]

When the operation lock of Section 13) is set **ON**, set a password value under password request screen.

The default value is set at 0000. When changing it, select password display and input 4 digit numbers.

5-2 INDICATION/MESSAGE



- 1) [TEST SCREEN]
Select test screen.
Tablet specification has 4 types of test screens, graph, meter, vac. diagram and value.
Panel mount specification has 2 types of test screen, graph and value.
Choose your preferred test screen.
- 2) [UNIT / LEAK RATE]
Select a leak rate to show on the test screen.
If Pa·m³/s, mbar·L/s, Torr·L/s and atm·cc/s are chosen as units, their pressure units of Pa, mbar, Torr and atm will be automatically shown. If other units are chosen, the pressure unit will be unchanged.
ppm unit can be set when selecting Sniffer concentration during test mode.
- 3) [UNIT / PRESSURE]
Select pressure unit to show on the test screen.
- 4) [LEAK RATE COEFFICIENT((×01.00))]
This is valid when multiplying coefficient for displaying leak rate. When using this setting, values except ×01.00 can be entered Valid when changing gas concentration of He gas or measuring operational exhausts.
<Example of use>
When using 5% of gas, 1/0.05=20.00 is to be entered. Since the display value will be 20 times, its corresponding value (expected leak rate when the gas concentration is 100%) when using 100% gas will be displayed.

5) [LEAK RATE COEFFICIENT(+0.00E+00)]

If User want to have correction for leak rate, this feature work for it.

Provided that leak rate is negative value, leak rate is shown as $<0.01 \times 10^{***}$. Please use except +0.00E+00 as offset.

This function work for stability of background display.

[Note]

In case that display value become negative with Auto ZERO function, Leak rate is indicated <0.01 . This function has correction for actual leak rate regardless of small and large leak rate. Set point value would need to be changed, provided that corrected leak rate make an impact.

<Example of use>

Below chart shows leak rate correction using $-1.00\text{E-}12$ as offset (in ULTRA flow measurement)

Actual leak rate	Corrected leak rate
$5.00\text{E-}11$ [Pam3/s]	$4.90\text{E-}11$ [Pam3/s]
$1.50\text{E-}11$ [Pam3/s]	$1.40\text{E-}11$ [Pam3/s]
$9.99\text{E-}12$ [Pam3/s]	$8.99\text{E-}12$ [Pam3/s]
$1.50\text{E-}12$ [Pam3/s]	$0.50\text{E-}12$ [Pam3/s]
$0.50\text{E-}12$ [Pam3/s]	$<0.01\text{E-}12$ [Pam3/s]

6) [LEAK RATE FILTER]

Filter setting against the leak rate display of test screen.

This filter uses ULVAC's unique algorithm for filtering. By using this filter, steady display of background is maintained under a reduced He condition. However, its response will be delayed.

Under **[FAST]** setting, indication of no filter is displayed.

Under **[NORMAL]** setting, it is displayed with standard filter.

Under **[SLOW]** setting, more stable display than NORMAL is possible with high-capacity filter.

When stable display is required, set to **[NORMAL]** or **[SLOW]**.

When response is prioritized as in the case of ALT system, **[FAST]** setting is recommended.

7) [MESSAGE / NOTICE]

A display setting during startup when minor abnormal* condition is detected. CAUTION screen will appear only when **[VALID]** is selected. Additionally, outputs ERROR2 signal with connector panel EXT.I/O connector PIN-7. (Section 11-1)

If **[INVALID]** is selected, the CAUTION screen is skipped and moves to TEST screen, but flashes a CAUTION error indicator on the status area at the screen top. Except for completion of startup, execute automatic setup by using EXT.I/O of external input/output signal and recommend to select **[VALID]**.

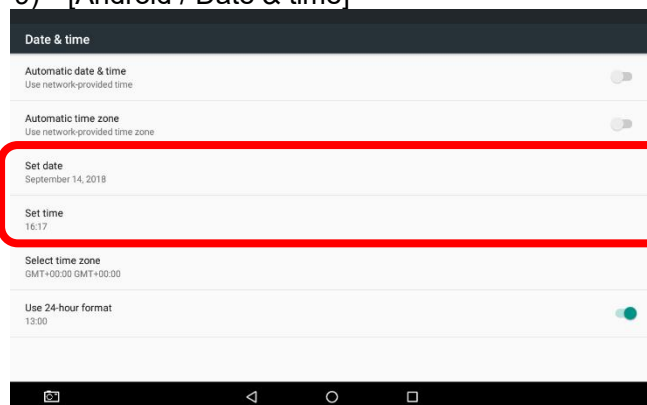
*Minor abnormal conditions are those do not lead to damage of the equipment. Rechecking of sensitivity by executing sensitivity recalibration is recommended. Even when **[INVALID]** is selected, the history remains in the error history (Section 6-5) which can be checked.

8) [MESSAGE / MAINTENANCE]

Displays periodic maintenance information screen at an appropriate interval. For preventive maintenance, except for completion of startup, execute automatic setup by EXT.I/O of external input/output signal and recommend to select **[VALID]**.

Even when **[INVALID]** is selected, maintenance elapse period indicator flashes on the status area at the screen top.

9) [Android / Date & time]



This sets the date and time stored in the tablet.

Date and time are used for preparing data history and calculation of secular change correction of calibration leak.

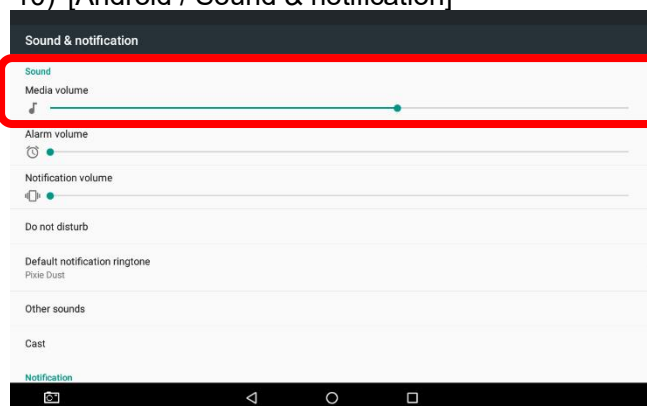
Selecting date & time switches to setting screen of Android. In the red frame on the left displays, set the date and time with set date and set time.

After setting, switch to setting screen of HELIOT by pressing  below.

Do not change the settings except those in the red frame. Change of settings may lead to failure of normal operation.

When using panel mount specification, select the numeric part on the screen. The numeric keypad window appears. Enter the value and press . (The keypad window will close.)

10) [Android / Sound & notification]



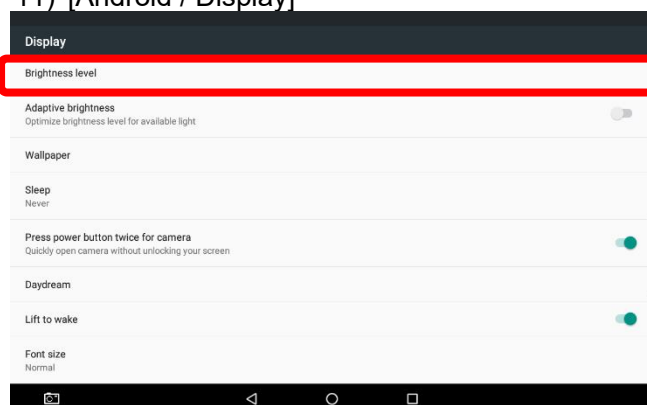
Selecting volume switches to setting screen of Android. In the red frame on the left displays, set the volume of audio alarm under sound setting. Battery lasting time depends on the volume. Set an appropriate volume.

After setting, switch to setting screen of HELIOT by pressing  below.

Do not change the settings except those in the red frame. Change of settings may lead to failure of normal operation.

It is a function of tablet specification. Panel mount specification does not have the function.

11) [Android / Display]



Selecting brightness level switches to setting screen of Android. In the red frame on the left displays, set the brightness with brightness level. Battery lasting time depends on the brightness of the screen. Set the brightness of screen appropriately.

After setting, switch to setting screen of HELIOT by pressing  below.

Do not change the settings other than those in the red frame. Change of settings may lead to failure of normal operation.

It is a function of tablet specification. Panel mount specification does not have the function.

12) [Android / Wi-Fi]

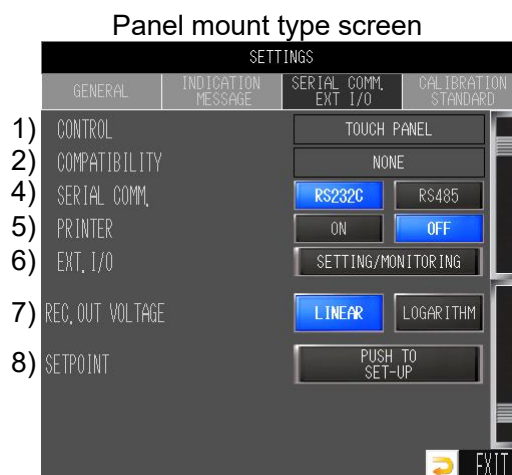
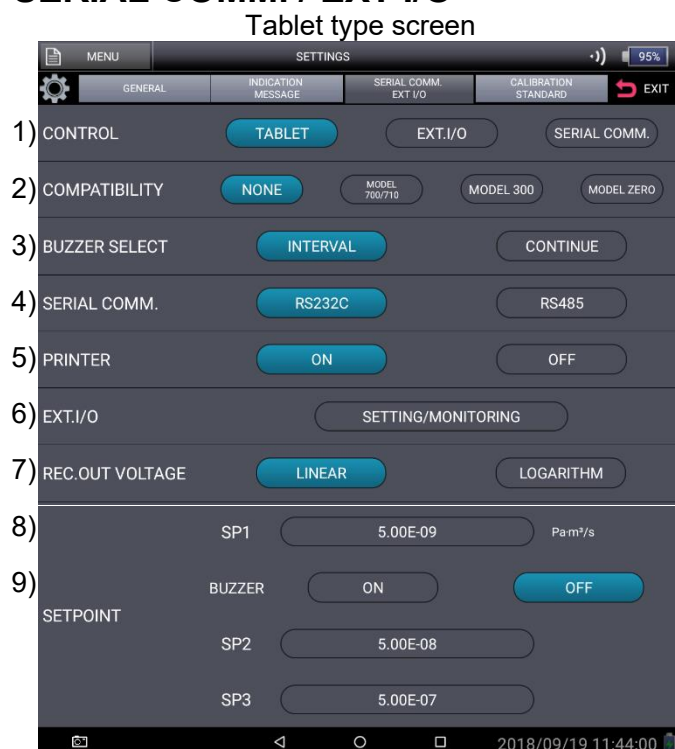
This sets ON/OFF of Wi-Fi.

When ☐ ON is set, Wi-Fi is turned off for wiring connection and Wi-Fi will be automatically on for wireless connection.

When ☐ OFF is set, Wi-Fi will not be turned on. Select ☐ OFF if radio waves shall not be emitted from the tablet (non-wireless model option).

It is a function of tablet specification. Panel mount specification does not have the function.

5-3 SERIAL COMM. / EXT I/O



1) [CONTROL]

This sets the control method of equipment.

In case of **TABLET** setting, input signals except EXT. I/O clean up (PIN 30), IND.HOLD (PIN 29), auto zero (PIN 26), Peak Hold (PIN 31) and PRINT (PIN 27) will be invalid.

However, when cycle test is selected under (Section 5-3-1), 1 cycle test will be conducted by TEST START/STOP (PIN 21) pulse input of EXT. I/O input signal.

In case of **EXT.I/O** setting, start-up and start/finish of tablet test, signals are valid except for CLEAN UP within the menu.

In case of **SERIAL COMM.** setting, start-up start/finish of test, CLEAN UP others are valid.

Signals except external I/O clean up (PIN 30), IND.HOLD(PIN 29), auto zero (PIN 26), Peak Hold(PIN 31) and PRINT(PIN 27) will be invalid.

After completion of startup, settings are not permitted to be changed.

2) [COMPATIBILITY]

This sets the compatibility.

In case of **NONE** setting, it will be set as MODEL 900 setting. If other MODEL 710/700, MODEL 300 and MODEL ZERO are selected, communication command and recorder output will be modified to maintain compatibility.

After completion of startup, settings are not permitted to be changed.

3) [BUZZER SELECT]

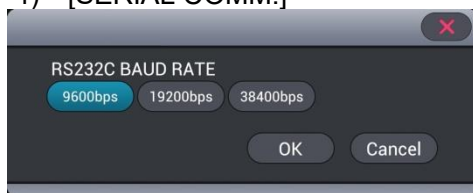
This selects the sound of audio alarm.

When **INTERVAL** is selected, the interval of measuring sound changes. The measuring sound is same as that of HELIOT 300 series.

When **CONTINUE** is selected, the frequency of measuring sound changes. The measuring sound is same as that of HELIOT 710/700 series.

It is a function of tablet specification. Panel mount specification does not have the function.

4) [SERIAL COMM.]



This sets various setting for communication.

When communication setting part of **RS232C**, **RS485** are selected, popup displays as on the left screen.

<RS232C/RS485 BAUD RATE>

Set the baud rate. Baud rate allows settings of **9600bps**, **19200bps**, **38400bps**.

<RS485 CHECK SUM>

ON : receives the HOST-side DATA checksum value, collates it with command DATA. The result of collation, when an error occurs in sending/receiving DATA, is returned as "n" and the operation corresponding to the command is not performed. If the collation result matches, the operation returns accordingly.

OFF : receives the HOST-side DATA checksum value, but does not collate it with command DATA.

Whatever the checksum's DATA is, so long as the command matches, the operation returns accordingly.

(Can communicate with the HOST-side DATA checksum value fixed as "00")

<RS485ADDRESS>

Setting rang is between 1 and 99 (00 is prohibited to use). However, the maximum number of nodes in a single line is 32 including the host.

5) [PRINTER]

Startup DATA and measurement value may be printed with optionally sold printer. When printer setting is set to **ON**, sensitivity under each flow is automatically printed at the time of startup completion.

Additionally, test measurement value is automatically printed when test is completed. Each time leak rate display part is pressed during testing, measurement value at a given point can also be printed. When printer selection is set to **OFF**, automatic printing stops. As for the connection of printer and operation, refer to (Section 11-3).

6) [EXT.I/O]



Execute setting/output of EXT.I/O.

When **SETTING/MONITORING** is selected on the screen, a pop up to check Input/output is indicated as in the left screen

<EXT.I/O INPUT HELIOT←>

When input signal is received from sequencers, etc. the assigned lamp lights up.

<EXT.I/O OUTPUT HELIOT→>

Output setting of N.O (NORMALLY OPEN) and N.C (NORMALLY CLOSED) can be performed on each signal.

When a button which is assigned against each output signal is pressed, the connector of the equipment EXT.I/O outputs signal.

The HELIOT should be in status before start-up when ON/OFF output signal from HELIOT to sequencer is required to check.

<REC.OUT HELIOT→>

Pseudo output of 0 to 10V recorder output is possible.

The HELIOT should be in status before start-up when ON/OFF output signal from HELIOT to sequencer is required to check. By selecting voltage display areas of 2, 3 and 4 and entering voltage, it outputs the voltage value set by the pin.

To check this output, it outputs against leak volume after the startup, therefore, it can only be used when the equipment is at a stop

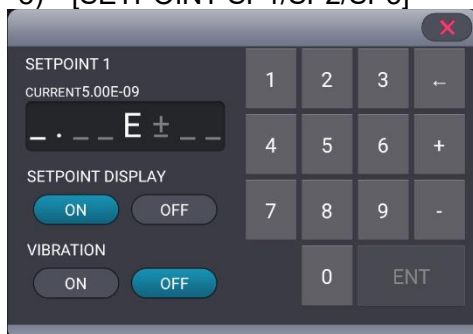
7) [REC. OUT VOLTAGE]

Set the configuration of the recorder output.

Sets to Linear output when **LINEAR** is selected.

Sets to LOG output when **LOGARITHM** is selected. Refer to Section 11-2 for details.

8) [SETPOINT SP1/SP2/SP3]



Set the set point by touching numerical parts.

The output signal from connector panel EXT.I/O connector (Section 11-1) will be turned on (contact switches from OPEN to CLOSE) when it is set at "Normally Open". It is used for decision to pass or fail of leak test using external lamps, buzzers, etc. SP1 (set point 1) is used for set point buzzers and judgement of cycle test result. SP2 (set point 2) is used for background monitoring of cycle test.

<SETPOINT DISPLAY>

When ☐ OFF is selected, the color of graph or number will not be changed.

When ☐ ON is selected, the color of graph or number will change during the test as follows. It changes to red when leakage rate exceeds the set value of SP1, and to yellow when leakage rate exceeds the set value of SP2, and to light blue when leakage rate exceeds the set value of SP3.

If the setting is set in this order, $SP1 > SP2 > SP3$, the color of graph or number will change as above.

If the setting is set in this order, $SP1 < SP2 < SP3$, the display will only be red SP1.

It is a function of tablet specification. Panel mount specification does not have the function.

<VIBRATION>

When ☐ OFF is selected, vibration is turned off.

When ☐ ON is selected, vibration is turned on when exceeding the set point during the test.

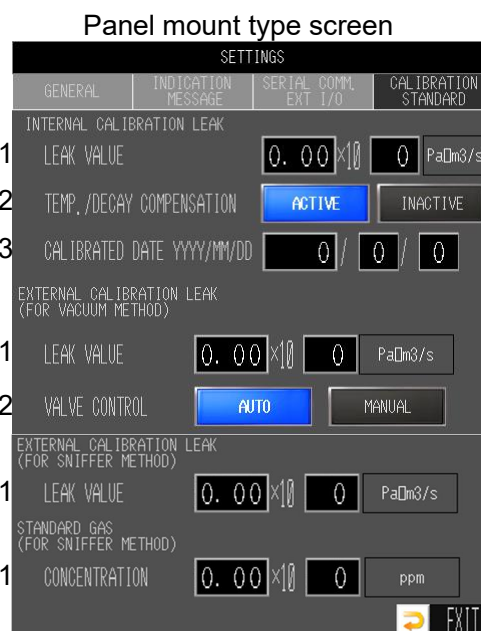
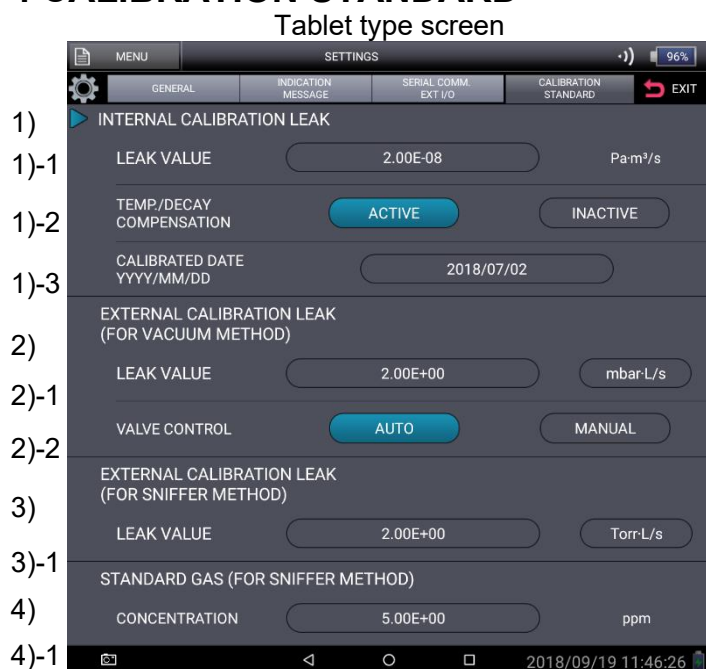
The interval of vibration is large in the order of $SP1 < SP2 < SP3$.

It is a function of tablet specification. Panel mount specification does not have the function.

9) [SETPOINT BUZZER]

This is the setting to use set point alarm. While ☐ ON is selected during the test, intermittent alarm sounds before leakage rate exceeds the set value of SP1, when it exceeds SP1, continuous audio alarm sets off. Refer to Section 5-2 10) for volumes of the alarm clock.

5-4 CALIBRATION STANDARD



1) [INTERNAL CALIBRATION LEAK]

1)-1 [LEAK VALUE]

Built-in calibration leak rate is set at the time of shipment. If the built-in calibration leak rate is changed by recalibration of the built-in calibration leak, press numerical area on the screen and re-enter suitable calibration lead value.

Settings cannot be changed after completion of startup.

1)-2 [Temp./DECAY COMPENSATION]

For Temperature correction due to tube surface temperature of calibration leak correction of calibration date, **ACTIVE** setting is used. In case above corrections are not executed **INACTIVE** setting is used.

(Compensation coefficient is for reference value only. The compensation coefficient is not measured individually.)

Settings cannot be changed after completion of startup.

1)-3 [CALIBRATED DATE]

Enter calibration date of calibration leak. The calibration date of calibration leak is indicated on the name plate of the calibration leak. The calibration leak value is automatically corrected by setting the current date and aforementioned secular change correction value.

Settings cannot be changed after completion of startup.

2) [EXTERNAL CALIBRATION LEAK (FOR VACUUM METHOD)]

2)-1 [LEAK VALUE]

Enter the calibration leak value used for external calibration leak. Select the unit.

2)-2 [VALVE CONTROL]

Set the control method of external calibration leak. Sensitivity calibration operates **AUTO** when automatic mode is set at the time of startup. When Manual mode is set, you will be prompted to operate open/close action of calibration leak in accordance screen guidance.

3) [EXTERNAL CALIBRATION LEAK (FOR SNIFFER METHOD)]

3)-1 [LEAK VALUE]

Enter external type calibration leak value used for Sniffer method. Select the unit. Select the unit used for the external type calibration leak.

4) [STANDARD GAS (FOR SNIFFER METHOD)]

4)-1 [CONCENTRATION]

Enter concentration of the gas to be the criteria.

5-5 List of Settings for Shipment from Manufacturer (Factory default)

Each setting values at the time of shipment from manufacturer is as listed below. Make necessary changes if required.

Setting Item	Description	Shipment Default Setting
GENERAL	GAS	HELIUM, HYDROGEN
	TEST MODE	AUTO MODE, ULTRA FLOW FIX, FINE FLOW FIX, GROSS FLOW FIX, SNIFFER (FLOW RATE), SNIFFER (CONCENTRATION)
	CYCLE TEST	ON, OFF
	ROUGHING TIMER	CONSTANT PRESSURE, 010.0sec
	CONNECTING PRESSURE	100Pa
	BACKGROUND TIMER	BELOW SP.2, 010.0sec, SKIP
	TEST TIMER	TEST END AT NG, 010.0sec
	He SPRAY TIMER	=TEST TIME, 010.0sec
	AUTO ZERO	1SHOT, ALTERNATE, INACTIVE
	STANDBY ZERO	ON, OFF
	Vent	CONTROL
	VENTING TIMER	AUTO, MANUAL, OFF
	Calibration: Selection except SNIFFER (concentration)	NORMALLY OPEN, 010sec
	Calibration: When SNIFFER (concentration) selected	START-UP
	START-UP	INT. CAL. LEAK, EXT. CAL. LEAK
	START-UP	ATM, STD. GAS
	START-UP	ON, OFF
	ION VOLT ADJ.	AT START-UP ONLY, AT EVERY CAL.
	CHECK	NOT CHECK, $\pm 10.0\%$
	TOLERANCE	$\pm 10.0\%$
	RETRY	03 TIMES
	GAUGE LOG	SAMPLING TIME
	FOLDER NAME	NO SAVED, 0.2sec, 1sec, 10sec, 30sec, 60sec
	DATE	
INDICATION/MESSAGE	OPERATION LOCK	ON, OFF
	PASSWORD	0000
	TEST SCREEN	GRAPH, METER, VAC. DIAGRAM, VALUE
	UNIT	LEAK RATE
	PRESSURE	Pa·m ³ /s, mbar·l/s, atm·cc/s, Torr·l/s, lusec, Mol/s, sccm, oz/a, g/a, %×R, Amp.
	LEAK RATE COEFFICIENT	Pa, mbar, atm, Torr
	LEAK RATE COEFFICIENT	×01.00
	LEAK RATE COEFFICIENT	+0.00E+00
	LEAK RATE FILTER	FAST, NORMAL, SLOW
MESSAGE	NOTICE	VALID, INVALID
	MAINTENANCE	ACTIVE, INACTIVE

Setting Item		Description	Shipment Default Setting
SERIAL COMM./EXT.I/O	CONTROL		TABLET, EXT.I/O, SERIAL COMM.
	COMPATIBILITY		NONE, MODEL 710/700, MODEL 300, MODEL ZERO
	BUZZER SELECT		INTERVAL, CONTINUE
	SERIAL COMM.		RS232C, RS485
	RS232C	RS232C Baud Rate	9600, 19200, 38400
	RS485	RS485 Baud Rate	9600, 19200, 38400
		CHECK SUM	ON, OFF
		ADDRESS	01
	PRINTER		ON, OFF
	REC. OUT VOLTAGE		LINEAR, LOGARITHM
	SETPOINT	SP1	5.00×10^{-9}
		SETPOINT DISPLAY	ON, OFF
		VIBRATION	ON, OFF
		BUZZER	ON, OFF
		SP2	5.00×10^{-8}
		SETPOINT DISPLAY	ON, OFF
		VIBRATION	ON, OFF
		SP3	5.00×10^{-7}
		SETPOINT DISPLAY	ON, OFF
		VIBRATION	ON, OFF
		LEAK VALUE	2.0×10^{-8} Depends on the equipment
		TEMP./DECAY COMPENSATION	ACTIVE, INACTIVE
CALIBRATION/STANDARD	INTERNAL CALIBRATION LEAK	CALIBRATED DATE	Depends on the equipment
		LEAK VALUE	$2.00 \times 10^{+00}$
		UNIT	Pa·m ³ /s, mbar·l/s, atm·cc/s, Torr·l/s, lusec, Mol/s, sccm, oz/a, g/a
	EXTERNAL CALIBRATION LEAK (FOR VACUUM METHOD)	VALVE CONTROL	AUTO, MANUAL
		LEAK VALUE	$2.00 \times 10^{+00}$
	EXTERNAL CALIBRATION LEAK (FOR SNIFFER METHOD)	UNIT	Pa·m ³ /s, mbar·l/s, atm·cc/s, Torr·l/s, lusec, Mol/s, sccm, oz/a, g/a
		CONCENTRATION	$5.00 \times 10^{+0}$
	STANDARD GAS (FOR SNIFFER METHOD)		

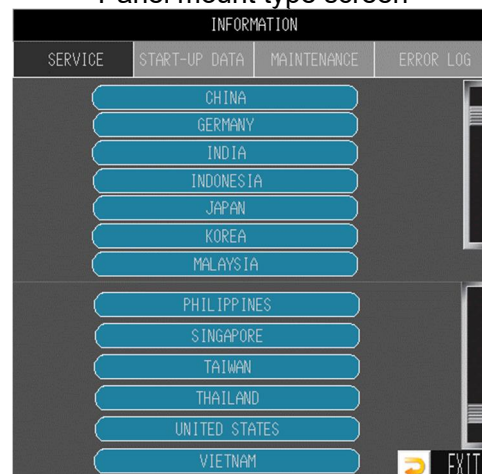
6. INFORMATION

6-1 SERVICE

Tablet type screen



Panel mount type screen



Displays servicing bases of ULVAC group.

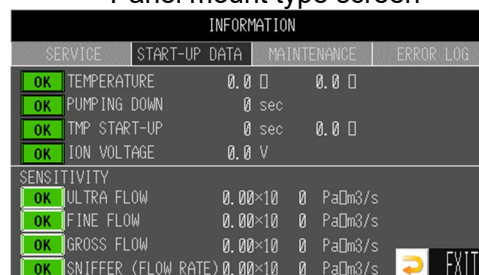
Displays the telephone numbers of servicing bases when a country is selected.

6-2 START-UP DATA

Tablet type screen

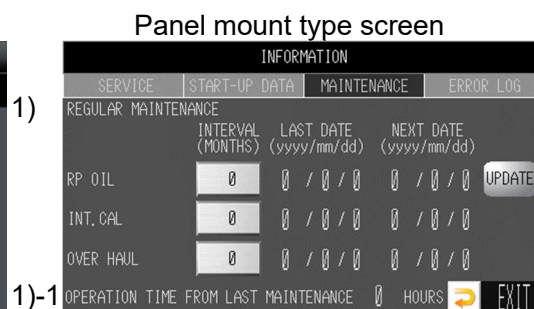
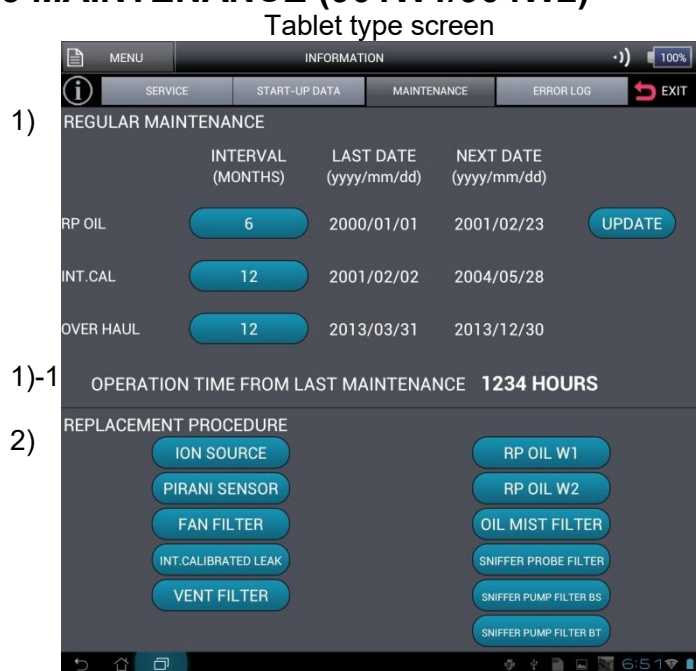


Panel mount type screen



Allows to check sensitivity data, etc. at startup.

6-3 MAINTENANCE (901W1/904W2)



Allows you to check on information of the items requiring periodical maintenance. Verification of maintenance record by the manufacturer and recording of the maintenance date are made possible. Available for preventive maintenance.

1) REGULAR MAINTENANCE

Cycle of each periodical maintenance can be entered by the user.

When the cycle of next set maintenance date exceeds, the top screen "maintenance alarm" lights.

When this icon is selected, this screen can be reached from any other screen.

As for RP Oil, pressing **UPDATE** displays verification screen, where **YES** can be selected if the oil has been replaced. Then the last date of replacement will be updated. The date will not be updated when **X** is pressed.

1)-1 OPERATION TIME FROM LAST MAINTENANCE

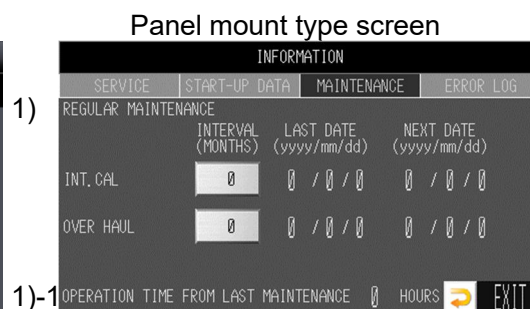
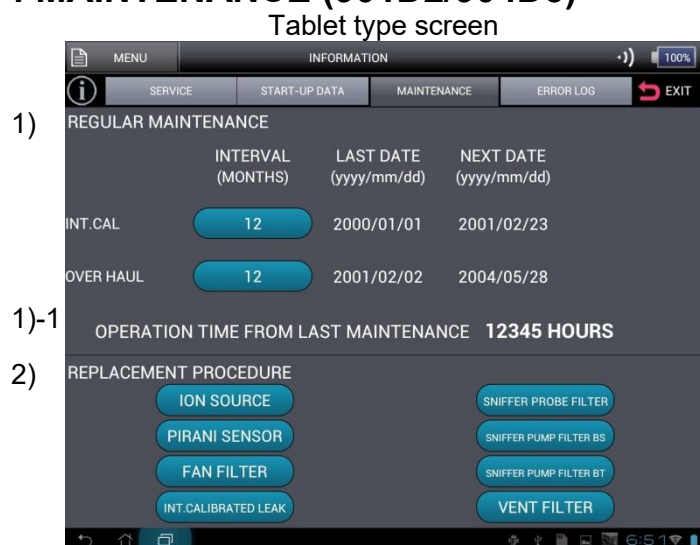
Cumulative time from the last O/H is recorded. This can be used for controlling the operating time.

2) REPLACEMENT PROCEDURE

(It is a function of tablet specification. Panel mount specification does not have the function.)

Shows replacement procedure for each maintenance items.

6-4 MAINTENANCE (901D2/904D3)



Allows you to check necessary items that require periodical maintenance. Enables you to check manufacturer's maintenance record and record the date of the maintenance user has conducted. Available for preventive maintenance.

1) REGULAR MAINTENANCE

Available for the user to enter the cycle of each periodical maintenance.

When the cycle of next set maintenance date exceeds, the top screen "maintenance alarm" lights.

When this icon is selected, this screen can be reached from any other screen.

1)-1 OPERATION TIME FROM LAST MAINTENANCE

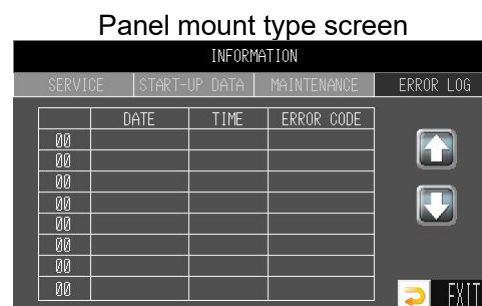
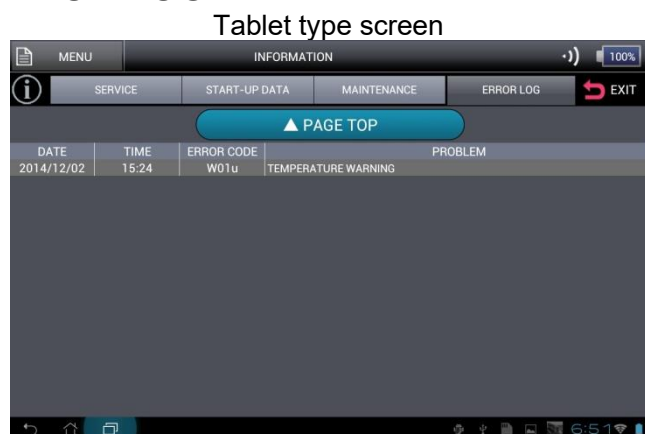
Cumulative time from the last O/H is recorded. This can be used for controlling the operating time.

2) REPLACEMENT PROCEDURE

(It is a function of tablet specification. Panel mount specification does not have the function.)

Shows replacement procedure for each maintenance items.

6-5 ERROR LOG



Displays the error code generated. The maximum number of data stored is 100 data. In case 100 data exceeds, data is deleted from the oldest data. See Section 9-3 for details.

For panel mount specification, when selecting ERROR CODE, the screen will be switched to a different screen that displays the contents of error.

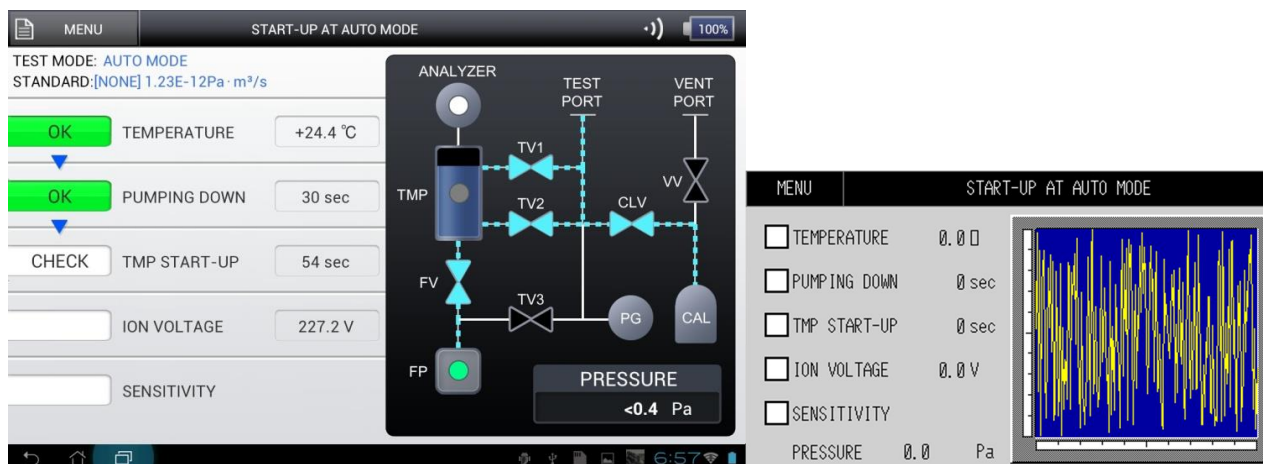
7. Startup

The startup method depends on vacuum method or Sniffer method.

7-1 Startup of Vacuum Method

Use of Blank Flange
Install blank flange to the test port when using under vacuum method. Starting the equipment by connecting pipings and testing unit may result in abnormal operation
Startup/Sensitivity Calibration (Vacuum Method)
When executing sensitivity calibration, install blank flange to the test port first. Risk of adverse impact on measurement due to incorrect calibration of sensitivity if the sensitivity calibration is executed with large capacity pipings installed.
Startup Without Calibration
The startup without calibration will apply the latest sensitivity data used, regardless of the current state of the equipment. It may have a large adverse impact to the measurement value depending on the difference in the state and conditions of the equipment. For the benefit of measurement reliability startup with calibration is recommended.

Slide the start button  (tablet specification) or press **START-UP** (panel mount specification) on the initial screen to switch to startup screen. It takes approximately 2 minutes without calibration and 5 minutes with calibration to complete the startup. Except when **EXT. CAL. LEAK** is selected for [GENERAL] – [CALIBRATION] – [START-UP] (Section 5-1_7)), and **MANUAL** is selected for [CALIBRATION STANDARD] – [EXTERNAL CALIBRATION LEAK (FOR VACUUM METHOD)] – [VALVE CONTROL (Section 5-4_2)-2], the calibration leak valve connected to external area must be opened by the user before beginning the startup process. For the sensitivity calibration while startup, user will be required to operate button and close the calibration leak according to message will be needed.



<Symbols for Vacuum System Diagrams>

No.	Display	Description
1	FIL.No*	Indicates the filament No. currently illuminated.
2	ANALYZER	Analyzing tube. Illuminates up green when filament is illuminated.
3	TMP	Turbomolecular pump. Flashes yellow during startup. Also indicates rotation numbers by bar graph. When the pump reaches steady rotation, illuminates green.
4	FV	Fore valve which illuminates blue when the valve is opened.
5	FP	When fore pump activates, flashes yellow. When roughing verification is completed, illuminates green.
6	TV1,TV2,TV3	Each indicates test valve of 1, 2, 3. Illuminates blue with the valve opened.
7	TEST PORT	Test port.

No.	Display	Description
8	CLV	Valve for open/close of calibration leak. Illuminates blue with the valve opened.
9	PG	Indicates Pirani gauge head.
10	VV	Valve to inject atmosphere to the test port. Illuminates blue with the valve opened.
11	CAL	Indicates built-in calibration leak.
12	PRESSURE	Indicates the pressure of test port measured by PG.
13	VENT PORT	Port to inject atmosphere to the test port.

<Items to check for startup >

1) [TEMPERATURE]

Measures ambient temperature. Acceptable within the range of 10 to 45°C

2) [PUMPING DOWN]

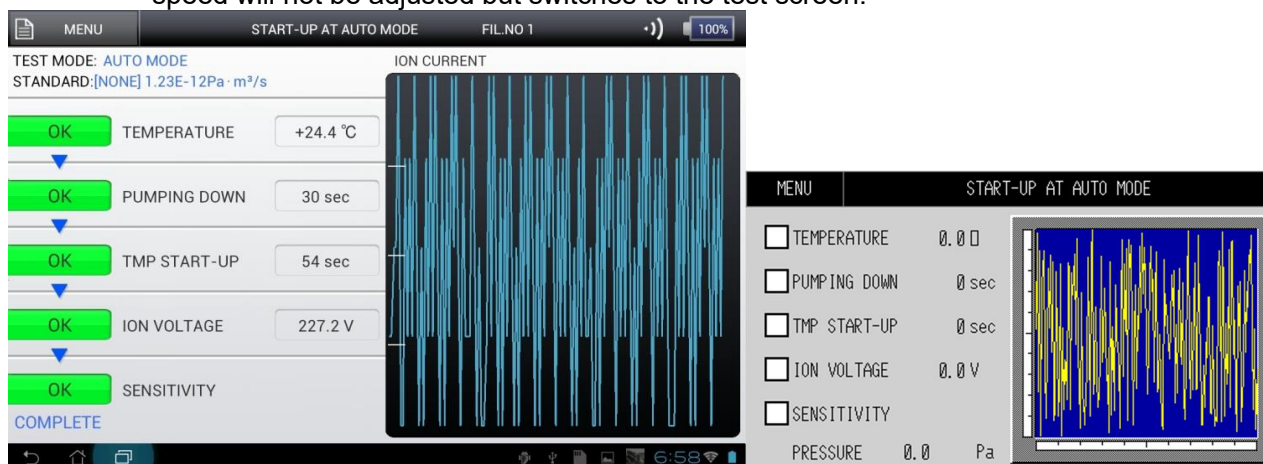
Executes roughing process from fore line to test port. Acceptable if it reached to 100Pa within 180 seconds.

3) [TMP START-UP]

Acceptable if Steady rotation of TMP is within 240 second.

4) [ION VOLTAGE]

After verifying the startup of TMP, illuminates filament of ion source. Verifies proper emission current and adjusts accelerated speed after illuminating the filament. Acceptable if the accelerated voltage falls within the range of 215 to 250 V. If **OFF** is selected in setting mode during [GENERAL] – [CALIBRATION] – [START-UP] (Section 5-1_7)), the accelerated speed will not be adjusted but switches to the test screen.



5) [SENSITIVITY]

SENSITIVITY CALIBRATION is executed under selected test mode to verify that the sensitivity is within the suitable range.

The sensitivity of GROSS FLOW FIX will be a value with a certain factor processing when [AUTO MODE] and [GROSS FLOW FIX] is selected at [GENERAL]-[TEST MODE](5-1_2)), and when [INT. CAL. LEAK] is selected at [GENERAL]-[CALIBRATION]-[START-UP](5-1_7)).

When [EXT. CAL. LEAK] is selected for [GENERAL] – [CALIBRATION] – [START-UP] (Section 5-1_7)), and [MANUAL] is selected for [CALIBRATION STANDARD] – [EXTERNAL CALIBRATION LEAK (FOR VACUUM METHOD)] – [VALVE CONTROL (Section 5-4_2)-2], the following actions by the user will be required.

- Press [OK] after verifying that the graph is stabilized.
- Close the valve of external calibration leak connected.
- Press [OK] after re-verifying that the graph is stabilized.

Operate according the message shown on the upper screen within the dotted frame. After that, it will complete the startup automatically.

When all the startup items are completed, it switches to the test screen.

Startup data can be checked with [MENU]-[INFORMATION]-[START-UP DATA]

7-2 Startup of Sniffer Method

 CAUTION	Sensitivity Calibration (Sniffer Method) Sniffer unit must be connected to test port without fail when executing Sensitivity Calibration. If used without connecting to the Sniffer unit, correct sensitivity value may not be calibrated and may cause adverse effect to the measurement value.
 CAUTION	Prohibition of Intake Do no intake water, water vapor, oil mist and powders using Sniffer probe. Risk of malfunction and damage of the equipment.
 CAUTION	External Calibration Leak After vacuum exhausting of the interior of external calibration leak, displacement of gas by pressurizing He is recommended before operating. Attention must be paid when pressurizing He from atmospheric pressure for direct connections to He cylinders because it may take 10–30 minutes to stabilize the input. If standing time for stabilization is insufficient, calibration leak output may not reach the calibration value or cause instability of output.
 CAUTION	Startup Without Calibration The startup without calibration will apply the latest sensitivity data used, regardless of the current state of the equipment. It may have a large adverse impact to the measurement value depending on the difference in the state and conditions of the equipment. For the benefit of measurement reliability startup with calibration is recommended.

The startup by Sniffer method can be selected from 2 types of test modes;

SNIFFER (FLOW RATE) and **SNIFFER (CONCENTRATION)**. Sensitivity calibration differ according to the above test modes chosen.

When **SNIFFER (FLOW RATE)** is set: Either built-in calibration leak or external calibration leak (external calibration leak) prepared separately by the user is selected as a criteria of sensitivity calibration

When **SNIFFER (CONCENTRATION)** is set: Either atmosphere (5ppm He gas present in the atmosphere) or standard gas prepared separately by the user is selected for the gas used as a criteria of sensitivity calibration.

These settings are executed in advance by the setting items; [GENERAL] – [CALIBRATION] – [START-UP] (Section 5-1 7)).

7-2-1 **SNIFFER (FLOW RATE)**

- 1) Install Sniffer Unit to the Test Port.
- 2) Prepare External Calibration Leak
 After vacuum exhausting the interior of external calibration leak, displacement of gas by pressurizing He is recommended before operating. When pressurizing He from atmospheric pressure, it may take 10–30 minutes to stabilize the He leak. If standing time for stabilization is insufficient, calibration leak output may not reach the calibration value or cause instability of output.
- 3) Calibration Leak Value Setting before Startup
 After selecting **SNIFFER (FLOW RATE)**, enter External Leak Value and Calibration unit under [CALIBRATION STANDARD] – [EXTERNAL CALIBRATION LEAK (FOR SNIFFER METHOD)].
- 4) Starting Startup
 Slide the Start button  (tablet specification) or press **START-UP** (panel mount specification) on the initial screen to switch to Startup screen ,and self-checking function of the equipment begins.
 1) [TEMPERATURE] to 4) [ION VOLTAGE] consist of the same startup details as Vacuum method.



5) [SENSITIVITY]

5)-1 Calibration Leak setting: Set at Internal Calibration Leak (Section 5-1_7))

Built-in Calibration Leak is used for startup of the equipment's Sensitivity Calibration. After completion of the startup, it switches to test screen automatically.

Calibration sensitivity by [INT. CAL. LEAK] is a value made of coefficient processing. Therefore, Measurement [INT. CAL. LEAK] is less compared to sensitivity calibration of [EXT. CAL. LEAK].

5)-2 Calibration Leak setting: Set at External Calibration Leak (Section 5-1_7))

External Calibration Leak is used for the equipment's Sensitivity Calibration.

- "SNIFFER CAL SUCTION" will be indicated in the pop up, where user is required to intake calibration leak according indication.
- When output is stabilized on the graph, press [OK] button. Sensitivity calibration will terminate.

After completion of the startup, it switches to test screen automatically.

7-2-2 SNIFFER (CONCENTRATION)

1) Install Sniffer Unit to the Test Port.

2) Prepare Standard Gas

Well-known gas concentration is used for concentration calibration. The user is required to prepare sufficient amount of gas in the atmosphere for intake which takes about several minutes. Plastic bags and other soft and enclosed type container for enclosing the gas would maintain the atmospheric pressure. During the startup intake of gas concentration is executed. Atmospheric calibration uses He which is approximately 5ppm present in atmospheric pressure. The concentration of He within the atmospheric pressure depends on the environment. It is recommended to use as a simplified calibration method. Atmospheric calibration starts up while absorbing atmosphere from the tip of the probe.

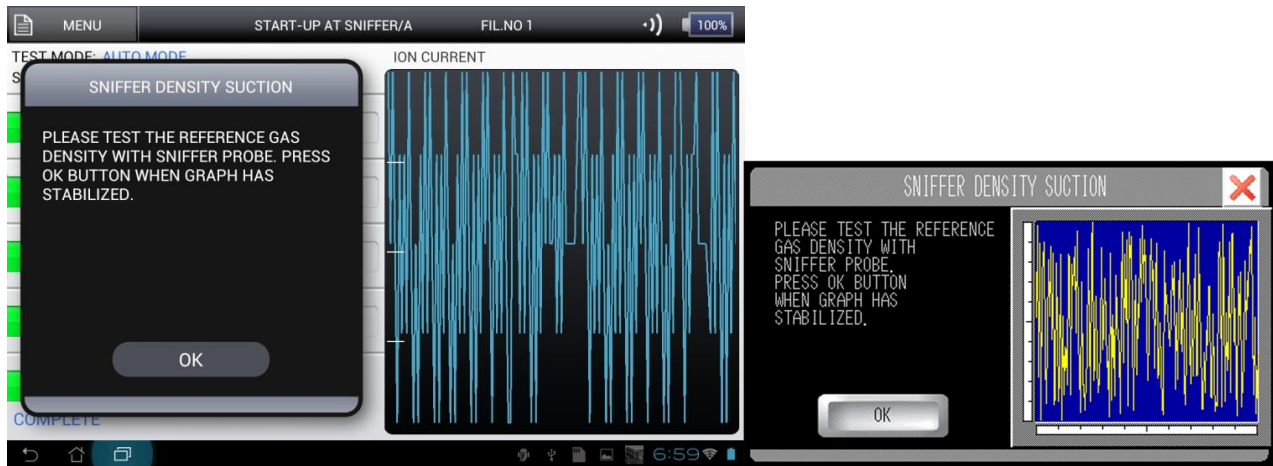
3) Setting of Standard Gas Concentration before Starting Startup

After selecting [SNIFFER (CONCENTRATION)] in the Test mode selection (Section 5-1_2)), enter standard gas concentration under [CALIBRATION STANDARD] – [STANDARD GAS (FOR SNIFFER METHOD)] (Section 5-4_4)-1). The unit used is ppm only.

4) Starting Startup

Slide the start button  (tablet specification) or press [START-UP] (panel mount specification) on the initial screen to switch to Startup screen, and self-checking function of the equipment begins.

1) [TEMPERATURE] to 4) [ION VOLTAGE] consist of the same startup details as vacuum method.



5) [SENSITIVITY]

5)-1 During Calibration Startup: Set at ATM (Section 5-1_7))

Atmosphere is used for startup of sensitivity calibration of the equipment. After completion of the startup, it switches to test screen automatically.

5)-2 During Calibration Startup: Set at STD. GAS (Section 5-1_7))

Standard gas concentration is used for sensitivity calibration of the equipment.

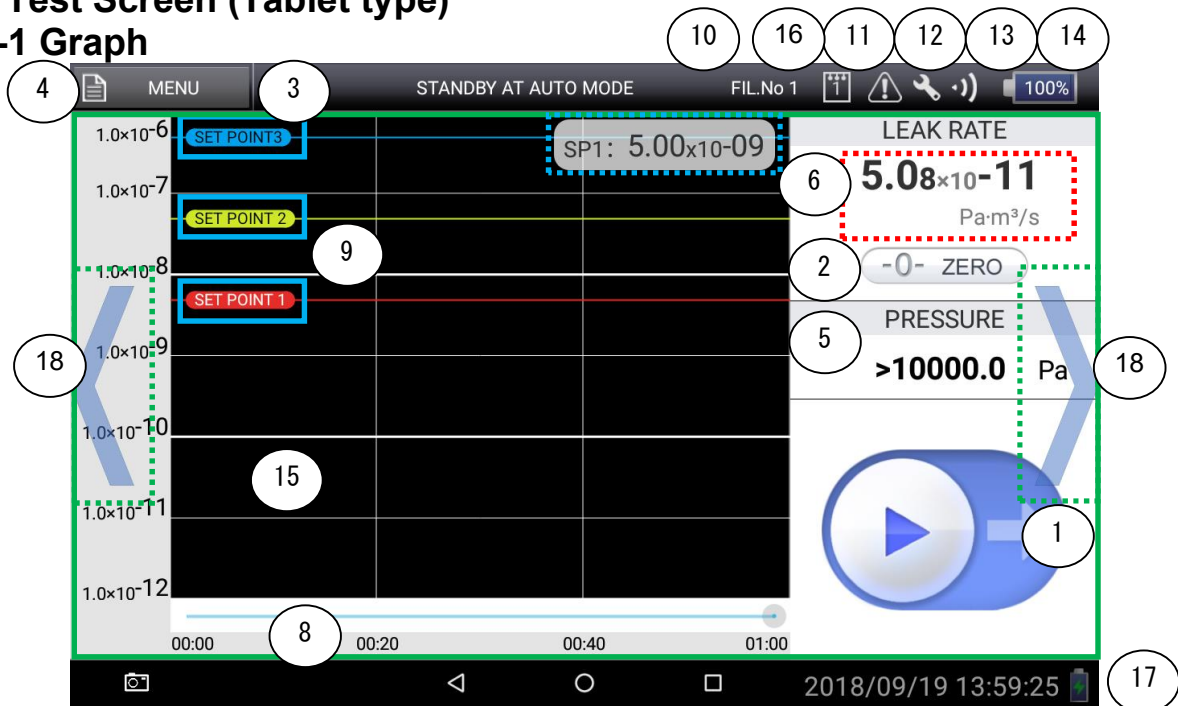
- "SNIFFER DENSITY SUCTION" will be indicated in the pop up, where user is required to intake Standard gas according to the indication.
- When output is stabilized on the graph, press **OK** button. Sensitivity calibration will terminate.

After completion of the startup, it switches to test screen automatically.

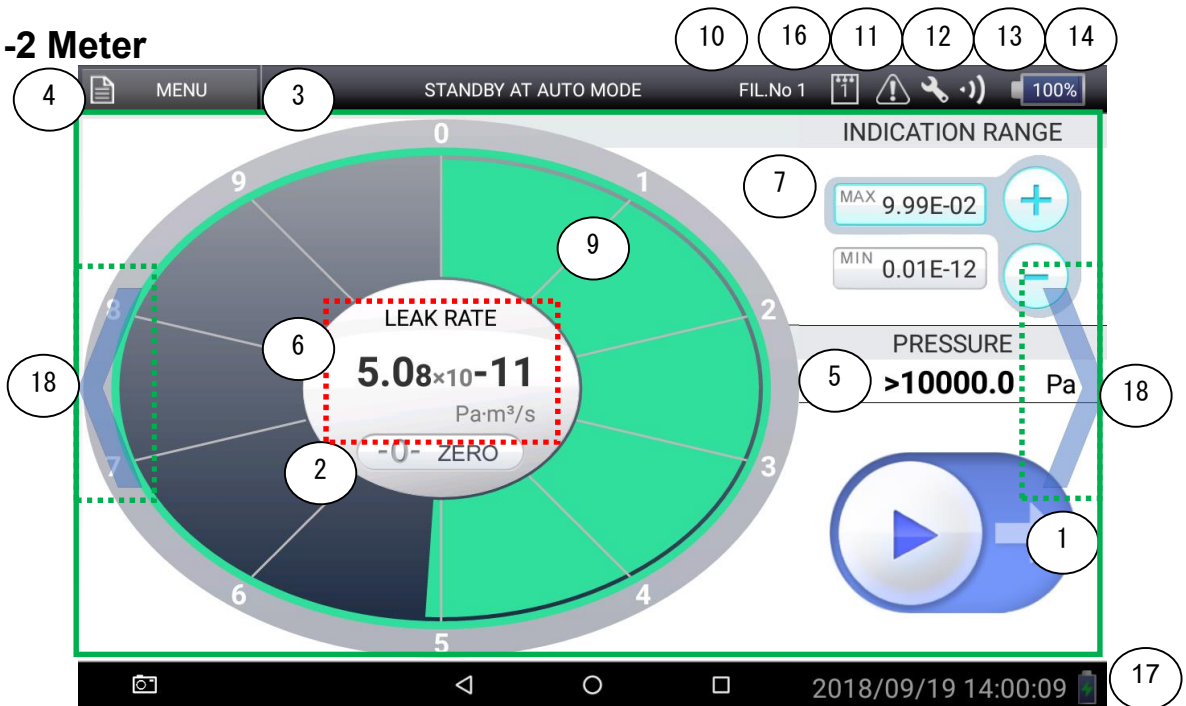
8. Testing

8-1 Test Screen (Tablet type)

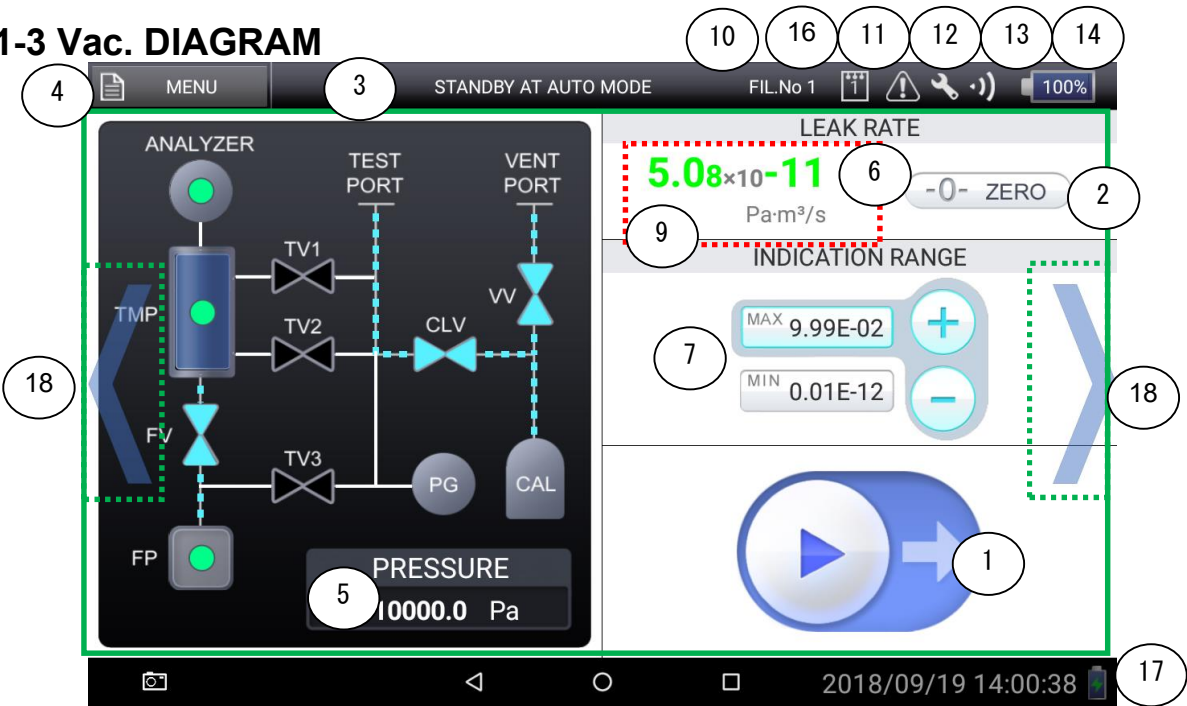
8-1-1 Graph



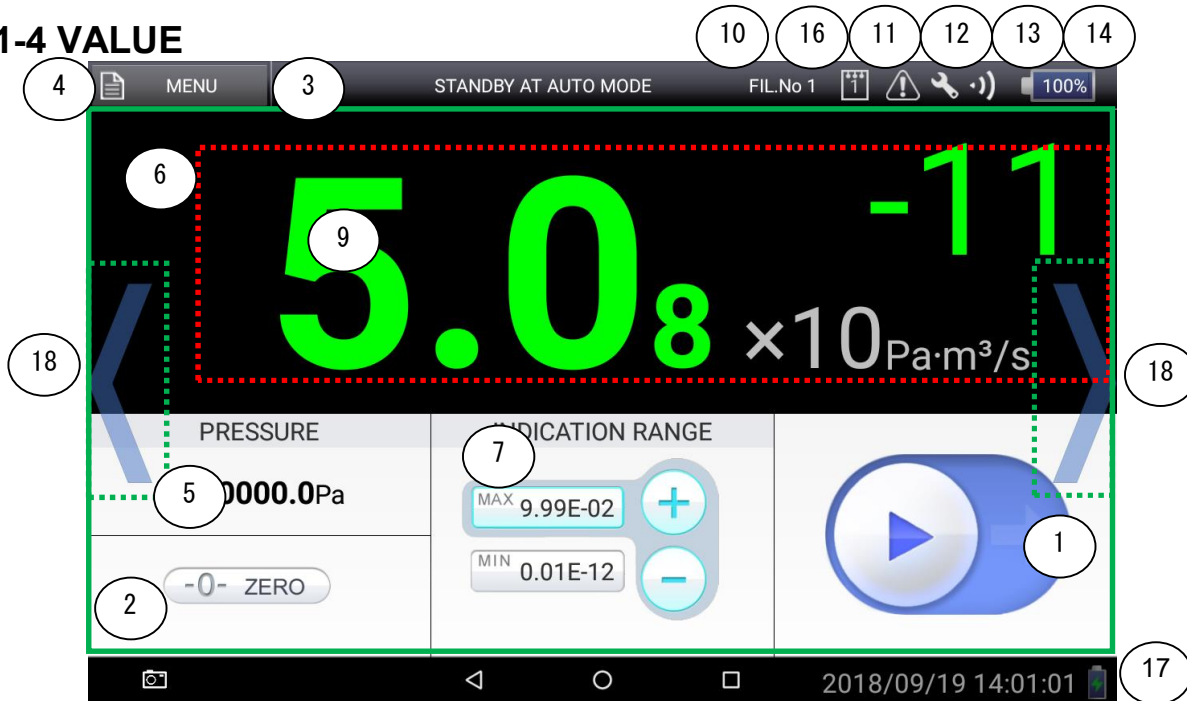
8-1-2 Meter



8-1-3 Vac. DIAGRAM



8-1-4 VALUE

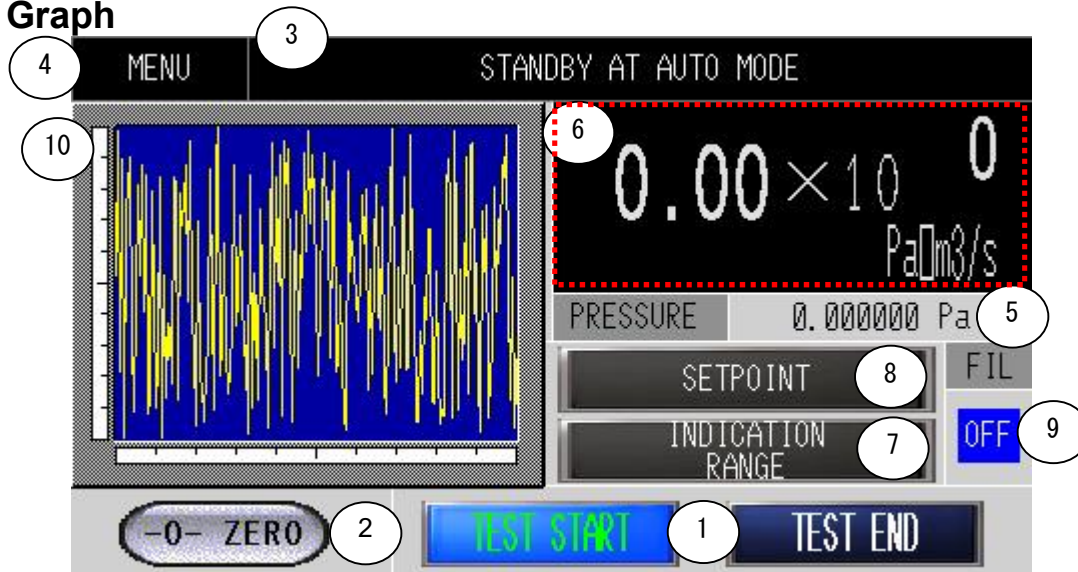


No.	Name	Function
1	Start/End/Vent Buttons for Testing	Slide when executing start/end/vent of the testing.
2	Auto Zero Button	Changes the indicator to zero during testing. Refer to description (Section 8-4) of setting screen for details.
3	Status Display	Real-time display of status.
4	MENU Button	Refer to (Section 4-3)
5	Test Port Pressure	Displays pressure of the test port. (<0.4 - > 10000Pa)
6	Leak Rate	Measurement value is shown during testing and last test end value is shown during stand-by mode. By pressing the red dotted frame during testing, the value at the time is recorded in CSV file (Section 11-4-3). It is printed when the printer setting is on (Section 11-3-1).

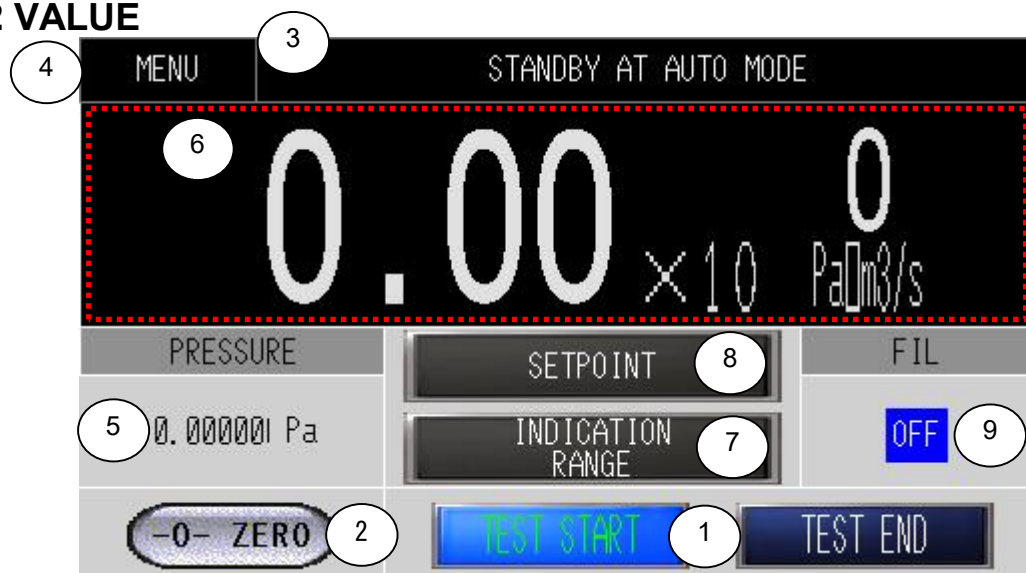
No.	Name	Function
7	Indication Range	Sets measurement range width of leak rate. With this setting the voltage value (Section 11-2-2-5) of LOG recorder output is determined. When using the test screen as a graph, set the other test screen with the width of measurement range.
8	Measurement Time	When using graph display set the measurement period by touching measurement time area with 2 fingers and opening (pinch out) and closing (pinch in) the finger space. Pervious graphs can be checked if testing is completed.
9	SETPOINT	SETPOINT 1, 2 and 3 are shown. (Section 5-3_8) It is green if the value is lower than SETPOINT 1, 2 and 3. It is red if the value is higher than SETPOINT 1. It is yellow if the value is higher than SETPOINT 2. It is light blue if the value is higher than SETPOINT 3. If the setting is set in this order, SP1 < SP2 < SP3, the display will only be red SP1. By touching the SETPOINT* for long, display in the blue frame while graph is displayed, the set point value is displayed in the blue dotted frame.
10	Filament Number	FIL.NO1 is normally displayed. FIL.NO2 is displayed when the Filament 1 is not available.
11	Annotation of Error Marking	This marking will flash when a caution error is generated in the equipment and INVALID is selected under [INDICATION/MESSAGE] – [MESSAGE/NOTICE] (Section 5-2_6)). By pressing this marking, the screen changes to [INFORMATION] – [ERROR LOG] (Section 6-5) screen, where you will be advised to check the status of the equipment.
12	Maintenance Time Elapse marking	This marking will flash when maintenance cycle set in this equipment exceeds and INACTIVE is selected under [INDICATION/MESSAGE] – [MESSAGE/MAINTENANCE] (Section 5-2_8)). By pressing this marking, the screen changes to [INFORMATION] – [MAINTENANCE] (Section 6-3) screen, where you will be advised to check the status of the equipment.
13	Communication strength	Communication strength is displayed by between the equipment and tablet.
14	Battery Level	Displays the amount of battery remained in the tablet.
15	Graph Display	Displaying width can be set by touching display range part with 2 fingers and opening (pinch out) and closing (pinch in) finger space. Optionally set the width.
16	Recipe Setting Number	When a recipe is used in setting screen, the selected recipe number is displayed.
17	Charge Indicator	The charge indicator is displayed or blink when the power supply cable is connected to the tablet.
18	Screen Switching	Arrow button is displayed in the green dotted frame by tapping the display area except the buttons in the green frame, LEAK RATE display (in the red dotted frame), or SETPOINT* display (in the blue frame). By touching the arrow button, the screen switches to the next test screen.

8-2 Test Screen (Panel mount type)

8-2-1 Graph



8-2-2 VALUE



No.	Name	Function
1	Start/End/Vent Buttons for Testing	Slide when executing start/end/vent of the testing.
2	Auto Zero Button	Changes the indicator to zero during testing. Refer to description (Section 8-4) of setting screen for details.
3	Status Display	Real-time display of status.
4	MENU Button	Refer to (Section 4-3)
5	Test Port Pressure	Displays pressure of the test port. (<0.4 - > 10000Pa)
6	Leak Rate	Measurement value is shown during testing and last test end value is shown during stand-by mode. By pressing the red dotted frame during testing, It is printed when the printer setting is on (Section 11-3-1).
7	Indication Range	Select this button to display the setup screen. Set the measurement range width of leak rate. With this setting the voltage value (Section 11-2-2-5) of LOG recorder output is determined.
8	SETPOINT	Select this button to display the set values of SETPOINT1, 2, 3 and confirm them.
9	Filament Number	Display the graph at the measurement.

8-3 Test Mode

**CAUTION****Load on Test Port**

When connecting pipe fitting to the test port, do not place loads over 50N, 5kg's, 10lbs. Risk of damaging the equipment.

Selected (Section 5-1_2)) from **AUTO MODE**, **ULTRA FLOW**, **FINE FLOW**, **GROSS FLOW**, **SNIFFER (FLOW RATE)**, **SNIFFER (CONCENTRATION)**. Each flow has the following features.

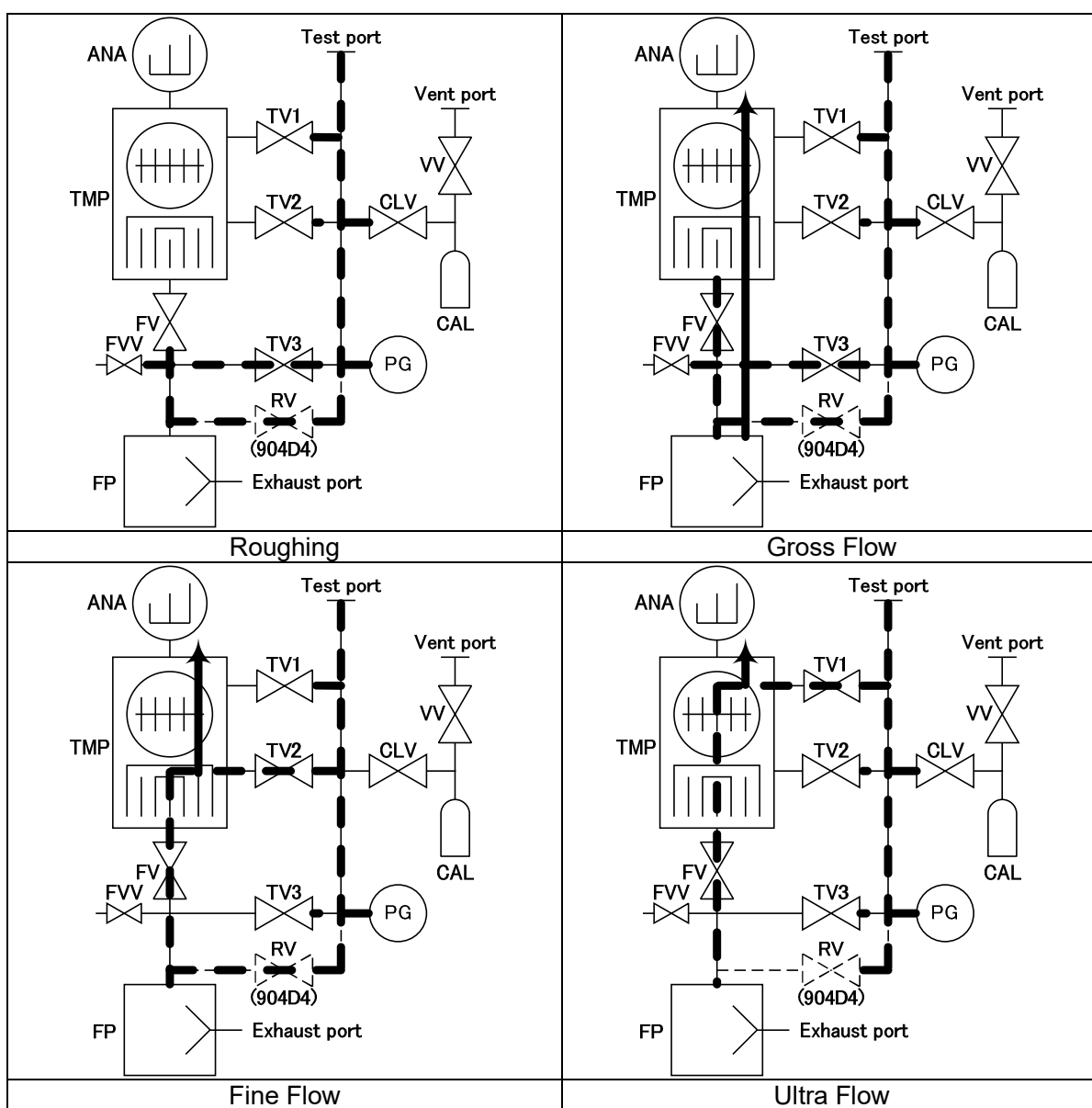
Test Flow	Test port Pressure Range			
	Pa	mbar	Torr	atm
Ultra Flow	< 2	< 0.02	< 0.015	< 0.00002
Fine Flow	< 100	< 1	< 0.75	< 0.001
Gross Flow	< 1200	< 12	< 9	< 0.011
Auto Mode	Gross, Fine and Ultra flows are automatically switched in accordance with pressure and leak rate			
Sniffer Flow	Atmospheric pressure	Atmospheric pressure	Atmospheric pressure	Atmospheric pressure

- * When measured gas is set at **H₂** and the test mode is selected at **SNIFFER (FLOW RATE)** or **SNIFFER (CONCENTRATION)**, fine flow port will be selected automatically.
- * When Auto mode is selected, automatically switches the above flow according to test port pressure and measurement leak rate.
- * It is the capacity set by readings of built-in Pirani gauge head and may differ from the actual subject pressure of measurement.

Range of measurement of leak rate.

Test Mode	Pa·m ³ /s	mbar·L/s Torr·L/s atm·cc/s	lusec	sccm	Mol/s
He Ultra Flow	0.01×10 ⁻¹² ~ 10 ⁻⁰⁶	0.01×10 ⁻¹¹ ~ 10 ⁻⁰⁵	0.01×10 ⁻⁰⁸ ~ 10 ⁻⁰²	0.01×10 ⁻¹⁰ ~ 10 ⁻⁰⁴	0.01×10 ⁻¹⁶ ~ 10 ⁻¹⁰
He Fine Flow	0.01×10 ⁻¹⁰ ~ 10 ⁻⁰⁵	0.01×10 ⁻⁰⁹ ~ 10 ⁻⁰⁴	0.01×10 ⁻⁰⁶ ~ 10 ⁻⁰¹	0.01×10 ⁻⁰⁸ ~ 10 ⁻⁰³	0.01×10 ⁻¹⁴ ~ 10 ⁻⁰⁹
He Gross Flow	0.01×10 ⁻⁰⁸ ~ 10 ⁻⁰³	0.01×10 ⁻⁰⁷ ~ 10 ⁻⁰²	0.01×10 ⁻⁰⁴ ~ 10 ⁺⁰¹	0.01×10 ⁻⁰⁶ ~ 10 ⁻⁰¹	0.01×10 ⁻¹² ~ 10 ⁻⁰⁷
He Auto Mode	0.01×10 ⁻¹² ~ 10 ⁻⁰³	0.01×10 ⁻¹¹ ~ 10 ⁻⁰²	0.01×10 ⁻⁰⁸ ~ 10 ⁺⁰¹	0.01×10 ⁻¹⁰ ~ 10 ⁻⁰¹	0.01×10 ⁻¹⁶ ~ 10 ⁻⁰⁷
H ₂ Fine Flow	0.01×10 ⁻⁰⁸ ~ 10 ⁻⁰⁵	0.01×10 ⁻⁰⁷ ~ 10 ⁻⁰⁴	0.01×10 ⁻⁰⁴ ~ 10 ⁻⁰¹	0.01×10 ⁻⁰⁶ ~ 10 ⁻⁰³	0.01×10 ⁻¹² ~ 10 ⁻⁰⁹
He Sniffer Flow (with AS Unit)	0.01×10 ⁻⁰⁸ ~ 10 ⁻⁰⁵	0.01×10 ⁻⁰⁷ ~ 10 ⁻⁰⁴	0.01×10 ⁻⁰⁴ ~ 10 ⁻⁰¹	0.01×10 ⁻⁰⁶ ~ 10 ⁻⁰³	0.01×10 ⁻¹² ~ 10 ⁻⁰⁹
He Sniffer Flow (with B* Unit)	0.01×10 ⁻⁰⁷ ~ 10 ⁻⁰³	0.01×10 ⁻⁰⁶ ~ 10 ⁻⁰²	0.01×10 ⁻⁰³ ~ 10 ⁺⁰¹	0.01×10 ⁻⁰⁵ ~ 10 ⁻⁰¹	0.01×10 ⁻¹¹ ~ 10 ⁻⁰⁷

Test Mode	Oz/a	g/a	%×R	Amp.	ppm
He Ultra Flow	0.01×10^{-09} ~ 10^{-04}	0.01×10^{-08} ~ 10^{-03}	$0.01 \times 10^{+00}$ ~ $9.99 \times 10^{+07}$	0.01×10^{-16} ~ 9.99×10^{-10}	
He Fine Flow	0.01×10^{-07} ~ 10^{-02}	0.01×10^{-06} ~ 10^{-01}			
He Gross Flow	0.01×10^{-05} ~ 10^{+00}	0.01×10^{-04} ~ 10^{+01}			
He Auto Flow	0.01×10^{-09} ~ 10^{+00}	0.01×10^{-08} ~ 10^{+01}			
H2 Fine Flow	0.01×10^{-05} ~ 10^{-02}	0.01×10^{-04} ~ 10^{-01}			
He Sniffer Flow (with AS Unit)	0.01×10^{-05} ~ 10^{-02}	0.01×10^{-04} ~ 10^{-01}			$0.01 \times 10^{+00}$ ~ 10^{+03}
He Sniffer Flow (with B* Unit)	0.01×10^{-04} ~ 10^{+00}	0.01×10^{-03} ~ 10^{+01}			



- 1) Gross Flow
Sliding the Start test button  of the test screen opens TV3,RV(904D4), executes roughing and changes to testing when the pressure of test port becomes 1200Pa or less. Due to low detection sensitivity, it is not suitable for high sensitivity test but is capable of testing under high pressure. After starting the test, if the pressure deviates from the test port pressure range, the testing automatically stops.
- 2) Fine Flow
Sliding the Start button  of the test screen opens TV3,RV(904D4), executes roughing and changes to testing when the pressure of test port becomes 100Pa or less. It is suitable for leak testing for a testing unit of leak rate of 10^{-10} to 10^{-5} [Pa·m³/s]. After starting the test, if the pressure deviates from the test port pressure range, the testing automatically stops.
- 3) Ultra Flow
Sliding the Start test button  of the test screen opens TV3,RV(904D4), executes roughing and changes to testing when the pressure of test port becomes 2Pa or less.
Testing with Ultra Flow mode fixed, enables faster testing than connecting to Ultra Flow mode under auto mode.
It is suitable for leak testing of testing unit with leak rate of 10^{-10} [Pa·m³/s] or less. After starting the test, if the pressure deviates from the test port pressure range, the testing automatically stops.
- 4) Auto Mode
Sliding the Start test button  of the test screen executes roughing with TV3,RV(904D4) and automatically switches to Gross, Fine, and Ultra Flows according to test port pressures and executes measurement. It is a suitable flow when the testing unit's leak rate and attained pressure are unknown. After starting the test, if the pressure deviates from the Gross Leak test port pressure range, the testing automatically stops. When the test flow switches, the display is fixed for a few seconds, thus this flow is not suitable for judging measurement values by external control.
- 5) Sniffer Method
Sliding the Start test button  of the test screen executes roughing with TV3,RV(904D4) and starts testing after a certain elapse time. Sliding the End test button  of the test screen terminates the testing.

8-3-1 Cycle Test

(It is a function of tablet specification. Panel mount specification does not have the function.)

(1) Overview

A single test cycle (Roughing/Back ground Monitoring/He spray signal/HeV output/up to acceptance evaluation) can be performed automatically.

Cycle test ☐ ON can be set when Ultra Flow, Fine Flow or Gross Flow are selected in the test mode setting.

(2) Operation Overview

2-1) In the case of helium spray test / Hood test

Slide Start test button 

↓

Start Roughing

↓

Satisfy [Test Starting condition] (End the test when not satisfied ; judge as FAIL)

↓

Start Test

↓

Satisfy [He Spray conditions] (End the test when not satisfied ; judge as FAIL)

↓

Start He Spray

↓

Test continued until [Test end conditions] satisfied

↓

Test End, He Spray End

2-2) In the case of bell jar test / Bombing test

Slide Start test button 

↓

Start Roughing

↓

Satisfy [Test Starting condition] (End the test when not satisfied ; judge as FAIL)

↓

Start Test

↓

Test continued until [Test end conditions] satisfied

↓

Test End, He Spray End

(3) Settings

	CYCLE TEST	ON	OFF
3-1)	ROUGHING TIMER	CONSTANT PRESSURE	010.0sec
3-2)	CONNECTING PRESSURE	100.0Pa	
3-3)	BACKGROUND TIMER	BELOW SP.2	010.0sec SKIP
3-4)	TEST TIMER	TEST END AT NG	010.0sec
3-5)	He SPRAY TIMER	=TEST TIME	010.0sec

3-1) [Roughing Timer]

Specify roughing time.

Selecting **CONSTANT** **PRESSURE** starts the testing when the pressure reaches to the connection pressure within the specified time.

Selecting **TIME** does not start the testing unless the specified time elapses. If the pressure does not reach to the connection pressure within the specified time, the test is judged as FAIL and stops the testing.

3-2) [Connecting pressure]

Set the pressure at the end of roughing

Maximum set pressure varies depending on the selected test mode. Set the pressure within the range of Test port pressure (above 8-3).

3-3) [BACKGROUND Timer]

Selecting **BELOW SP.2** starts the testing when leak rate display becomes set point 2 or below even within the time specified.

When **TIME** is selected, testing will not start unless the specified time elapses and yet leak rate display becomes set point 2 or below. If the leak rate display becomes set point 2 or above at the specified time elapsed, the test is judged as FAIL and stops the testing.

When **SKIP** is selected, regardless of leak rate display, as soon as the roughing completes, testing starts.

3-4) [Test Timer]

Selecting **TEST END AT FAIL** terminates the testing and judges as FAIL at the point when the leak rate display exceeds set point 1 even if it is within the specified time.

When **TIME** is selected, after the specified time elapsed, set point 1 setting value and leak rate are compared on display and judged as PASS/FAIL. After terminating the test the HELIOT will move to stand-by mode.

3-5) [He Spray Timer]

Set the output condition of He Spray signal/HeV output which is one of EXT.I/O (Section 11-1).

Selecting **= TEST TIME** executes He Spray signal/HeV output under the condition set with 3-3) TEST TIMER.

When **TIME** is selected, after starting output of He Spray signal/HeV output and after the specified time lapsed, output is turned OFF. If time setting is set to 0, He Spray signal/HeV output will not be executed.

AUTOMATIC JUDGEMENT PASS SCREEN



AUTOMATIC JUDGMENT FAIL SCREEN



(4) Recommended Settings

	Spray test / Hood test	Bell jar test / Bombing test
Roughing Timer	TIME	CONSTANT PRESSURE
BACKGROUND Timer	BELOW SP.2	SKIP
Test Timer	TEST END AT FAIL	TIME
He Spray Timer	TIME	0sec(non-use)

8-4 -0-ZERO Button and Functions

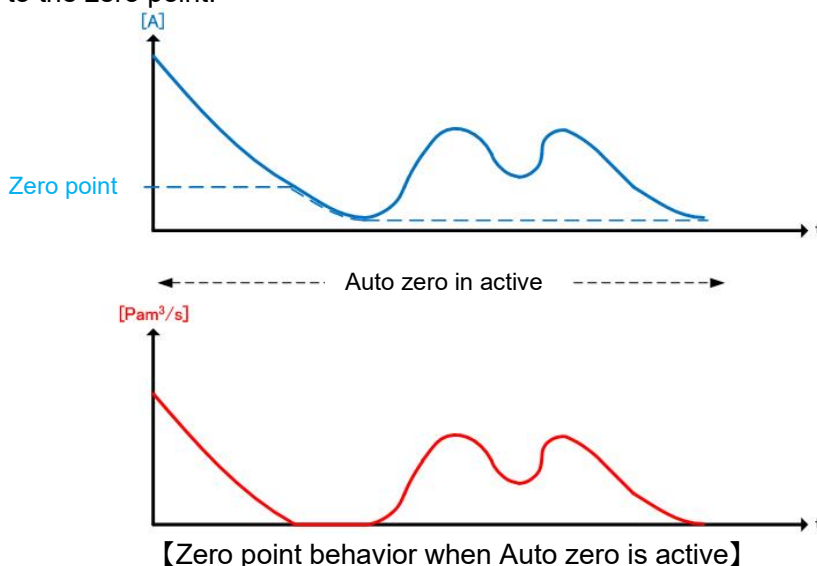
After being measured as an initial value at sensitivity calibration (refer to Section 1-8-2), zero point changes after startup in cold start up. Zero point during measurement will be as follows.

8-4-1 -0-ZERO Button Condition Display

- (1) When **-0-ZERO** button lights (blue)

When **-0-ZERO** button lights, Auto Zero is active.

When Auto Zero is active, the minimum ion current value at the time of measurement is always updated to the zero point.

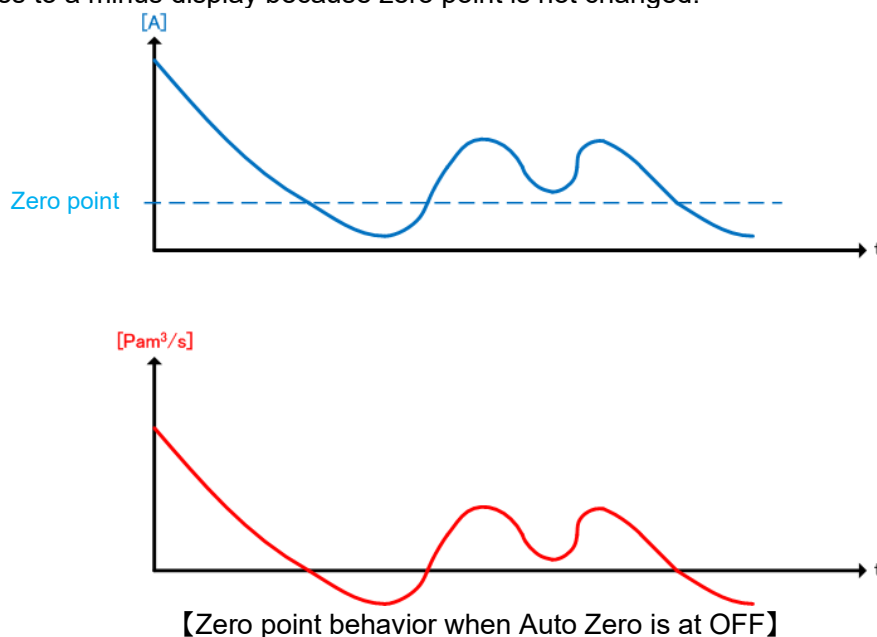


A blue solid line shows a graph of ion current, and a blue dotted line shows zero point. The leak rate is calculated by the ion current and the ion current value at zero point. A red curved line shows the leak rate.

- (2) When **-0-ZERO** button does not light (white)

When **-0-ZERO** button does not light, Auto Zero is not active.

When Auto Zero is not active, zero point is not changed from the zero point at sensitivity calibration (value β). Even if the measured ion current value is below value β , the value reaches to a minus display because zero point is not changed.



※ Note when auto zero function is turned off.

The amount of residual helium in the analyzer tube changes right after the startup or when gross leak is measured. During testing with auto zero function turned off right after startup, the display value of leak rate may become negative (lower value) as the amount of residual helium decreases.

8-4-2 Difference of Settings of Auto Zero Function and Example of Use

- (1) When **1SHOT** and standby zero **ON** are set
-0-ZERO button continuously lights (blue), and the minimum ion current is always updated to zero point during testing and test standby. By touching **-0-ZERO** button for 3 seconds during measurement, the ion current value at touching is shifted to zero point.

<Example of Use>

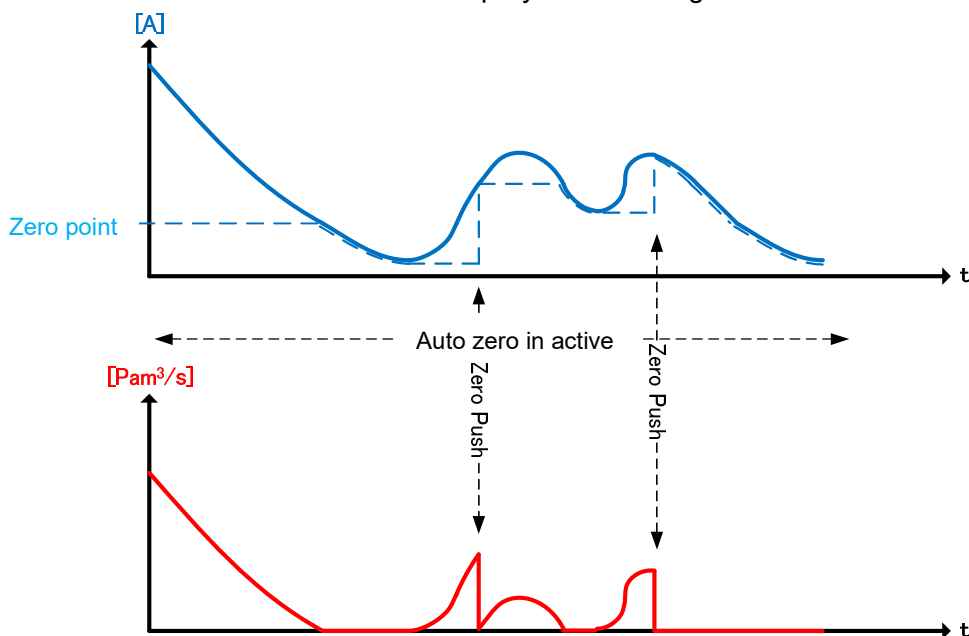
This setting is recommended when testing the work filled with helium by chamber/bell jar method or bombing test. Since the ion current becomes minimum during standby, the leak rate is calculated from the difference between the ion current during standby and ion current during measurement.

- (2) When **1SHOT** and standby zero **OFF** are set
-0-ZERO button continuously lights (blue), and the minimum ion current is always updated to zero point during testing. Update of zero point is not executed during standby. By touching **-0-ZERO** button for 3 seconds during measurement, the ion current value at touching is shifted to zero point.

<Example of Use>

This setting is recommended with helium spray or hood test in which helium is sprayed to the work.

Before spraying helium (during B.G. measurement), cancel B.G. by long touching **-0-ZERO** button for 3 seconds. Then spray helium and calculate the leak rate from the difference between the ion current when helium is sprayed and background ion current value.



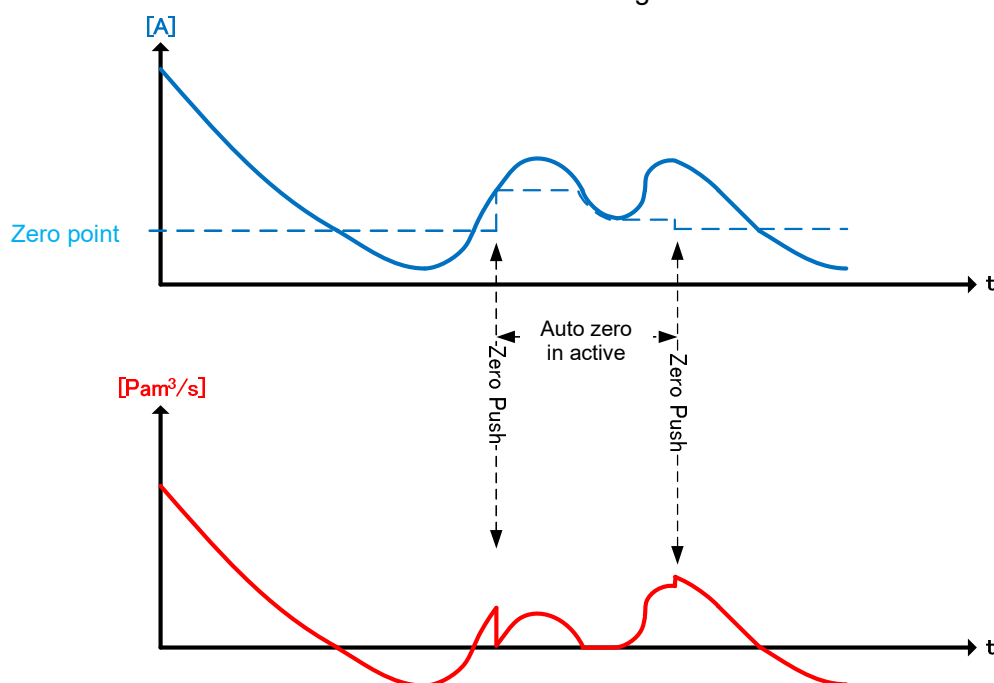
【Zero point behavior when auto zero function is set at **1SHOT** and **-0-ZERO** button is pressed】

(3) **ALTERNATE**

It changes every time when **-0-ZERO** button of ON/OFF (blue / white) of auto zero update function is long pressed for 3 seconds. It is automatically turned off when the test is completed. When Auto Zero is active, the minimum ion current is updated to zero point (Section 8-4-1(1)). When at OFF, zero point at sensitivity calibration is used (Section 8-4-1(2)). When switched from OFF to ON by long pressing **-0-ZERO** button for 3 seconds, the ion current value at pressing is shifted to zero point.

<Example of Use>

This setting is used with helium spray or hood test in which helium is sprayed to the work, and when it is necessary to check the change from ion current at calibration is necessary. Change of helium concentration in a measurement environment can be checked by checking the change from the ion current at calibration. Before spraying helium (during B.G. measurement), cancel B.G. by long pressing **-0-ZERO** button for 3 seconds. Then spray helium and calculate the leak rate from the difference between the ion current when helium is sprayed and background ion current. This setting is recommended with the sniffer method (flow rate and concentration) also to avoid an update of zero point in case the tip of the probe is obstructed by error. To cancel B.G before the measurement of the work, touch **-0-ZERO** button for 3 seconds and execute the measurement of the testing unit.



【Zero point behavior when auto zero function is set at **ALTERNATE** and **-0-ZERO** button is pressed】

※ When B.G. is cancelled by touching Auto Zero **1SHOT** or **-0-ZERO** button at **ALTERNATE**, the leak rate display changes depending on the measurement flow.

- Ultra Flow : 0.0₁E-12 [Pa·m³/s]
- Fine Flow : 0.0₁E-10 [Pa·m³/s]
- Gloss Flow : 0.0₁E-08 [Pa·m³/s]
- Sniffer (Flow Rate) : 0.0₁E-08 [Pa·m³/s](AS) unit
: 0.0₁E-07 [Pa·m³/s](BS/BT) unit
- Sniffer (Concentration) : 0.0₁E+00 [ppm](AS/BS/BT) unit

(4) **INACTIVE**

Operation of zero point button becomes inactive (remain off). Zero point is not changed from the zero point at sensitivity calibration. The leak rate display always results in a negative value when detecting the ion current lower than zero point at sensitivity calibration. Set after reading the note of Section 8-4-1(2).

NOTE :

*Auto zero function does not distinguish between background and measurement value during testing. If resetting timing is not correct when pressing **-0-ZERO** for resetting zero point, risk of changing the value to zero for the value to be measured also. The operator is requested to fully understand the function before use.

*Auto zero will not function when display unit is set to **%xR**, **Amp.**.

8-5 How to Use **CLEAN UP**

When large amount of He/H₂ is injected into the equipment during the test, this is a function to flush out He/H₂ from the interior of the equipment by injecting small amount of atmosphere. The steps below show the clean up operation.

When CYCLE TEST of TEST MODE (5-1_3) is on, the cleanup operation becomes valid only in a test standby mode.

- (1) Long press **MENU** button for 3 seconds. The menu window displays.
- (2) Press **CLEAN UP** button.
- (3) The message bar display on the test screen displays "CLEAN UP PROCESSING".
- (4) Executes approximately 5 seconds of clean up.
- (5) When clean up is completed, the display switches to test screen.

8-6 How to Use **CAL. START**

Function to execute Sensitivity Calibration from Test Standby mode. In order to maintain measurable condition with high accuracy, periodical (approx. once per every 1 - 4 hours) Sensitivity Calibration during continuous operation is recommended. Sensitivity Calibration is also effective for Startup in **OFF** mode through [GENERAL] – [CALIBRATION] – [START-UP] (Section 5-1_7)).

Before Sensitivity Calibration, install a blank flange to the test port for Vacuum Method and a Sniffer Unit for Sniffer method.

- (1) Long press **MENU** button for 3 seconds. The menu window displays.
- (2) Press **CAL. START** button.
- (3) Switches from Test Screen to Sensitivity Calibration Screen and executes Sensitivity Calibration.
- (4) When Sensitivity Calibration is completed, the display switches to test screen.

8-7 How to Use **CAL.CHECK**

Function to execute measurement of calibration leak from Test Standby. By measuring leak rate of calibration leak known, it is possible to check if suitable measurement value is attained.

- (1) Long press **MENU** button for 3 seconds. The menu window displays.
- (2) Press **CAL. CHECK** button.
- (3) The message bar display on the test screen displays "CAL. LEAK VALUE CHECK WAITING".
- (4) To reset (normal measuring mode). long press **MENU** button again for 3 seconds followed by **CAL. CHECK**.
- (5) Sliding  Start Test button on the test screen, displays "ROUGHING AT CAL. CHECK" on the message bar of the test screen during roughing and in case of testing, the message bar on the test screen displays "CAL. LEAK VALUE CHECKING" and executes calibration measurement.
- (6) When terminating calibration leak check, slide the End Test  button (Section 8-8).

NOTE :

*Leak Rate of calibration leak changes according to elapsed time from the calibration date and ambient temperature. See instruction manual for details of calibration leak.

8-8 End of Testing

Sliding End Test button  of test screen terminates the test and vents (atmosphere release) to the test port

- **AUTO** : Vents after the end of the test.
- **MANUAL** : Vents when sliding the Vent button after the end of the testing.
- **OFF** : No vent is executed.



CAUTION

Atmosphere Release of Test Port

Do not release atmosphere of Test port by removing blank flanges, testing units or Sniffer units installed in the test port, or release atmosphere except by tablet operation before ventilation. Risk of damaging the equipment.

NOTE :

*If you wish to maintain the testing unit and inside of the piping in vacuum without releasing atmosphere after testing, installation of valves between the test port and testing unit is recommended.

8-9 Hydrogen Measurement

H₂ Measurements are greatly affected by the condition of the equipment (background) when compared to He measurement. Measurement values in particular tend to be unstable immediately after startup completes. When measuring below E-7Pa·m³/s level, warm up of over 1 hour after completion of startup followed by sensitivity calibration is recommended before use.



CAUTION

Handling of Hydrogen Gas

There is a danger of explosion when hydrogen is mixed with atmosphere of 4% or more. Make sure to check the safety of the hydrogen gas or hydrogen mixture gas with MSDS before handling without fail.

9. Error Modes

 CAUTION	Errors In the event of an error, release the error mode press  after checking the state of error described in the error message. See the troubleshooting section and service/repair as necessary.
 CAUTION	Release of Error Mode In the event of an error, release the error mode press  after checking the state of error described in the error message.

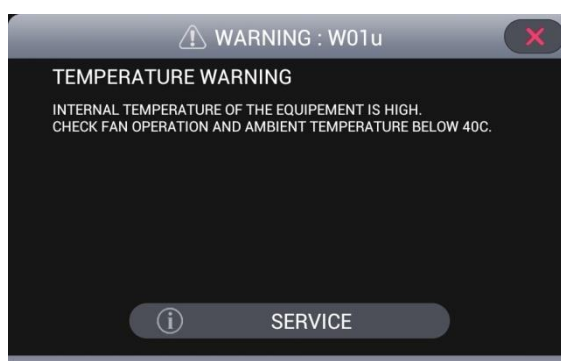
Displays the detail of error in case of any abnormalities occurred with the equipment. Errors are classified into 2 types as “Warning Error” and “Caution Error”. After displaying the message of abnormal condition, “Warning Error” stops the operation and “Caution Error” recovers the operation by pressing .

“Caution Error” will not be displayed when **INVALID** is set for [INDICATION/MESSAGE] – [MESSAGE] – [NOTES] (Section 5-2_7)). When error message is shown, immediate servicing or repair of equipment is needed.

9-1 Warning Errors

Warning error occurs in case of problems at startup or failure in testing. If an error occurs at startup, it stops immediately. If the warning error occurs during testing, the test stops and the test port releases the atmosphere. Then enters stop mode to stop the equipment.

- 1) Error occurs during operation. It stops operation in parallel with the start of warning error. Then the following warning screen displays.



- 2) The error screen displays its detail and what may be considered as the cause. Read the detail of the error carefully and inspect it accordingly. By pressing **SERVICE**, a list of Service Desks will be displayed. Changes to initial mode when  is pressed.
- 3) If the condition does not resolve after inspection, please contact your nearest Service Desk.

9-2 Caution Errors

Caution errors do not have serious impact to startup or testing of the equipment. However, it may have serious impact to the equipment in the future

- 1) Error occurs during operation. During startup of the equipment, errors do not display immediately. After completion of the startup, the following message displays. Also, as for the errors occurred during testing, error is displayed immediately.
The message shows the details of what may be considered as the cause. Except when [INDICATION/MESSAGE] – [MESSAGE] – [NOTICE] (Section 5-2_7)) is set as INVALID, the error screen will not be displayed.



- 2) Check the details of the error message and repair/service accordingly. Caution Error does not require immediate maintenance. However, in order for you to use the equipment in a safer environment, we recommend maintenance of the equipment.
- 3) By pressing X, maintains the Test Mode Standby or Test state. Changes to maintenance screen by pressing MAINTENANCE. If the condition does not resolve after servicing, please contact your nearest Service Desk.

9-3 List of Error Messages

9-3-1 Warning Errors

Following is the list of all the error messages displayed in this equipment. Warning messages are shown with W OR C at the head of the numbers + state occurred and caution messages are shown with N at the head of the numbers + state occurred.

Key modes: A: Startup/sensitivity calibration, B: Standby, C: Testing

Error Code				Error Message/Abnormal Condition	Remarks
	A	B	C		
W01	u	s	t	TEMPERATURE WARNING Temperature within the equipment above 55°C and over	1) Check the ambient temperature 2) Possibility of dirty air filter of air cooling fan
C02	u	s	t	PIRANI SENSOR BURN OUT Filament of Pirani vacuum gauge was disconnected. Communication failure between the control board of HELIOT and the detection unit of Pirani sensor gauge.	1) Pirani gauge head may be disconnected. Replace the Pirani gauge head. 2) Is there any water vapor or oil mist being injected to the equipment? If any of the above are present to the Pirani gauge head, the equipment will diagnose it as disconnection. Replacement of Pirani gauge head is necessary. 3) Check the connection of the cable.
C03	u	s	t	FOREPUMP OVERLOAD Circuit protector for protecting Fore Pump operated because the temperature of the Fore Pump was detected as being too low.	1) Reset the circuit protector for Fore Pump on the connector panel. 2) Start after setting the ambient temperature to 10°C and over.
C04	u	s	t	FORE PUMP OVERLOAD Circuit protector for protecting Fore Pump operated.	1) Reset the circuit protector for Fore Pump on the connector panel. 2) Check to see that the exhaust vent port is not obstructed. 3) Check power supply voltage. 4) If supplying power with cord reel, remove the cord reel and check again.
C05	u	s	t	SNIFFER PUMP OVERLOAD Circuit protector for protecting Sniffer Pump operated.	1) Reset the circuit protector for Sniffer Pump on the connector panel.
W06	u	s	t	TMP OVERLOAD Error occurred in the Turbomolecular Pump.	1) Was the pressure of test port increased suddenly during operation? Protective circuit causes the pump to stop when the pressure rises suddenly. Restart unit.

※ U : Code suffix @ start up.

※ S : Code suffix @ stand by.

※ T : Code suffix @ testing.

C10	u	—	—	ROUGHING ERROR AT START-UP A state where Test Port is unable to achieve 100Pa or below (within 180 seconds) at Startup.	1) Connect the blank flange to the Test Port and execute Startup. 2) Check power supply voltage. 3) If supplying power with cord reel, remove the cord reel and check again. 4) If the internal capacity of the sample is large, exhausting by single main equipment may not be possible. If error frequently occurs, install a separate exhaust system. 5) When using rotary pump, is the oil being replaced? Is maintenance of Fore Pump being executed? Check the maintenance period and if it is approaching, execute the maintenance.
C11	u	—	—	TMP ROTATION ERROR A state where rotation number of Turbomolecular pump does not reach steady rotation (within 240 seconds) at Startup.	1) Has there been any case of subjecting the Turbomolecular pump to a frequent sudden rise in pressure? Rapid rise in pressure will cause malfunction of Turbomolecular pump. 2) Is the Wick holder being replaced periodically? Replacement of once in 2 years is required as a target. 3) There could be communication failure between the control board of the HELIOT and the turbo molecular pump if this error occurs after startup.
C12	u	—	—	DC-AMP ERROR Ion detection current value is detected at 1.00×10^{-13}[A] or over.	1) Check to see that the ground terminal of power supply of the HELIOT is connected. If it is not connected, connect and verify at startup. 2) DC amp is damaged. Contact your nearest Service Desk.
W13	u	s	t	EMISSION ERROR (LOW) If emission current is unable to obtain. (When filament of ion source is disconnected).	1) Is the connector of ion being securely connected? Reconnect the connector, Then restart. 2) Replace ion source by referring to replacement method of ion source.
W14	u	s	t	EMISSION ERROR (HIGH) Filament current is too high	1) Control wiring board is damaged. Contact your nearest Service Desk.
C15	u	—	—	CANNOT FIND He/H2 PEAK When He/H2 peak cannot be obtained by adjusting accelerated voltage.	1) A state where He/H2 peak cannot be detected during accelerated voltage adjustment. The calibration leak of [GENERAL] – [CALIBRATION] – [START-UP] is set with a internal calibration leak and verify at startup.
C16	u	—	—	PEAK HEIGHT OVER RANGE When He/H2 peak voltage exceeded over during accelerated voltage adjustment.	1) At accelerated voltage adjustment, peak voltage is outside of the reference range. The calibration leak of [GENERAL] – [CALIBRATION] – [START-UP] is set with a internal calibration leak and verify at startup.

C17	u	—	—	PEAK POSITION OVER RANGE When accelerated voltage is outside of proper voltage value.	1) Check to see that the ground terminal of power supply of the HELIOT is connected. If it is not connected, connect and verify at startup. 2) Possibility of dirty analyzer tube. Early overhaul is recommended.
C18	u	s	t	CIRCUIT PROTECTOR I/O TRIPPED When circuit protector of DC24 V which outputs from EXT.I/O operated.	1) EXT.I/O circuit protector located in the connector panel tripped. Verification is necessary. 2) Wiring and external system (sequencers) need to be checked.
W19	u	s	t	CIRCUIT PROTECTOR FILAMENT TRIPPED When circuit protector for filament circuit power supply operated.	1) Circuit protector within the control wiring board tripped. Verification is necessary. 2) Check the cable for ion source and fixing for oil source.
C21	u	—	—	SENSITIVITY DEFECT (VACUUM) Outside range of the sensitivity calibration.	1) Is the maintenance for Fore Pump being executed? Check the maintenance time of the Fore Pump and if the maintenance time is approaching, an early overhaul is recommended. 2) Is the ion source clean? The ion source is a consumable. When you find the sensitivity is reduced, replacement is recommended.
C22	u	—	—	SENSITIVITY TOO HIGH (VACUUM) Outside range of the sensitivity calibration.	1) Was the large amount of He being absorbed during the last measurement time? The concentration of He within the equipment is becoming high. Several operations of start/stop are needed. 2) Is the maintenance of Fore Pump being executed? Check the maintenance time of the Fore Pump and if the maintenance time is approaching, an early overhaul is recommended. 3) Is the ion source clean? The ion source is a consumable. When you find the sensitivity is reduced, replacement is recommended.
C23	u	—	—	SENSITIVITY DEFECT (SNIFFER) Outside range of the sensitivity calibration.	1) Is the pressure of He cylinder at normal? External calibration leak is calibrated at 0.1MPa. Verification of supplied pressure is necessary. 2) Is the maintenance of Fore Pump being executed? Check the maintenance time of the Fore Pump and if the maintenance time is approaching, an early overhaul is recommended. 3) Is the ion source clean? The ion source is a consumable. When you find the sensitivity is reduced, replacement is recommended.

C24	u	—	—	SENSITIVITY TOO HIGH (SNIFFER) Outside range of the sensitivity calibration.	1) Is the pressure of He cylinder at normal? External calibration leak is calibrated at 0.1MPa. Verification of supplied pressure is necessary. 2) Is the maintenance of Fore Pump being executed? Check the maintenance time of the Fore Pump and if the maintenance time is approaching, an early overhaul is recommended. 3) Is the ion source clean? The ion source is a consumable. When you find the sensitivity is reduced, replacement is recommended.
C25	u	—	—	SENSITIVITY DEFECT (SNIFFER) Outside range of the sensitivity calibration.	1) Is the maintenance of Fore Pump being executed? Check the maintenance time of the Fore Pump and if the maintenance time is approaching, an early overhaul is recommended. 2) Is the ion source clean? The ion source is a consumable. When you find the sensitivity is reduced, replacement is recommended.
C26	u	—	—	SENSITIVITY TOO HIGH (SNIFFER) Outside range of the sensitivity calibration.	1) Was He being used before startup of the equipment? The concentration of He within the environment is becoming high. Find a place where He concentration is stable and restart. 2) Is the maintenance of Fore Pump being executed? Check the maintenance time of the Fore Pump and if the maintenance time is approaching, an early overhaul is recommended. 3) Is the ion source clean? The ion source is a consumable. When you find the sensitivity is reduced, replacement is recommended.

9-3-2 Caution Errors

Key modes: A: Startup/sensitivity calibration, B: Standby, C: Testing

Error Code				Error Message/Abnormal Condition	Remarks
	A	B	C		
N01	u	s	t	TEMPERATURE WARNING When the temperature within the equipment rise to 45°C and over. When the filter is dirty	1) Check the ambient temperature 2) Air filter of air cooling fan may be dirty.
N10	u	—	—	ROUGHING ERROR AT Re-CALIBRATION A state where Test Port is unable to achieve 100Pa or below at Roughing Sensitivity Re-calibration	1) Connect the blank flange to the Test Port and execute startup. 2) Has the maintenance of Fore Pump being executed? Check the maintenance time of the Fore Pump and if the maintenance time is approaching, an early overhaul is recommended. 3) If cycle test is selected, adjust the roughing time of the cycle to a proper value.
N11	u	—	—	ROUGHING ERROR AT Re-CALIBRATION A state where Test Port is unable to achieve 100Pa or below at Roughing Sensitivity Re-calibration	1) Is the maintenance of Fore Pump being executed? Check the maintenance time of the Fore Pump and if the maintenance time is approaching, an early overhaul is recommended. 2) If cycle test is selected, adjust the roughing time of the cycle to a proper value.
N21	u	—	—	SENSITIVITY FALL(VACUUM) When worse than resulting sensitivity range of the sensitivity calibration. Ultra Flow: 3.00×10^{-12} and over Fine Flow: 3.00×10^{-11} and over Gross Flow: 1.00×10^{-06} and over	1) Is the maintenance of Fore Pump being executed? Check the maintenance time of the Fore Pump and if the maintenance time is approaching, an early overhaul is recommended. 2) Is the ion source clean? The ion source is a consumable. When you find the sensitivity is reducing, replacement is recommended.

- ※ U : Code suffix @ start up.
 ※ S : Code suffix @ stand by.
 ※ T : Code suffix @ testing.

N22	u	—	—	SENSITIVITY TOO HIGH (VACUUM) When better than resulting sensitivity range of the sensitivity calibration. Ultra Flow: 2.00×10^{-13} and below Fine Flow: 2.00×10^{-12} and below Gross Flow: 1.00×10^{-11} and below	1) Did the large amount of He being absorbed during the last measurement? The concentration of He within the equipment is rising. Several operations of start/stop are needed. 2) Is the maintenance of Fore Pump being executed? Check the maintenance time of the Fore Pump and if the maintenance time is approaching, an early overhaul is recommended. 3) Is the ion source clean? The ion source is a consumable. When you find the sensitivity is reducing, replacement is recommended.
N23	u	—	—	SENSITIVITY TOO HIGH (SNIFFER) When worse than resulting sensitivity range of the sensitivity calibration. 1.00×10^{-08} and over	1) Is the pressure of He cylinder at normal? External calibration leak is calibrated at 0.1MPa. Verification of supplied pressure is necessary. 2) Is the maintenance of Fore Pump being executed? Check the maintenance time of the Fore Pump and if the maintenance time is approaching, an early overhaul is recommended. 3) Is the ion source clean? The ion source is a consumable. When you find the sensitivity is reducing, replacement is recommended.
N24	u	—	—	SENSITIVITY TOO HIGH (SNIFFER) When better than resulting sensitivity range of the sensitivity calibration. 1.00×10^{-12} and below	1) Is the pressure of He cylinder at normal? External calibration leak is calibrated at 0.1MPa. Verification of supplied pressure is necessary 2) Has the maintenance of Fore Pump being executed? Check the maintenance time of the Fore Pump and if the maintenance time is approaching, an early overhaul is recommended. 3) Is the ion source clean? The ion source is a consumable. When you find the sensitivity is reducing, replacement is recommended.
N27	u	—	—	BACKGROUND ERROR(VACUUM) When the Background is high at the time of Startup. 1.000×10^{-13}[A] and over	1) Did the large amount of He being absorbed during the last measurement? The concentration of He within the equipment is rising. Several operations of start/stop are needed. 2) Check to see that the ground terminal of power supply of the HELIOT is connected. If it is not connected, connect and verify at startup.

N28	u	—	—	BACKGROUND ERROR(SNIFFER) When the Background is high at the time of Startup. $5.000 \times 10^{-11} [A]$ and over	1) Did He being used before startup of the equipment? The concentration of He within the environment rising. Find a place where He concentration. Is stable and execute restart. 2) Check to see that the ground terminal of power supply of the HELIOT is connected. If it is not connected, connect and verify at startup.
N31	u	—	t	SNIFFER PRESSURE TOO LOW CAUTION When injection pressure to Turbomolecular pump decreased. This error is read out only once per Testing. 20Pa and below	1) Check to see that the tip of the probe is not obstructed. Is sintered filter at the tip clear of any clogs? Replace the sintered filter if any clogging is detected. 2) Check the pressure of Test port when using Sniffer BS/BT unit. If the pressure is getting low, microseparator may be deteriorating. 3) Check the Sniffer probe tube for any bent areas. Make sure that the tube is not bent.
N32	u	—	t	SNIFFER PRESSURE TOO HIGH CAUTION When injection pressure to Turbomolecular pump increased. This error is read out only once per Testing. 45Pa and above	1) Is the tip of probe free of any problems? Check the sintered filter for any disconnection. If disconnected, its reconnection is required. 2) Check the pressure of Test port when using Sniffer BS/BT unit. If the pressure is getting low, microseparator may be deteriorating. 3) Check the tube insider the Sniffer probe tube for any cuts. If so replace them.
N33	u	—	t	SNIFFER FLOW TOO LOW CAUTION When Sniffer flow rate decreased. This error is read out only once per Testing. 0.5SLM and below	1) Check to see that the tip of the probe is not obstructed. Sintered filter may be clogged. Replace the sintered filter. 2) Check the Sniffer probe tube for any bent areas. Make sure that the tube is not bent when use. 3) Check to see that the exhaust port of the Sniffer unit is not obstructed.
N34	u	—	t	SNIFFER FLOW TOO HIGH CAUTION When Sniffer flow rate increased. This error is read out only once per Testing. 8.5SLM and above	1) Is the sintered filter at the tip of the probe securely fixed? Reattach the sintered filter.

N40	—	—	t	PRESSURE INCREASE When the pressure rose during testing.	1) The fixed Ultra Flow turns to error when it becomes 3Pa and over. In such a case, test with Fine Flow or Auto Flow. 2) The fixed Fine Flow turns to error when it becomes 150Pa and over. In such a case, test with Gross Flow or Auto Flow. 3) The fixed Gross Flow turns to error when it becomes 1800Pa and over.
W910	—	—	—	CPU Error When watchdog timer operated.	1) This error occurs when the equipment's program hangs up to improper state and regular watch dog operation could not be performed. Check again after reconnecting the power supply.

NOTE :

*Refer to Maintenance Section 10, for error messages regarding maintenance inspection and replacement of parts.

10. Maintenance

There are some equipment/parts used in this equipment require periodical maintenance and replacement. Some parts deteriorate after prolonged use and must be replaced in the event of failure. The maintenance and replacement procedures are described below.

 WARNING	Power Shutdown When installing the equipment and removing the external panels for inspection and replacement of parts, turn off the MAIN POWER switch and disconnect plug from the outlet before servicing. Possibilities of electric shock and damages to the equipment due to high voltage areas.
 CAUTION	High Temperature Warning The pump, analyzer tube, and solenoid valve are extremely hot immediately after stopping. When inspecting/replacing parts, wait for 15 minutes or more after stopping and then proceed carefully with the work. Risk of injury from burns and the possibility of damage to the equipment.
 CAUTION	Overhaul Parts (O-ring and drive parts) used inside of the equipment, including consumables, are subject to deterioration over time. To maintain the performance of the equipment, make sure to execute periodical overhaul. A period of once a year is recommended.
 CAUTION	Do Not Use Grease Grease is not used for piping joints and valve interiors of the equipment. Do not use grease when disassembling and assembling. It may cause malfunction of the equipment and may lead to damage of components.
 CAUTION	Do Not Touch Vacuum Components Components exposed to vacuum in the equipment and component surfaces that face the vacuum have been treated with precision cleaning and are maintained in a clean state. Do not touch these components with bare hands but use rubber gloves when disassembling/assembling. Risk of reduced performance of the equipment.
 CAUTION	Removal of Dust O-rings are use for piping joints. Remove any dust on the O-ring before disassembling and assembling. Use alcohol to clean away any sweat or oil on the parts. It may cause malfunction of the equipment and damage to the components.
 CAUTION	Maintenance in Personnel Trained maintenance staff are to perform any task for maintenance.
 CAUTION	Disposal When disposing the unit or a portion of the unit, refer to local laws and ordinances. When toxic gas is used, the unit must be disposed through an industrial disposal specialist. The cost incurred to the disposal will be covered by the customer.

10-1 List of Maintenance Items

The following components require periodical maintenance. Refer to maintenance procedure for each component for operation.

Component Name (model installed)		Task	Frequency	Type
Fore Pump	Rotary Pump (901W1, 904W2)	Replacement of oil	1 per 6 month	W1(GHD-031):R-2 W2(GLD-137):SMR-100
		Overhaul	1 per year	(*1)
	Scroll Pump (901D2 、 904D3 、 904D4)	Overhaul	1 per year or per 8000 hrs operation	
	Diaphragm Pump (Unit BS/BT)	Replacement of pump	1 per10000hrs	
Turbomolecular Pump		Replacement of wick holder	1 per2 years	
		Overhaul	1 per2 years	
Pirani Gauge Head		Replacement of gauge head	When disconnected or deteriorated	WP-01
Ion Source		Replacement of Ion source	When disconnected or deteriorated	IS-BA1
Calibration Leak		Recalibration	Set by client	CLM-08F
Sniffer AS Probe tip Sintered Metal Element		Replacement of Sintered metal element	When dirty, clogged	ESD-4-2-10
Sniffer BS Probe tip Sintered Metal Element		Replacement of Sintered metal element	When dirty, clogged	ESD-4-2-40
Sniffer Unit BS/BT		Replacement of microseparator	When dirty, clogged	MS-80
Sniffer Unit BS		Replacement of dust filter	Decreased flow rate	VFJ44
Sniffer Unit BT		Replacement of dust filter	Decreased flow rate	A1019E
Internal Fan Filter of the		Replacement of fan filter	When polluted	109-1003M40
Intake Fan Filter		Replacement of fan filter	When polluted	FE-462-2-F4
Oil Mist Filter, (901W1)		Replacement of element	When polluted	M1000-KIT
Vent Filter		Replacement of fan filter	When polluted	ZFC-EL-4
Analyzer Tube		Surface treatment	When deteriorated	(*1)
Piping		Cleaning	When polluted	
Valve Plunger		Replacement	When deteriorated	
O-rings		Replacement	When deteriorated	

(*1) Request your overhaul, cleaning or replacement of part of components to your nearest Service Desk. When returning the main equipment for maintenance and repair, fill in the Pollution Identification Form with the following details; any inclusion of toxic substances in the equipment, or devices are polluted. In case the equipment is polluted, indicate the nature of danger in detail. The Pollution Identification Form can be found in the last page of this manual. This form must be either attached or enclosed with the equipment.

*Parts (O-rings, drive parts) used inside the equipment, including consumables, are subject to deterioration over time. In order to maintain its performance periodical overhaul is needed. A cycle of once per year is recommended.

10-2 Maintenance Procedures

10-2-1 How to Install/Remove External Panels

For maintenance, first the external panels need to be removed according to a given order. The following describes the method of removing each panel.

Power Shutdown

When installing the equipment and removing the external panels for inspection and replacement of parts, turn off the MAIN POWER switch and disconnect plug from the outlet before servicing. Possibilities of electric shock and damages to the equipment due to high voltage areas.

(1) Top panel

- 1) Remove the flexible hose connected to the Test Port and the clamp which secures chambers.
- 2) Catch the top panel removing part located in the left panel surface with your finger and lift it up as shown by the arrow.



(2) Rear Panel

- 1) Lift the panel in the direction of the arrow and remove it.



All replacement maintenance is possible by removing top and rear panels.

(3) Attachment

- 1) To replace the panels, attach them by using the reverse sequence of removing panel procedure.

10-2-2 Rotary Pump

(1) Areas of inspection

- 1) Oil level: Fill with oil between 50 to 80 % of the view port.
- 2) Oil wear: Check for discoloration and dust interfusion.

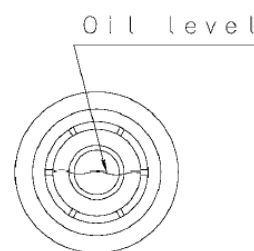
(2) Inspection Procedures

- For model 901W1 -

A view port is located at the lower area of the left panel. Check the oil level and oil wear through this view port.

- For model 904W2 -

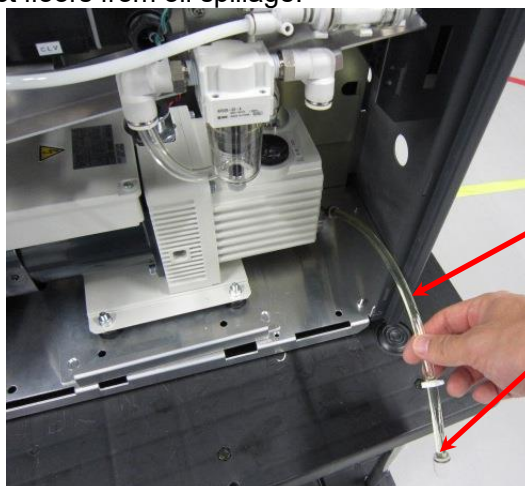
Rotary Pump is located on the mobile cart. The oil view port is located at the handle part of the mobile cart. Check for oil level and oil wear through this view port.



(3) Oil Replacement Procedures

- For model 901W1 -

- 1) Turn OFF the main power supply switch and make sure to remove the power supply cable from the main unit.
- 2) Remove the top and rear panels. Refer to the procedure for removing external panels (Section 10-2-1) for removal method.
- 3) Remove the cap attached to the end of drain tube and drain out the oil into an oil pan placed under the tube end. (Approximately 370 ml oil will be drained). Attention must be paid to protect floors from oil spillage.



- 4) When the oil is completely drained, turn the tube end upwards. Use a funnel and pour in oil through the tube. The amount of oil is to be 80% when viewed through the view port. The type of oil used is R-2.
- 5) Replace the cap when the oil is filled.
- 6) Replace the panels removed.

- For model 904W2 -

- 1) Remove oil drain cap and connect hoses. Remove the oil intake cap. Place an oil drain pan at the end of the hose and drain the oil by turning the drain faucet. (Approximately 1 liter of oil is drained) When the oil has finished draining, close the drain faucet.



Drain faucet cap (Oil draining port)

- 2) Pour in oil into the intake port (photo above) until it reaches approximately 80% of the view port. The type of oil used is SMR-100.
- 3) When the oil is filled, replace the drain faucet and the cap of the oil intake port.

NOTE :

In order to maintain the equipment in good condition, oil replacement of every 6 months is recommended.

10-2-3 Pirani Gauge Head

(1) Areas of Inspection

1) Check for disconnection of Pirani Gauge Head

There should be an electrical continuity between one pin of group A and one pin of group B of the following diagram. (Approximately $13\ \Omega$ within the atmosphere)

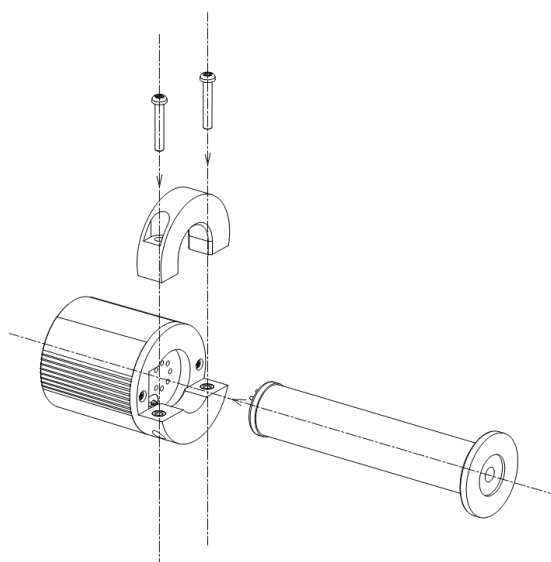
Over Voltage to Filament

Risk of disconnection if 2mA or more overload current is applied to the filament. Be careful of current value of measurement device.

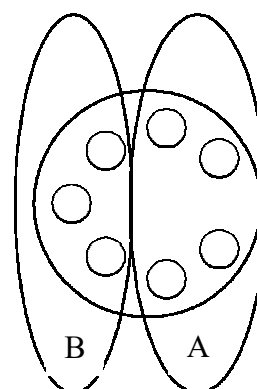
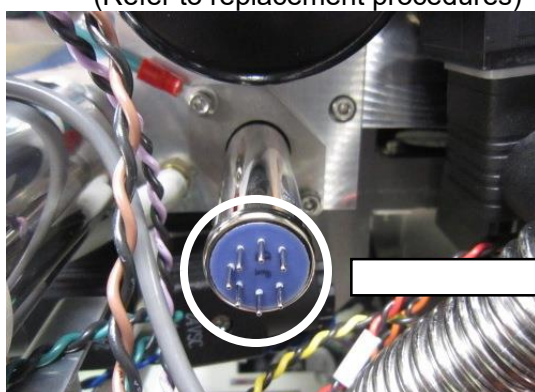
Measurement must be made in atmospheric pressure because filaments will be heated in vacuum environment and correct measurement of resistance value is not possible.

(2) Inspection Procedures

- 1) Turn OFF the main power supply switch and make sure to remove the power supply cable from the main unit.
- 2) Remove the top and rear panels. Refer to the procedure for removing external panels (Section 10-2-1) for removal method.
- 3) Turn the clamp stop screw of detection part (SPU) connected to Pirani gauge head and loosen the clamp. Remove the detection part.

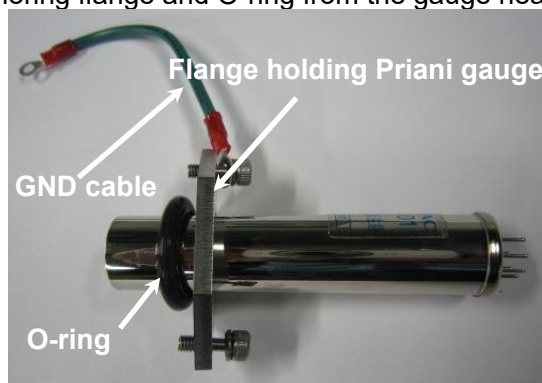


- 4) Check the electrical continuity. If no electrical continuity is found, there is a possibility of disconnection of Pirani gauge head. Replacement of Pirani gauge head is needed. (Refer to replacement procedures)



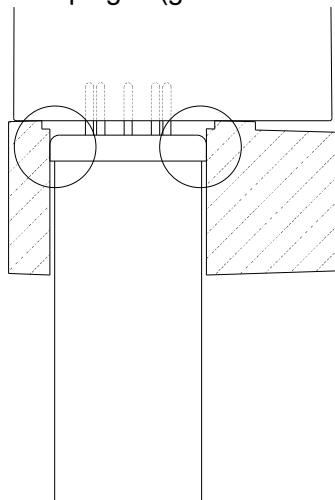
(3) Replacement Procedure

- 1) Turn OFF the main power supply switch and make sure to remove the power supply cable from the main unit.
- 2) Remove the top and rear panels. Refer to the procedure for removing external panels (Section 10-2-1) for removal method.
- 3) Turn the clamp stop screw of detection part (SPU) connected to Pirani gauge head and loosen the clamp. Remove the detector part.
- 4) Unscrew Allen-head bolts (2 locations: 4x10) anchoring the flange of Pirani gauge head. Special caution is required to perform the task due to limited working space.
- 5) Remove anchoring flange and O-ring from the gauge head removed

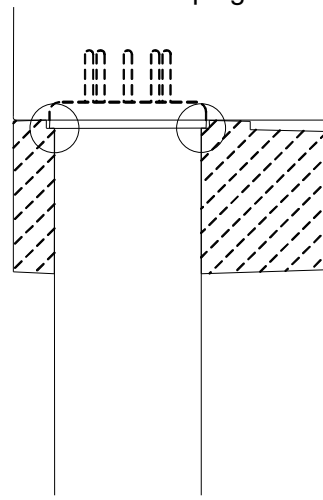


- 6) Replace with the new gauge head and fix anchoring flange of the gauge head and O-ring.
- 7) Assemble the gauge head by using reverse procedure to assembling.
- 8) If the gauge head is not securely inserted to the end of detector area as illustrated below, gauge head may cause leakage due to clamp tightening. When securing detector (SPU) clamp, place GND cable in between the stopping screw.

Insufficient plug in (generation of leaks)



Sufficient plug in

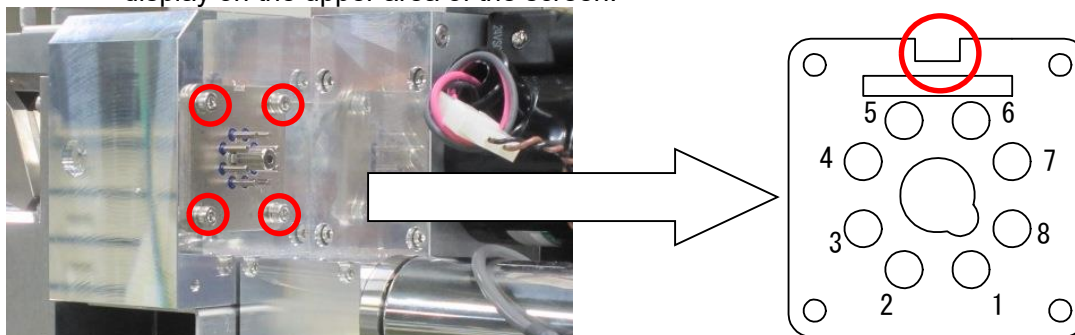
**CAUTION****Caution Handling Pirani Gauge Head**

Pirani gauge head is connected to the turbomolecular pump. When the Pirani Gauge Head is removed, be careful not to allow dust ingestion of the turbomolecular pump. Mechanical shocks subjected by dropping may cause error to its operation due to disconnection.

10-2-4 Ion Source

(1) Areas of Inspection

- 1) In case of disconnection error of filament.
- 2) In case of sensitivity error.
- 3) 2 Filaments of Filaments 1 and 2 are installed. Only when Filament 1 is disconnected, it automatically switches to Filament 2. In such a case preparation of ion source replacement is recommended. Filament numbers selected can be checked by Fil. *display on the upper area of the screen.



(2) Replacement Procedure

- 1) Turn OFF the main power supply switch and make sure to remove the power supply cable from the main unit.
- 2) Remove the top and rear panels. Refer to the procedure for removing external panels (Section 10-2-1) for removal method.
- 3) Remove the connector which is connected to the ion source by pulling out the connector.
- 4) The ion source is fixed as shown in the photo and illustration above. Remove the Allen-head bolts (4 locations: M4x10) fixing the ion source.
- 5) Fix the new ion source with Allen-head bolts (4 locations: M4x10). When installing the ion source place so that the cutout area (red circled area of the top right diagram) comes to the top. Attention must be paid to the facing direction of the ion source when fixing it.
- 6) Plug in the connector to the ion source.
- 7) Replace the panels removed.



CAUTION

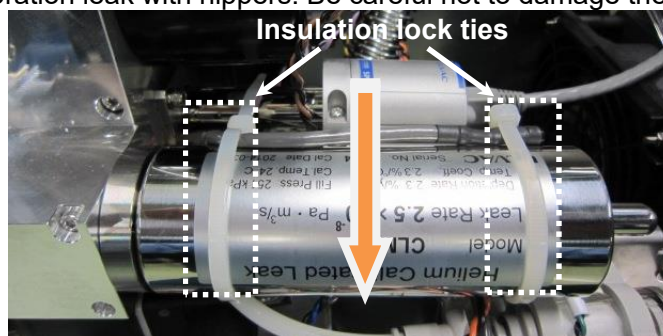
Caution Handling Ion Source

Ion Source has been treated with precision cleaning. Do not touch the interior with bare hand when replacing ion source. Risk of malfunction of the equipment and may lead to damage of components.

10-2-5 Calibration Leak

(1) Replacement Procedure

- 1) Turn OFF the main power supply switch and make sure to remove the power supply cable from the main unit.
- 2) Remove the top and rear panels. Refer to the procedure for removing external panels (Section 10-2-1) for removal method.
- 3) Cut the insulation lock ties (refer to the photo below) securing the temperature sensor to the calibration leak with nippers. Be careful not to damage the temperature sensor.



- 4) Remove the calibration leak by loosening it by anticlockwise rotation (direction of arrow). Be careful not to drop the calibration leak. Also, make sure to remove the O-ring between the calibration leak and turbomolecular pump.
- 5) Secure tightly the new calibration leak by clockwise motion. Make sure to insert the O-ring.
- 6) Secure the temperature sensor with an insulation lock (not less than 200mm long) on the tube surface of the calibration leak.
- 7) Replace the panels removed.



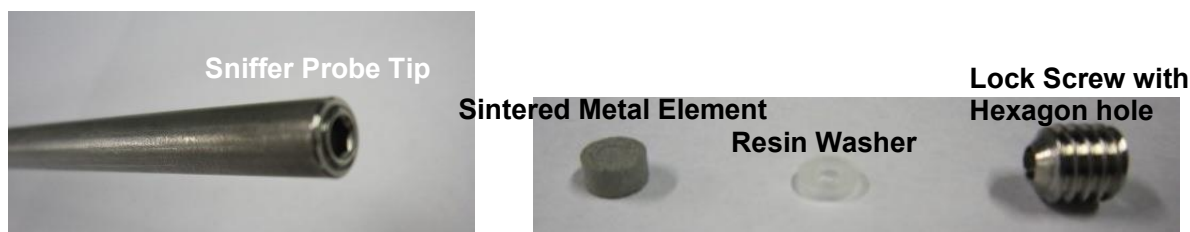
CAUTION

Caution Handling Calibration Leak

Calibration leak is connected to turbomolecular pump. When removing the calibration leak make sure that turbomolecular pump is not subjected to dust ingestion. Any severe shock subjected, such as dropping will break the calibration leak. Special care must be taken for handling of the calibration leak.

10-2-6 Sintered Metal Element of Sniffer Probe Tip

- (1) Areas of Inspection
 - 1) The Sintered Filter should be free from dirt or clogs.
- (2) Inspection Procedure
 - 1) Replacement is necessary if caution error (decrease in injection pressure or increase in injection pressure) (decrease and increase in flow rate of Sniffer Unit BS) occurs frequently during Sniffer test.
- (3) Replacement Procedure
 - 1) Remove the securing screw of Allen-head bolt in the Sniffer probe tip by using 2.5mm hexagonal wrench key.
 - 2) By tilting the tip of Sniffer Probe, disengage the sintered metal element.
 - 3) Put the following components in order of New sintered metal element and resin washer and secure with a lock screw with hexagon hole.



10-2-7 Microseparator (Sniffer Unit BS/BT only)

- (1) Areas of Inspection
 - 1) Replace is necessary when caution error (decrease in injection pressure or increase in injection pressure) is indicated.
- (2) Replacement Procedure
 - 1) Remove the NW25 clamp of Sniffer Unit BS/BT connected to the test port.
 - 2) Replace with a new microseparator attached between the test port flange and Sniffer Unit BS/BT. Refer to the photo below for attachment face.



- 3) Place the Sniffer Unit BS/BT to the test port and secure them with the NW25 clamp.

10-2-8 Dust Filter (Sniffer BS Unit only)

(1) Areas for Inspection

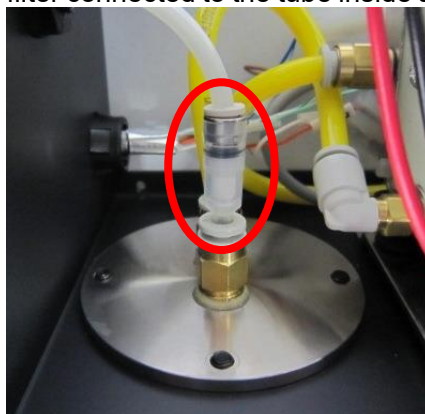
- 1) Replace it when caution error (decrease in injection pressure or decrease in flow rate) is indicated.

(2) Replacement Procedure

- 1) After removing the NW25 clamp of Sniffer Unit BS Unit connected to the test port, remove the cover of Sniffer Unit BS. Truss head screw (6 locations: M5x10)



- 2) Remove the inline filter connected to the tube inside and replace it with a new inline filter.



- 3) After attaching the cover of Sniffer Unit BS, connect it to the test port.

10-2-9 Dust Filter (Sniffer Unit BT only)**(1) Areas for Inspection**

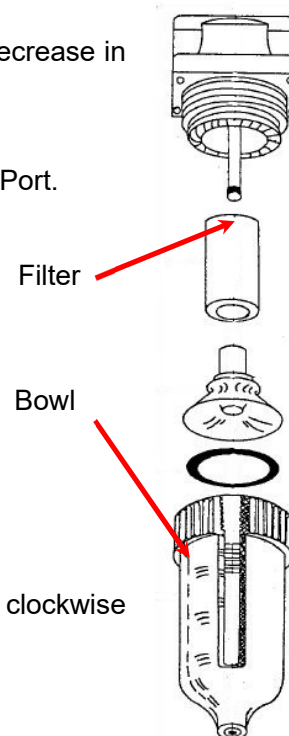
- 1) Replace it when caution error (decrease in injection pressure or decrease in flow rate) is indicated.

(2) Replacement Procedure

- 1) Remove the NW25 clamp of Sniffer Unit BT connected to the Test Port.



- 2) Replace with a new filter by turning the clear bowl of filter area to clockwise and also removing the internal filter with a screw.
- 3) Attach the filter bowl and connect it to the test port.



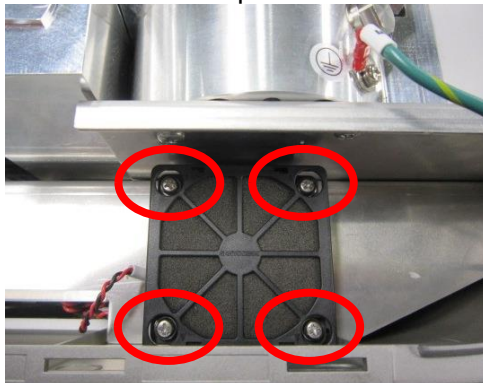
10-2-10 Fan Filter Inside the Equipment

(1) Areas for Inspection

- 1) Replace when filter is dirty.

(2) Replacement Procedure

- 1) Turn OFF the main power supply switch and make sure to remove the power supply cable from the main unit.
- 2) Remove the top and rear panels. Refer to the procedure for removing external panels (Section 10-2-1) for removal method.
- 3) The fan filter is located at the front panel as shown in the photo below.



- 4) Remove the cover of the fan filter by lifting it up.
- 5) Replace the fan filter and attach the cover removed in step4.
- 6) Attach the panel removed.

10-2-11 Intake Fan Filter

(1) Areas for Inspection

- 1) Replace when filter is dirty.

(2) Replacement Procedure

- 1) Turn OFF the main power supply switch and make sure to remove the power supply cable from the main unit.
- 2) Remove the surface cover by sliding a slotted screw driver to the click releasing hole as shown in the photo.

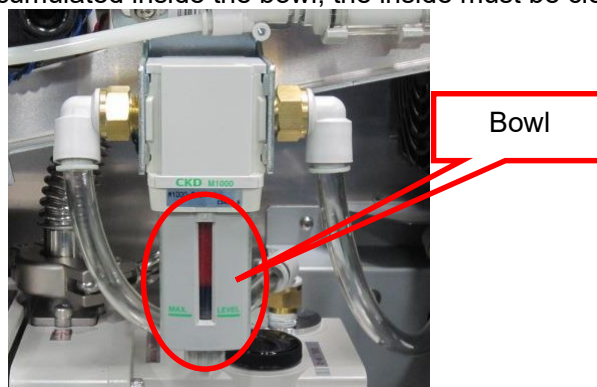


- 3) Replace the filter and attach the front cover removed in 2)

10-2-12 Oil Mist Filter

(1) Areas for Inspection

- 1) Replace when the element becomes dirty.
- 2) If oil is already accumulated inside the bowl, the inside must be cleaned.



(2) Replacement Procedure

- 1) Turn OFF the main power supply switch and make sure to remove the power supply cable from the main unit.
- 2) Remove the top and rear panels. Refer to the procedure for removing external panels (Section 10-2-1) for removal method.
- 3) Turn the bowl of the oil filter 45 degrees to the left remove the filter. Be careful not to spill any oil accumulated in the bowl.



- 4) Turn the mantle by turning it to the left.
- 5) Attach O-ring to the mantle and install the mantle to the body. The attachment of the mantle should be to a position where the end of the mantle touches (until it feels slightly solid).
- 6) Attach the bowl of oil filter to the body.
- 7) Attach the rear panel and top panels.

(3) In this case?

- 1) If oil accumulates frequently in the oil mist filter or gives adverse impact to measurement, remove IN/OUT tube of the oil mist filter, connect a tube with straight type joint for 10φ to create a state where no filter is required.

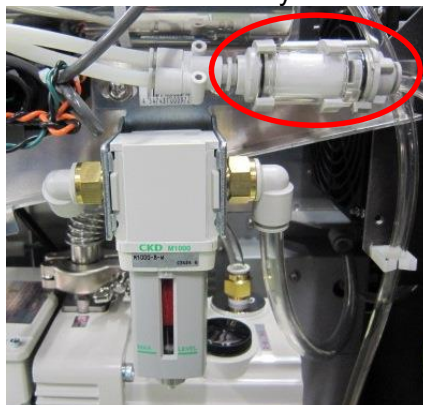


- 2) Possibility of exhausting oil mist from PUMP EXHAUST of connector panel if the filter is removed.

10-2-13 Vent Filter

(1) Areas for Inspection

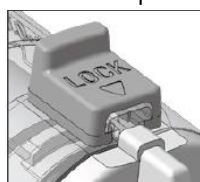
- 1) Replace when the element becomes dirty.



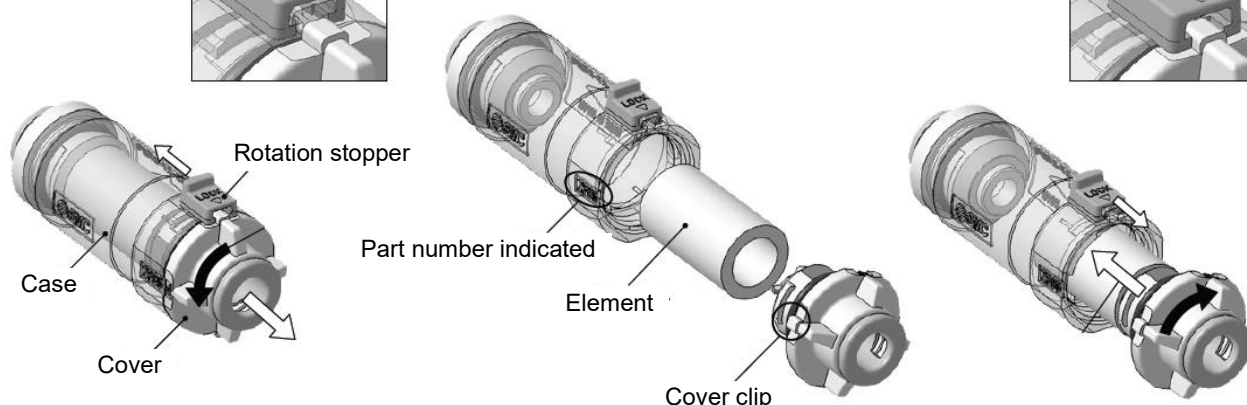
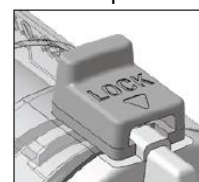
(2) Replacement Procedure

- 1) Turn OFF the main power supply switch and make sure to remove the power supply cable from the main unit.
- 2) Remove the top and rear panels. Refer to the procedure for removing external panels (Section 10-2-1) for removal method.
- 3) Remove the filter part from the bracket.
- 4) Disengage the tube with a single touch of the joint.
- 5) Release the lock by sliding the rotation stopper to the direction of allow.
- 6) Rotate the cover 90 degrees anticlockwise.
- 7) Take out the element by pulling out the cover from the case. As for the dust piled up within the case, remove them by air blower.
- 8) Attached a new element to the cover, and fit it into the case.
- 9) Turn the lug of the cover until it meets the part numbers of the case side, push in the cover until it touches against the end, and turn it clockwise until it stops.
- 10) Return the rotation stopper to the locked position and make sure that the cover is locked.
- 11) Assemble the equipment by reverse procedure of the above.

Lock released position



Locked position



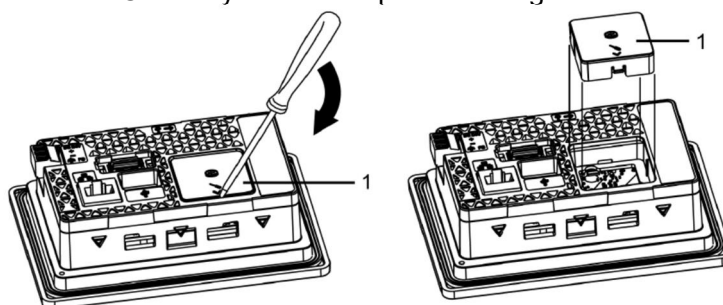
10-2-14 Replacement of panel mount specification RTC Battery set

(1) Areas for Inspection

- 1) Replace the RTC Battery set regularly, every 5 years.

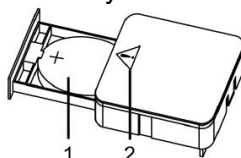
(2) Replacement Procedure

- 1) Turn off the main power switch and disconnect the power cable from the main unit certainly.
- 2) Remove power supply and COM I/F connector from the touch panel with panel mount specification.
- 3) Place this product on a flat, level surface, with the rear side pointing up.
- 4) Remove the RTC Battery Set on this product using a flat-blade screwdriver as illustrated:



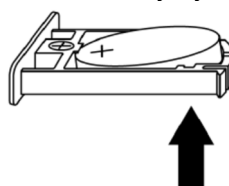
1 RTC Battery Set

- 5) Pull out the tray of the RTC Battery Set.

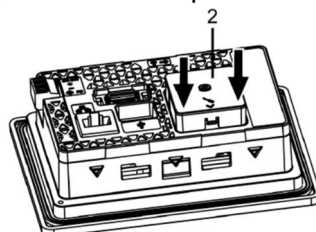


1 Battery
2 Safety alert symbol

- 6) Remove the spent battery from the tray by touching the battery from the bottom.



- 7) Put the new battery on the tray in accordance with the polarity markings in the tray and on the battery.
- 8) Close the tray.
- 9) Insert the RTC battery horizontal with the product, and push the points indicated by the arrows until the battery clicks into the product.



2 RTC Battery Set

- 10) Reconnect power supply and COM I/F connector to the touch panel.

11. Input/Output Signals

Input/output signals are operated with 4 types of connectors; EXT.I/O (external control), LEAK RATE (Leak Rate output), RS-232C (Printer connection and RS232C communication), and display/RS485 (RS-485 communication). The following list describes each of these functions and their usage procedure.

11-1 EXT.I/O

To output the condition of equipment and to receive external control signals.

 CAUTION	Load Always provide a load between pins used for output of signals and power supply. Check ON/OFF of output signal by operating the load. Risk of damage to the equipment if no load is provided.
 CAUTION	Maximum Current The maximum current to be passed to the load of output signal should be not be more than 50 mA. Exceeding 50 mA may cause damage to the equipment.
 CAUTION	Maximum Voltage The voltage applied to the input signal pins should be within the range of DC +20 to 30 V. (Recommended value DC +24 V) If voltage outside of this range is applied, the equipment may be damaged.
 CAUTION	Electric Short Circuit of Pins Prohibited The maximum of DC +24 V is applied to the input/output pins. Do not under no circumstances short circuit between pins and GND level or short circuit the pins between them. Risk of damaging the equipment.
 CAUTION	One-Shot Input The input time of one-shot input should not be less than 1 second. Risk of malfunction if the input time is short.

11-1-1 List of Output Signals (standard mode: not in cycle test mode)

No	Signal Name	I/O	Description (Set at Normally Open)
1	SETPOINT1	OUT	Outputs this signal when leak rate exceeds set point 1 – 3. Maintains the output until the next TEST START signal is entered.
2	SETPOINT2		
3	SETPOINT3		
4	ROUGHING /TESTING		Outputs from start of roughing until the end of the test. (It does not output during Standby).
5	ERROR1		Starts output from the time warning error starts, and turns OFF the output in parallel with error release.
6	OVER RANGE		Outputs when the maximum leak detection capacity exceeds. It also outputs when measurement range exceeds in the test screen.
7	ERROR2		Output begins at the moment when caution error occurs and the output turns OFF in parallel with the release of error mode. When [INVALID] is selected with [MESSAGE] – [NOTICE] (Section 5-2_7)) this output is not read out.
8	TV3 OPEN		Outputs when valve TV3 opens.
9	He Spray		He spray signal during cycle test (Section 8-3-1)
10	START UP		Outputs signal during startup. Also outputs during sensitivity recalibration. After completing the startup the signal turns OFF.
11	AUTO ZERO		An output signal when the Auto Zero is at ON.
12	TESTING		An output signal when leak rate is displayed after starting the test. It does not output signal during Roughing.
13	STANDBY		An output signal read out when startup is completed and turned into Test standby mode. This signal is read out until it turns to stop operation mode. However, it does not output any signal during sensitivity recalibration
14	CLEAN UP		An output signal during cleanup
15	<, –		When the Auto Zero is set at [1SHOT] (Section 5-1_4)), outputs signal if measurement value reaches the minimum display value or below. When the Auto Zero is set at [ALTERNATE] (Section 5-1_4)), outputs the signal if measurement value reaches to a minus display. This is an output signal during testing.
16	EXT.CLV	OUT	This is an output signal to operate external calibration leak valve when external calibration leak [GENERAL] – [CALIBRATION] – [START-UP] (Section 5-1_7)) and automatic [CALIBRATION STANDARD] – [EXTERNAL CALIBRATION LEAK (FOR VACUUM METHOD)] – [VALVE CONTROL] are selected. The maximum current is 1A.
17	EXT.CLV COM		Remote controller for pin 16.
34 35	-COM	IN	Remote controller for output signal.

11-1-2 List of Output Signals (in Cycle test mode)

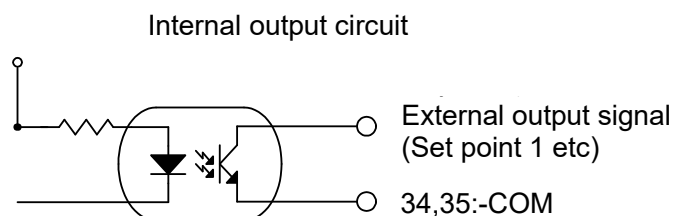
No	Signal Name	I/O	Description (Set at Normally Open)
1	PASS	OUT	Outputs when PASS is ON at Cycle test screen. Output signal is kept until next TEST START signal is input.
2	FAIL		Outputs when FAIL is ON at Cycle test screen. Output signal is kept until next TEST START signal is input.
3	B.G. MONITORING		Outputs while during B.G. monitoring timer is active. If FAIL is happened during B.G. monitoring, Output signal is kept until next TEST START signal is input.
4	PUMPING		Outputs while during Pumping time is active. If FAIL is happened during pumping down, Output signal is kept until next TEST START signal is input.
5	ERROR1		Starts output from the time warning error starts, and turns OFF the output in parallel with error release.
6	OVER RANGE		Outputs when the maximum leak detection capacity exceeds. It also outputs when measurement range exceeds in the test screen.
7	ERROR2		Output begins at the moment when caution error occurs and the output turns OFF in parallel with the release of error mode. When INVALID is selected with [MESSAGE] – [NOTICE] (Section 5-2_7)) this output is not read out.
8	TV3 OPEN		Outputs when valve TV3 opens.
9	He SPRAY		Outputs while during He spray timer is active.
10	START UP		Outputs signal during startup. Also outputs during sensitivity recalibration. After completing the startup the signal turns OFF.
11	AUTO ZERO		An output signal when the Auto Zero is at ON.
12	TESTING		Outputs while during test timer is active.
13	STANDBY		An output signal read out when startup is completed and turned into Test standby mode. This signal is read out until it turns to stop operation mode. However, it does not output any signal during sensitivity recalibration
14	CLEAN UP		An output signal during cleanup
15	<, –		When the Auto Zero is set at 1SHOT (Section 5-1_4)), outputs signal if measurement value reaches the minimum display value or below. When the Auto Zero is set at ALTERNATE (Section 5-1_4)), outputs the signal if measurement value reaches to a minus display. This is an output signal during testing.
16	EXT.CLV	OUT	This is an output signal to operate external calibration leak valve when external calibration leak [GENERAL] – [CALIBRATION] – [START-UP] (Section 5-1_7)) and automatic [CALIBRATION STANDARD] – [EXTERNAL CALIBRATION LEAK (FOR VACUUM METHOD)] – [VALVE CONTROL] are selected. The maximum current is 1A.
17	EXT.CLV COM		Remote controller for pin 16.
34 35	-COM	IN	Remote controller for output signal.

*When the I/O output signal setting at [EXT.I/O] (Section 5-3_6)) is selected as **NO**, the operation will be as explained above. When **NC** setting is selected, the output will be in reverse with above operation.

(1) Output signals

- 1) Output signal outputs on a steady basis.
- 2) Output is an open collector output of emitter common. The emitter common is 34, and 35 pin (-COM).
- 3) The output rating is [DC + 20 to 30 V (+24V recommended) 50mA_{MAX} saturated voltage]
- 4) Place a load between each pin and power supply. Check the ON/OFF of the output signal by operation of the load.

An example of output current is shown below. Construct an input/output circuit with reference to the circuit example.



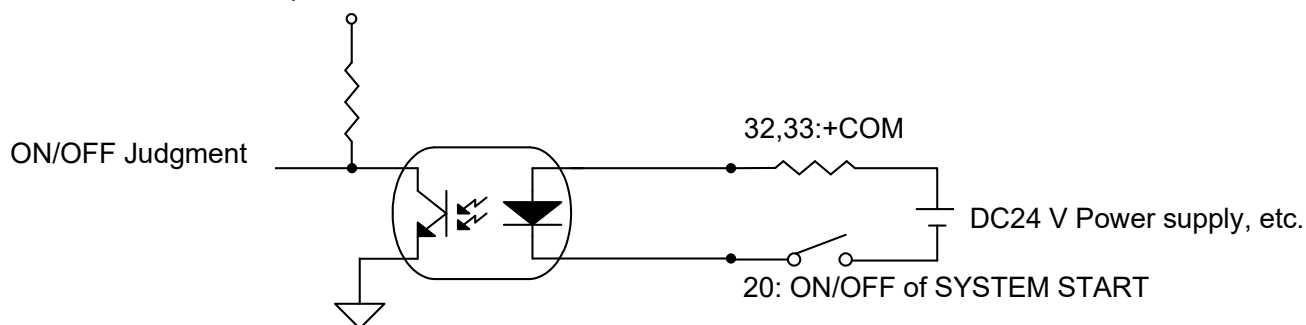
11-1-3 List of Input Signals

No	Signal Name	I/O	Description
18	EXT.POWER	OUT	Power supply output of DC 24V maximum current 2A
19	DC24V		
20	SYSTEM START/STOP	IN	Start and stop input signal of the equipment Activates when changed from high to low. Stops when changed from low to high
21	TEST START/STOP		Start and stop input signal of test. When changed from high to low: Starts testing When changed from low to high: Stops testing When cycle test is selected, one cycle test is executed by pulse input from high to low. Input is possible only during Test standby mode
22	unassigned		Unused.
23	unassigned		Unused.
24	unassigned		Unused.
25	Re- CALIBRATION		Input signal for Sensitivity Recalibration. As for the input signal, enter pulse input from high to low. Input is possible only during Test standby mode
26	AUTO ZERO		Input signal for Auto Zero. When [1SHOT] is selected for setting, the input signal must be entered with pulse input of high to low. At [ALTERNATE] setting: When changed from high to low: ON When Changed from low to high: OFF Input is possible only during Test standby mode
27	PRINT		Input signal to print out leak rate. As for the input signal, enter pulse input from high to low. Input is possible only during Test standby mode
28	Error Reset		Reset input signal for errors occurring in the equipment. As for the input signal, enter pulse input from high to low. The input signal can only be entered during error condition.
29	HOLD INDICATION		Input signal to show leak rate display as Hold. When changed from high to low: in Hold mode When changed from low to high: Hold released Input is possible only during Test mode.
30	CLEAN UP		Input signal for clean up. As for the input signal, enter pulse input from high to low. Input can be executed any time except during Startup.
31	Peak Hold		Input signal of the maximum value of leak rate hold. When changed from high to low: Hold mode at maximum value of leak rate from the point. When changed from low to high: Release of maximum value. Input is possible only during Test mode.
32	+COM		Remote controller for Input signal. Enter DC +24 V
33			
36	EXT.POWER 0V	OUT	Output common (SG) for pins 18 and 19
37			

(1) Input Signals

- 1) Input voltage of Pin +COM 32, 33 is DC +20 to 30V (+24 V recommended)
- 2) Place a junction or open collector between input signal and GND. Input the signal by operation of the junction.
- 3) Pulse input of not less than 1 second per pulse is to be entered.
- 4) When using EXT. POWER DC 24 V, construct the circuit so as to allow current flow of less than 2A.
- 5) If current of 0.1 mA or over passes between each input signal pin and +COM terminal, the internal circuit of the equipment may process it as signal input (terminal short circuit).
- 6) After activation of power supply, SYSTEM START/STOP signal of No. 20 must have elapse time of more than 30 seconds before entering the start signal. The equipment may not start operating if the input is executed earlier than 30 seconds.

An example of input current is shown below. Construct an input/output circuit with reference to the circuit example.



11-2 LEAK RATE

Voltage output of leak rate and test port pressure. The voltage output is DC 0 V to 10 V. Use this voltage by connecting to PLCs and pen recorders.

11-2-1 Output Pin Number

Terminal	Description	Signal
2	Leak rate mantissa portion output +	DC0~10 V
7	Leak rate mantissa portion output -	
3	Leak rate exponent portion output +	DC 0~10 V
8	Leak rate exponent portion output -	
4	Test port pressure LOG output +	DC 0~10 V
9	Test port pressure LOG output -	

*At the LOG setting, the same output signal will come from 2 to 7, 3 to 8.port and read out.

11-2-2 Output Table

11-2-2-1 Leak Rate Mantissa Portion Output Table

Output Voltage (V)	All Units (except for %×R)		%×R	
	Measured Value	Display Value	Measured Value	Display Value
9.99	9.99E-**	9.9E-**	99.9% **R	99% **R
9.00	9.00E-**	9.0E-**	90.0% **R	90% **R
8.00	8.00E-**	8.0E-**	80.0% **R	80% **R
7.00	7.00E-**	7.0E-**	70.0% **R	70% **R
6.00	6.00E-**	6.0E-**	60.0% **R	60% **R
5.00	5.00E-**	5.0E-**	50.0% **R	50% **R
4.00	4.00E-**	4.0E-**	40.0% **R	40% **R
3.00	3.00E-**	3.0E-**	30.0% **R	30% **R
2.00	2.00E-**	2.0E-**	20.0% **R	20% **R
1.00	1.00E-**	1.0E-**	10.0% **R	10% **R
0.00	0.00E-**	0.0E-**	00.0% **R	00% **R

11-2-2-2 Leak Rate Exponent Portion Output Table

(When NONE is selected for COMPATIBILITY)

Output Voltage (V)	Pa·m3/s	mbar·L/s Torr·L/s atm·cc/s	lusec	sccm	Mol/s
10.00	E-03	E-02	E+01	E-01	E-07
9.00	E-04	E-03	E+00	E-02	E-08
8.00	E-05	E-04	E-01	E-03	E-09
7.00	E-06	E-05	E-02	E-04	E-10
6.00	E-07	E-06	E-03	E-05	E-11
5.00	E-08	E-07	E-04	E-06	E-12
4.00	E-09	E-08	E-05	E-07	E-13
3.00	E-10	E-09	E-06	E-08	E-14
2.00	E-11	E-10	E-07	E-09	E-15
1.00	E-12	E-11	E-08	E-10	E-16

Output Voltage (V)	Oz/a	g/a	%×R	Amp.	ppm
10.00	E+00	E+01		E-07	E+06
9.00	E-01	E+00		E-08	E+05
8.00	E-02	E-01		E-09	E+04
7.00	E-03	E-02	10 ⁶ R	E-10	E+03
6.00	E-04	E-03	10 ⁵ R	E-11	E+02
5.00	E-05	E-04	10 ⁴ R	E-12	E+01
4.00	E-06	E-05	10 ³ R	E-13	E+00
3.00	E-07	E-06	10 ² R	E-14	E-01
2.00	E-08	E-07	10 ¹ R	E-15	E-02
1.00	E-09	E-08	10 ⁰ R	E-16	E-03

11-2-2-3 Leak Rate Exponent Portion Output Table
(When other than NONE is selected for COMPATIBILITY)

Output Voltage (V)	Pa·m3/s	mbar·L/s Torr·L/s atm·cc/s	lusec	sccm	Mol/s
10.00	E-01	E+00	E+03	E+01	E-05
9.00	E-02	E-01	E+02	E+00	E-06
8.00	E-03	E-02	E+01	E-01	E-07
7.00	E-04	E-03	E+00	E-02	E-08
6.00	E-05	E-04	E-01	E-03	E-09
5.00	E-06	E-05	E-02	E-04	E-10
4.00	E-07	E-06	E-03	E-05	E-11
3.00	E-08	E-07	E-04	E-06	E-12
2.00	E-09	E-08	E-05	E-07	E-13
1.00	E-10	E-09	E-06	E-08	E-14
0.00	E-11	E-10	E-07	E-09	E-15

Output Voltage (V)	Oz/a	g/a	%×R	Amp.	ppm
10.00	E+02	E+03		E-07	E+06
9.00	E+01	E+02		E-07	E+06
8.00	E+00	E+01		E-08	E+05
7.00	E-01	E+00		E-09	E+04
6.00	E-02	E-01	10 ⁶ R	E-10	E+03
5.00	E-03	E-02	10 ⁵ R	E-11	E+02
4.00	E-04	E-03	10 ⁴ R	E-12	E+01
3.00	E-05	E-04	10 ³ R	E-13	E+00
2.00	E-06	E-05	10 ² R	E-14	E-01
1.00	E-07	E-06	10 ¹ R	E-15	E-02
0.00	E-08	E-07	10 ⁰ R	E-16	E-03

11-2-2-4 Quasi LOG Output Table of Test Port Pressure

The relational expression between test port pressure and output voltage of REC OUT is as below.

$$P=10(V-E) \times 10^{-(S-E)}$$

P : Pressure value

V : REC.OUT Output voltage

E : Value rounded off decimal points form REC.OUT Output voltage

S : Pa : 2 , mbar : 4 , atm : 7 , Torr : 4

Output voltage (V)	Pa	mbar	atm	Torr
6.10	1.0E+04	1.0E+02	1.0E-01	
5.99	9.9E+03	9.9E+01	9.9E-02	
5.75	7.5E+03	7.5E+01	7.5E-02	7.5E+01
5.10	1.0E+03	1.0E+01	1.0E-02	1.0E+01
4.99	9.9E+02	9.9E+00	9.9E-03	9.9E+00
4.10	1.0E+02	1.0E+00	1.0E-03	1.0E+00
3.99	9.9E+01	9.9E-01	9.9E-04	9.9E-01
3.10	1.0E+01	1.0E-01	1.0E-04	1.0E-01
2.99	9.9E+00	9.9E-02	9.9E-05	9.9E-02
2.10	1.0E+00	1.0E-02	1.0E-05	1.0E-02
1.99	9.9E-01	9.9E-03	9.9E-06	9.9E-03
1.40	4.0E-01	4.0E-03	4.0E-06	4.0E-03
1.30				3.0E-03

11-2-2-5 Leak Rate LOG Output Table (When NONE is selected for COMPATIBILITY)

Leak rate LOG output voltage will be a different output due to measurement range set.

The relation between leak rate and output voltage is as below.

$$V = \frac{9}{A - B + 3} \left(\log_{10} LR + \frac{A - 10B + 21}{9} \right)$$

$$LR = 10^{\frac{(V-1)A + (10-V)B + 3V - 21}{9}}$$

A : A: Measured range, MAX setting of 9.99E+A

B : B: Measured range, MIN setting of 0.01E+B

LR : LEAK RATE

V : OUTPUT [V]

11-2-2-6 Leak Rate LOG Output Table**(When other than NONE is selected for COMPATIBILITY)**

Leak rate with log output voltage depends on the unit of leak rate.

The relation between leak rate and output voltage is as below.

Refer to the section about REC.OUT of the previous models for details.

$$LR = 10(V - E) \times 10^{-(S-E)}$$

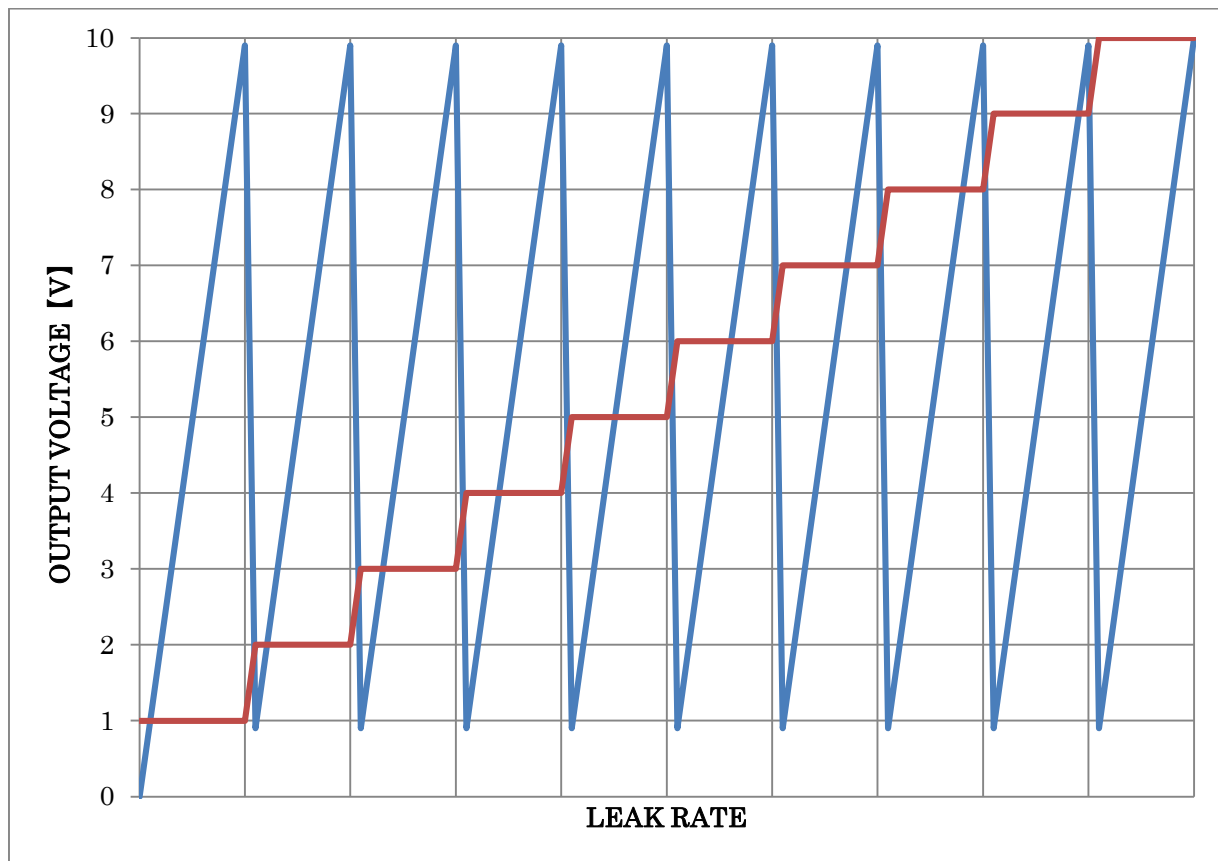
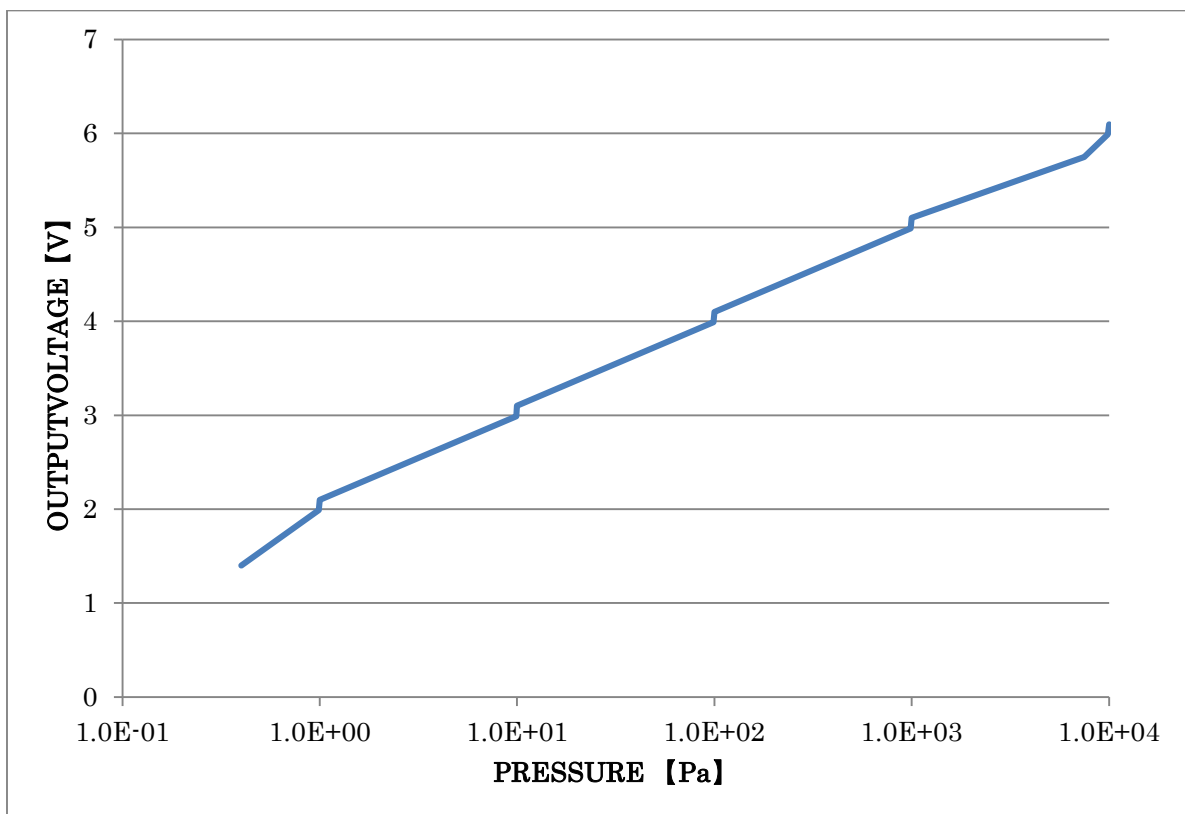
LR : LEAK RATE

V : OUTPUT [V]

E : The value of the digits truncated after the decimal point from the OUTPUT [V]

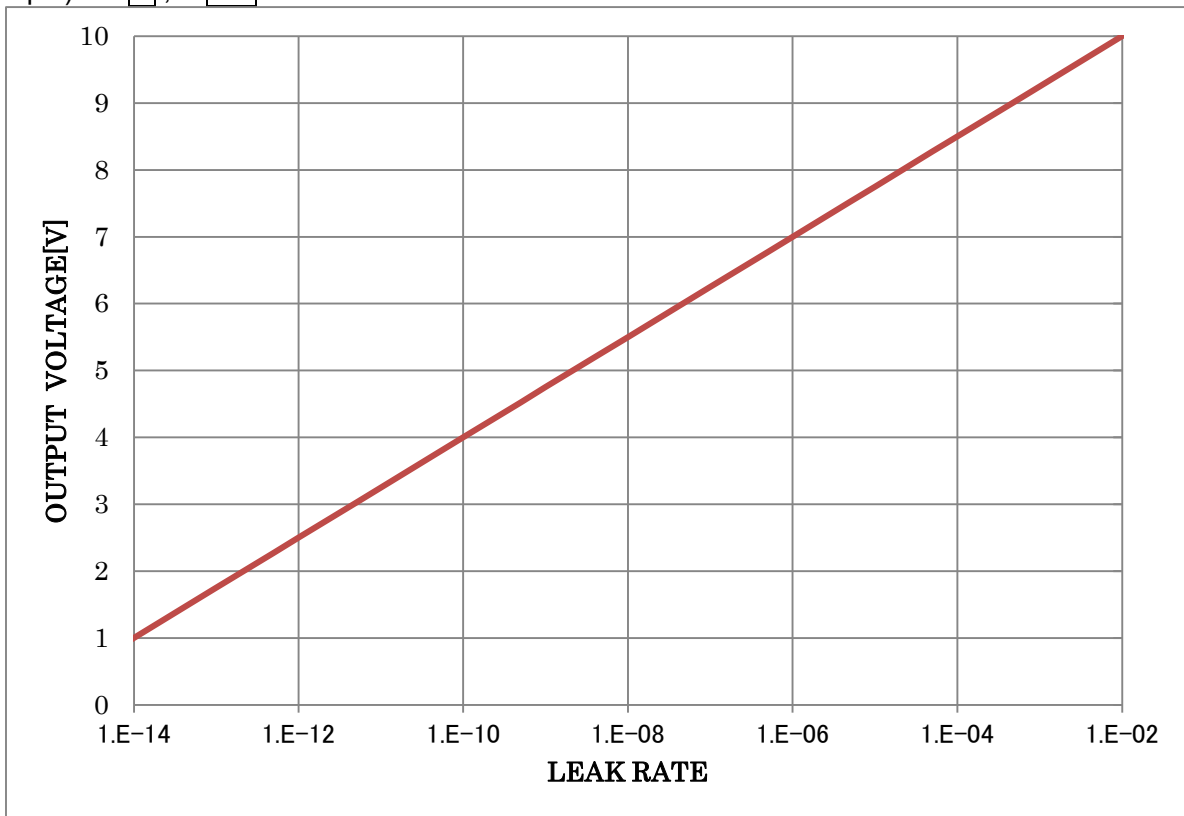
S : Minimum digit of the display value

Output voltage (V)	Pa·m3/s	mbar·L/s Torr·L/s atm·cc/s	ppm
9.999	9.99E-02	9.99E-01	9.99E+06
9.100	1.00E-02	1.00E-01	1.00E+06
8.999	9.99E-03	9.99E-02	9.99E+05
8.100	1.00E-03	1.00E-02	1.00E+05
7.999	9.99E-04	9.99E-03	9.99E+04
7.100	1.00E-04	1.00E-03	1.00E+04
6.999	9.99E-05	9.99E-04	9.99E+03
6.100	1.00E-05	1.00E-04	1.00E+03
5.999	9.99E-06	9.99E-05	9.99E+02
5.100	1.00E-06	1.00E-05	1.00E+02
4.999	9.99E-07	9.99E-06	9.99E+01
4.100	1.00E-07	1.00E-06	1.00E+01
3.999	9.99E-08	9.99E-07	9.99E+00
3.100	1.00E-08	1.00E-07	1.00E+00
2.999	9.99E-09	9.99E-08	9.99E-01
2.100	1.00E-09	1.00E-08	1.00E-01
1.999	9.99E-10	9.99E-09	9.99E-02
1.100	1.00E-10	1.00E-09	1.00E-02
0.999	9.99E-11	9.99E-10	9.99E-03
0.100	1.00E-11	1.00E-10	1.00E-03
0.010	0.10E-11	0.10E-10	0.10E-03
0.000	0.00E-11	0.00E-10	0.00E-03

11-2-2-7 Recorder Output Graph (Leak Rate Mantissa / exponent portion output)**11-2-2-8 Recorder Output Graph (Test port pressure quasi LOG output)**

11-2-2-9 Recorder Output Graph (Leak Rate LOG Output)

Example) A=-3, B=-12 Set time



11-3 RS232C

Connection of either Printer or RS-232C communication connector is possible. If RS232C communication is employed, turn the printer setting (Section 5-3_5)) to OFF.

11-3-1 Connection of Printer

The printer prints the startup sensitivity (minimum detection sensitivity) of each flow and measurement value (leak rate) for test. The recommended printer is listed below, however, connection of other printer is possible if the specifications are similar.



CAUTION

Printer

When a printer with different specifications is connected, it may lead to incorrect printing or cause malfunction.

(1) Recommended Printer

Seiko Instruments Inc.

- Thermal printer DPU-S445
- AC adaptor PW-D0940-W2
- Serial cable IFC-S01-1-E
- Normal paper Paper width 112 mm: length of roll 28 m Type : TP-341L-1
- Clean room paper Paper width 112 mm: length of roll 28 m Type : TP-469L

(2) Recommended Printer SWDIP Setting

SWDIP switch-1

SWDIP	Function	Setting	
1-8	Data Control	1	Busy
1-7	Stop Bit	1	1Bit
1-6	Parity	0	None
1-5		0	
1-4	Bit Length	1	8bits
1-3	Baud Rate	1	19200
1-2		0	
1-1		0	

SWDIP switch-2

SWDIP	Function	Setting	
2-8	Auto Status Output	1	Disable
2-7	Kanji Code	1	JIS Code
2-6	Font Size	1	24 dots
2-5	Auto Power Off	1	Disable
2-4	Character Set	1	ANK
2-3	Auto Loading	1	Enable
2-2	Data Input Mode	0	Serial / USB
2-1		1	

SWDIPswitch-3

SWDIP	Function	Setting	
3-8	Reserve	1	Fixed to 1
3-7	Print Density	0	100 %
3-6		1	
3-5	Paper Select	1	TF50KS-E2D (TP-341L-1)
3-4		1	
3-3		1	
3-2	Paper Mode	0	Roll Paper
3-1		1	

(3) Connection of Printer

Connect the printer to the main unit RS232C connector using D-Sub9Pin cross cable.

HELIOT side PIN No.		Wire connection	Printer PIN No.		
N.C.	1		7	N.C.	Not connected
			8	RTS	Request for sending
TxD	2		3	RxD	Data receiving
RxD	3		2	TxD	XON/XOFF output
N.C.	4		6	—	Short-circuited with terminal 4-6
N.C.	6		4	—	
GND	5		5	GND	GND
RTS	7		1	N.C.	Not connected
CTS	8				

(4) Print Setting of Printer

On setting screen, set Printer (Section 5-3_5)) to **ON**, Serial communication to **RS232C** and Baud Rate to **19200bps** (Section 5-3_4)), the sensitivity of each flow at the time of startup completion are printed out. The test measurement value (leak rate) at the time of completion of the test is automatically printed out. By pressing **LEAK RATE DISPLAY** during test, the test measurement value of the time is printed out. If the Printer (Section 5-3_5)) is set to **OFF**, the startup sensitivity data and automatic printing at the time of completion of the test will not be executed.

(5) Printing

```

*****
* ULVAC, Inc.   DATE:20**/**/20** **.* **
* Leak Detector HELIOT 900
*   ULTRA  : *.**E-*** Pam3/s
*   FINE   : *.**E-*** Pam3/s
*   GROSS  : *.**E-*** Pam3/s
*   SETPOINT1 : *.**E-*** Pam3/s
*   SETPOINT2 : *.**E-*** Pam3/s
*   SETPOINT3 : *.**E-*** Pam3/s
*****
No.  VALVE:LEAK  DATE/TIME
[Pam3/s]
00001 ULTRA: *.**E-*** 20**/**/20** **.* **
00002 FINE : *.**E-*** 20**/**/20** **.* **
00003 GROSS: *.**E-*** 20**/**/20** **.* **
00004 SNIF. : *.**E-*** 20**/**/20** **.* **

```

Startup date/time

Sensitivity of each flow

Set point value being set

Prints out leak rate when print out signal is received

- 1) Startup date/time
Prints out the date and time of startup
- 2) Sensitivity of each flow
Displays sensitivity of ULTRA, FINE and GROSS
- 3) Set point 1-3
Displays setting value of each set point.
- 4) Measurement Result
Displays test result (test measurement value). 00001 up to 99999 are in sequence. Prints out the date and the time of test flow and leak rate.
The number is initialized when Startup and Sensitivity calibration are executed.
Test valve display, leak rate, date and time at the time of measurement are printed.

11-3-2 RS-232C Communication

RS-232C communication is made possible by using cable (D-Sub9Pin) commercially available.



CAUTION

Connection of Connector

MAIN POWER must always be turned OFF before connecting the connector to the main unit. Risk of damage to the equipment.

11-3-2-1 Communication Protocol

Communication protocol	: RS-232C
Signal format	: 2-wire system
	: Full duplex
Transfer architecture	: Start stop synchronization
Transfer speed	: 9600, 192000, 384000bps (changeable by setting)
Transfer distance	: 15m
Max. number of connection: 1	
Bit configuration	
Start bit	: 1bit
Data bit	: 8bit
Parity bit	: None
Stop bit	: 1bit
Data configuration	: All data are ASCII codes
Data format	
Command	: 3 bytes, fixed (command 2 bytes +CR)
Response	: R2(OK), R4(ERR), Data +CR

11-3-2-2 Communication Cable

(1) Connection with HELIOT900 series

Example of RS-232C connection is shown below.

D-sub 9 pin at host side and D-sub 9 female and inch screw #4-40 are at HELIOT side.

7Pin (RTS) and 8Pin (CTS) are short-circuited at HELIOT main unit side.

HELIOT side PIN No.		Wire connection	Host side PIN No.	
TxD	2		2	RxD
RxD	3		3	TxD
GND	5		5	GND
RTS	7		7	RTS
CTS	8		8	CTS

- (2) Communication cable change, which used for HELIOT700/710 and HELIOT300
 It was D-sub 25 female connector in the case of previous models. Prepare for wiring of D-sub 25 female, D-sub9 female and inch screw #4-40 at HELIOT side.
 7 Pin (RTS) and 8 Pin (CTS) are short-circuited at HELIOT main unit side.

HELIOT side PIN No.		Wire connection	D-sub25 wiring side PIN No.	
TxD	2		2	RxD
RxD	3		3	TxD
GND	5		7	GND
RTS	7		8	DCD
CTS	8			

11-3-2-3 Commands

Command	Parameter	Response	Data	Description
A1	-	OK	R2	Stops the equipment
		ERR	R4	During stop During error When startup setting accessory is installed
A2	-	OK	R2	Starts the equipment
		ERR	R4	Except stop When startup setting accessory is installed
A3	-	OK	R2	Starts testing
		ERR	R4	During standby Except during checking double vent
A4	-	OK	R2	Terminates testing
		ERR	R4	Except during testing
AD	-	OK	R2	Vent
		ERR	R4	Except the end of testing
A5	-	OK	R2	Auto Zero ON/OFF
		ERR	R4	Except during testing
AG	-	OK	R2	Waiting for calibration leak
		ERR	R4	Except during standby
AB	-	OK	R2	Execute clean up
		ERR	R4	During startup During error
A6	-	OK	R2	Printing ON
		ERR	R4	Printing command period 3 sec or below
A7	-	OK	R2	Execute sensitivity recalibration
		ERR	R4	Except during stop and testing When startup setting accessory is installed
AE	-	OK	R2	Execute calibration
		ERR	R4	Except calibration request

Command	Parameter	Response	Data	Description
AH	-	OK	R2	Verification execution
		ERR	R4	Except verification screen of request for re-sniffing by sniffer method
B0	-	-	R2	Release error
B2	-	-	**±**.*	Test mode, temperature read out Test mode code 2 digits, temperature 5 digits
B3	-	-	*****	HELIOT condition read out Condition code 2 digits, error code 4 digits (refer to the error catalog list)
BG	-	-	±n.nnE-nn	Current value read out Current value 9 digits
B4	-	-	±n.nnE± nn***	Leak value read out Leak value 9 digits, 1 digit within zero, unit 1 digit, coefficient display (1=ON, 0=OFF)
B5	-	-	n.nnE±nn	Pirani pressure read out Pressure value 8 digits
BD	-	-	***	Sniffer flow rate read out Flow rate 3 digits
H7	-	-	*	Filament condition read out (1=FIL1,2=FIL2)
MV	-	-	***** , , , , , , ,	Valve condition read out 13 digits of TV1, TV2, TV3, FV, VV, CLV and FVV
MW	-	-	*****	HELIOT condition read out Condition code 2 digits, error code 4 digits (refer to the error catalog list)
C1	-	-	*	Measured gas read out (0=HELIUM, 1=HYDROGEN)
C1	*	OK	R2	Measured gas setting (0=HELIUM, 1=HYDROGEN)
		ERR	R4	Setting error After completion of startup Command byte count is different
C0	-	-	*	Test mode read out
C0	*	OK	R2	Test mode setting
		ERR	R4	Except stop Setting error Command byte count is different
G1	-	-	*	Cycle test read out (1=OFF, 0=ON)
G1	*	OK	R2	Cycle test setting (1=OFF, 0=ON)
		ERR	R4	During startup During error Command byte count is different
G2	-	-	***.*,*	Roughing timer read out Timer setting 5 digits, Unit 1 digit (0=sec), Setting 1 digit (1=Time priority, 0=Constant Pressure)
G2	***.*,*	OK	R2	Roughing timer setting Timer setting 5 digits, Unit 1 digit (0=sec), Setting 1 digit (1=Time priority, 0= Constant Pressure)
		ERR	R4	During startup During error Command byte count is different

Command	Parameter	Response	Data	Description
G9	-	-	*** ** . , ,	Background timer read out Timer setting 5 digits, Unit 1 digit (0=sec), Setting 1 digit (0=BELOW SP.2, 1=Time priority, 2=SKIP)
G9	*** ** . , ,	OK	R2	Background timer setting Timer setting 5 digits, Unit 1 digit (0=sec), Setting 1 digit (0=BELOW SP.2, 1=Time priority, 2=SKIP)
		ERR	R4	During startup During error Command byte count is different
G3	-	-	*** ** . , ,	He Spray timer read out Time setting 5 digits, Unit 1 digit (0=sec), Setting 1 digit (2=Time priority, 1=Test time)
G3	*** ** . , ,	OK	R2	He Spray timer setting Time setting 5 digits, Unit 1 digit (0=sec), Setting 1 digit (2=Time priority, 1=Test time)
		ERR	R4	During startup During error Command byte count is different
G4	-	-	*** ** . , ,	Test timer read out Timer setting 5 digits, Unit 1 digit (0=sec), Setting 1 digit (1=Time priority, 0=Test end at ng)
G4	*** ** . , ,	OK	R2	Test timer setting Timer setting 5 digits, Unit 1 digit (0=sec), Setting 1 digit (1=Time priority, 0=Test end at ng)
		ERR	R4	During startup During error Command byte count is different
C6	-	-	*	Auto zero read out (0=1SHOT [STANDBY ZERO:OFF], 1=ALTERNATE, 2=INVALID, 3=1SHOT [STANDBY ZERO:ON])
C6	*	OK	R2	Auto zero setting (0=1SHOT [STANDBY ZERO:OFF], 1=ALTERNATE, 2=INVALID, 3=1SHOT [STANDBY ZERO:ON])
		ERR	R4	Setting error Command byte count is different
D1	-	-	*	Vent control read out (0=AUTO, 1=MANUAL, 2=OFF)
D1	*	OK	R2	Vent control setting (0=AUTO, 1=MANUAL, 2=OFF)
		ERR	R4	During startup During error Command byte count is different
G5	-	-	***, ,	Vent time setting read out Time setting 3 digits, setting 1 digit (0=NORMALLY OPEN, 1=Time setting)
G5	***, ,	OK	R2	Vent time setting Time setting 3 digits, setting 1 digit (0=NORMALLY OPEN, 1=Time setting)
		ERR	R4	During startup During error Command byte count is different

Command	Parameter	Response	Data	Description
C3	-	-	**	Read out during calibration startup (Except Sniffer (concentration) setting) (1 st digit 1=With calibration, 0=Without calibration 2 nd digits 0=INT. CAL. LEAK, 1= EXT. CAL. LEAK)
C3	**	OK	R2	Setting during calibration startup (Except Sniffer (concentration) setting) (1 st digit 1=With calibration, 0=Without calibration 2 nd digits 0=INT. CAL. LEAK, 1= EXT. CAL. LEAK)
		ERR	R4	Except when stop During error Command byte count is different
C3	-	-	**	Read out during calibration startup (Sniffer (concentration) setting) (1 st digit 1=With calibration, 0=Without calibration 2 nd digits 0=ATM, 1=STD GAS)
C3	**	OK	R2	Setting during calibration startup (Sniffer (concentration) setting) (1 st digit 1=With calibration, 0=Without calibration 2 nd digits 0=ATM, 1=STD GAS)
		ERR	R4	After completion of startup Command byte count is different
H1	-	-	*	Ion voltage adjustment read out (0=At start-up only, 1=At every cal.)
H1	*	OK	R2	Ion voltage adjustment setting (0=At start-up only, 1=At every cal.)
		ERR	R4	During startup During error Command byte count is different
EB	-	-	*	Calibration check read out (0= NOT CHECK, 1= Yes)
EB	*	OK	R2	Calibration check setting (0= NOT CHECK, 1= Yes)
		ERR	R4	During startup During error Command byte count is different
EC	-	-	***, **	Calibration check read out Reference range 4 digits, checking frequency 2 digits
EC	***, **	OK	R2	Calibration check setting Reference range 4 digits, checking frequency 2 digits
		ERR	R4	During startup During error Command byte count is different
D7	-	-	*	Test screen read out (0=Graph, 1=Meter, 2=Vac. diagram, 3=Value)
D7	*	OK	R2	Test screen setting (0=Graph, 1=Meter, 2=Vac. diagram, 3=Value)
		ERR	R4	During startup During error Command byte count is different
C2	-	-	*	Unit leak rate read out of
C2	*	OK	R2	Unit leak rate setting
		ERR	R4	During error Command byte count is different

Command	Parameter	Response	Data	Description
CA	-	-	*	Unit pressure read out (0=Pa, 1=mbar, 2=atm, 3=Torr)
CA	*	OK	R2	Unit pressure setting (0=Pa, 1=mbar, 2=atm, 3=Torr)
		ERR	R4	Setting error Command byte count is different
E5	-	-	**.**	Leak rate correction (coefficient) read out Setting value 5 digits
E5	**.**	OK	R2	Leak rate correction (coefficient) setting Setting value 5 digits
		ERR	R4	Setting error Command byte count is different
EF	-	-	$\pm^{*}.**E\pm^{*}$	Leak rate correction (shift) read out Setting value 9 digits
EF	$\pm^{*}.**E\pm^{*}$	OK	R2	Leak rate correction (shift) setting Setting value 9 digits
		ERR	R4	Setting error Command byte count is different
CD	-	-	*	Leak rate filter read out (0=Fast, 1=Normal, 2=Slow)
CD	*	OK	R2	Leak rate filter setting (0= Fast, 1=Normal, 2=Slow)
		ERR	R4	Setting error Command byte count is different
D2	-	-	*	Message notice read out (1=INVALID, 2=VALID)
D2	*	OK	R2	Message notice setting (1=INVALID, 2=VALID)
		ERR	R4	During startup During error Command byte count is different
D4	-	-	*	Message maintenance read out (1=INACTIVE, 2=ACTIVE)
D4	*	OK	R2	Message maintenance setting (1=INACTIVE, 2=ACTIVE)
		ERR	R4	During startup During error Command byte count is different
C7	-	-	*	Control read out (0=Tablet, 1=EXT.I/O, 2=Serial comm.)
C7	*	OK	R2	Control setting (0=Tablet, 1=EXT.I/O, 2=Serial comm.)
		ERR	R4	Setting error Command byte count is different
H3	-	-	*	Compatibility read out (0=None, 1=710/700, 2=300, 3=ZERO)
H3	*	OK	R2	Compatibility setting (0=None, 1=710/700, 2=300, 3=ZERO)
		ERR	R4	Setting error Command byte count is different

Command	Parameter	Response	Data	Description
E9	-	-	*	REC. OUT voltage read out (0=Linear, 1=Logarithm)
E9	*	OK	R2	REC. OUT voltage setting (0=Linear, 1= Logarithm)
		ERR	R4	During error Command byte count is different
B7	-	-	n.nnE±nn*	Set point 1 read out Setting value 8 digits, set point 1 ON/OFF (1=ON, 0=OFF)
B7	n.nnE±nn	OK	R2	Set point 1 setting Setting value 8 digits
		ERR	R4	Setting change on touch panel Command byte count is different
E1	-	-	*	Set point buzzer read out (0=OFF, 1=ON)
E1	*	OK	R2	Set point buzzer setting (0=OFF, 1=ON)
		ERR	R4	Setting error Command byte count is different
B8	-	-	n.nnE±nn*	Set point 2 read out Setting value 8 digits, set point 2 ON/OF (1=ON, 0=OFF)
B8	n.nnE±nn	OK	R2	Set point 2 setting Setting value 8 digits
		ERR	R4	Setting change on touch panel Command byte count is different
B9	-	-	n.nnE±nn*	Set point read out Setting value 8 digits, set point 3 ON/OF (1=ON, 0=OFF)
B9	n.nnE±nn	OK	R2	Set point 3 setting Setting value 8 digits
		ERR	R4	Setting change on touch panel Command byte count is different
F1	-	-	n.nnE±nn	Internal calibration leak value (vacuum method) read out Setting value 8 digits
F1	n.nnE±nn	OK	R2	Internal calibration leak value (vacuum method) setting Setting value 8 digits
		ERR	R4	After completion of startup Command byte count is different
F2	-	-	*	Internal calibration leak value (vacuum method) temp./ decay compensation read out (0=ACTIVE, 1=INACTIVE)
F2	*	OK	R2	Internal calibration leak value (vacuum method) temp./ decay compensation setting (0=ACTIVE, 1=INACTIVE)
		ERR	R4	After completion of startup Command byte count is different

Command	Parameter	Response	Data	Description
F3	-	-	*****	Calibration date of Internal calibration leak value (vacuum method) read out Year 4 digits, month 2 digits, day 2 digits
F3	*****	OK	R2	Calibration date of Internal calibration leak value (vacuum method) setting Year 4 digits, month 2 digits, day 2 digits
		ERR	R4	After completion of startup Command byte count is different
F5	-	-	n.nnE±nn,*	External calibration leak value He (vacuum method) read out Setting value 8 digits, unit 1 digit
F5	n.nnE±nn,*	OK	R2	External calibration leak value He (vacuum method) setting Setting value 8 digits, unit 1 digit
		ERR	R4	After completion of external startup Command byte count is different
FD	-	-	n.nnE±nn,*	External calibration leak value H2 (vacuum method) read out Setting value 8 digits, unit 1 digit
FD	n.nnE±nn,*	OK	R2	External calibration leak value H2 (vacuum method) setting Setting value 8 digits, unit 1 digit
		ERR	R4	After completion of external startup Command byte count is different
F6	-	-	*	External calibration leak value (vacuum method) control read out (0=Auto, 1=Manual)
F6	*	OK	R2	External calibration leak value (vacuum method) control setting (0=Auto, 1=Manual)
		ERR	R4	After completion of startup Command byte count is different
F9	-	-	n.nnE±nn,*	External calibration leak value (Sniffer method) read out Setting value 8 digits, unit 1 digit
F9	n.nnE±nn,*	OK	R2	External calibration leak value (Sniffer method) setting Setting value 8 digits, unit 1 digit
		ERR	R4	After completion of startup Command byte count is different
FC	-	-	n.nnE+nn	Sniffer method standard gas value read out Setting value 8 digits
FC	n.nnE+nn	OK	R2	Sniffer method standard gas value setting Setting value 8 digits
		ERR	R4	After completion of startup Command byte count is different

(*1) For test modes refer to the list below

(*2) For status codes see below. For error codes refer to Section 9-3.

11-3-2-4 Status Codes

① When B3 command is used

Code	Description
51	Stop
52	Start-up at Auto mode
53	Start-up at Ultra flow
54	Start-up at Fine flow
55	Start-up at Gross flow
56	Start-up at Sniffer/A
57	Start-up at Sniffer/B
58	Standby at Auto mode
59	Standby at Ultra flow
60	Standby at Fine flow
61	Standby at Gross flow
62	Standby at Sniffer/A
63	Standby at Sniffer/B
64	Roughing at Auto mode
65	Roughing at Ultra flow
66	Roughing at Fine flow
67	Roughing at Gross flow
68	Testing at Gross flow (Auto)
69	Testing at Fine flow (Auto)
70	Testing at Ultra flow (Auto)
71	Testing at Gross flow
72	Testing at Fine flow
73	Testing at Ultra flow
74	Testing at Sniffer/A
75	Testing at Sniffer/B
76	Push "VENT"
77	Sensitivity checking
78	Roughing at cal. check
79	Cal. leak value checking
80	Settings
81	Information
84	Cal. leak value check waiting
06	Request Sniffer method calibration leak
07	Request Sniffer method reference gas
08	Request for re-sniffing by sniffer method (calibration leak)
09	Request for re-sniffing by sniffer method (standard gas)
31	Clean up processing
34	Over range
38	RAM clear

② When MW command is used

Code	Description
51	Stop
01	Pumping
18	ANALYZER PUMPING DOWN
03	Undergoing accelerating voltage adjustment
04	Undergoing ion focus voltage adjustment
05	Undergoing sensitivity calibration
17	Under sensitivity recalibration by vacuum method (until sensitivity check)
27	Under sensitivity recalibration by sniffer method (until sensitivity check)
58	Standby at Auto mode
59	Standby at Ultra flow
60	Standby at Fine flow
61	Standby at Gross flow
62	Standby at Sniffer/A
63	Standby at Sniffer/B
64	Roughing at Auto mode
65	Roughing at Ultra flow
66	Roughing at Fine flow
67	Roughing at Gross flow
68	Testing at Gross flow (Auto)
69	Testing at Fine flow (Auto)
70	Testing at Ultra flow (Auto)
71	Testing at Gross flow
72	Testing at Fine flow
73	Testing at Ultra flow
74	Testing at Sniffer/A
75	Testing at Sniffer/B
76	Push "VENT"
77	Sensitivity checking
78	Roughing at cal. check
79	Cal. leak value checking
80	Settings
81	Information
84	Cal. leak value check waiting
06	Request Sniffer method calibration leak
07	Request Sniffer method reference gas
08	Request for re-sniffing by sniffer method (calibration leak)
09	Request for re-sniffing by sniffer method (standard gas)
31	Clean up processing
34	Over range
38	RAM clear

11-3-2-5 Test Mode Codes

Code	Description
0	Auto mode
1	Ultra flow
2	Fine flow
3	Gross flow
7	Sniffer concentration: Atm
8	Sniffer flow rate
9	Sniffer concentration: Std. gas

11-3-2-6 Unit Codes

Code	Description
0	Pa · m ³ /s
1	mbar · L/s
2	atm · cc/s
3	Torr · l/s
4	luck
5	sccm
6	Mol/s
7	ppm
8	% × R
9	oz/a
A	g/a
B	Amp.

11-3-3 RS-485 Communication

11-3-3-1 Communication Specification

Signal format	: RS-485
	: 2-wire system
	: half duplex
Rotation method	: Start stop synchronization
Data configuration	: ASCII code
Transmission distance	: 500m
Max. No. of connection	: 32 (includes host)
Transfer speed	: 9600,19200,38400bps (changeable by setting)
Bit configuration	
Start bit	: 1bit
Data bit	: 8bit
Parity bit	: None
Stop bit	: 1bit

11-3-3-2 Connection Method of Wire

(1) RS-485 No Terminal Resistance (example)

As a wire connection of RS485, USB serial interface, USB-485 of NATIONAL EQUIPMENTS is used as an example to describe wire connection of RS485.

HELIOT side PIN No.		Wire connection	Host side PIN No.	
LINE +	4		4	RxD+
			8	TxD+
LINE -	1		5	RxD-
			9	TxD-
GND	5		1	GND

(2) RS-485 No Terminal Resistance (example)

As a wire connection of RS485, USB serial interface, USB-485 of NATIONAL EQUIPMENTS is used as an example to describe wire connection of RS485.

When there will be multiple connections of RS-485, the total length of connection cable becomes 15 m or over, or frequent case of communication errors occur, it is essential to install terminal resistance to the terminal equipment.

HELIOT side PIN No.		Wire connection	Host side PIN No.	
LINE +	4		4	RxD+
			8	TxD+
LINE -	1		5	RxD-
			9	TxD-
GND	5		1	GND
Terminal resistance	9			
LINE +	6			

11-3-3-3 Checksum

Checksum is used for checking data sent is received properly. The calculation of the checksum will be up to a letter XOR (the exclusive theory sum) before checksum from the address.

When calculating checksum manually, it is useful to use a standard “calculator” in WINDOWS. Select scientific for calculator type and calculate the checksum in hexadecimal.

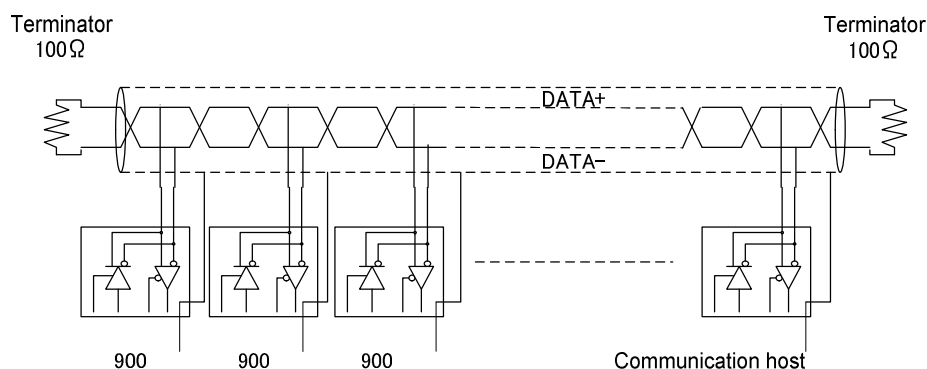
11-3-3-4 Block Configuration Diagram

This equipment employs half duplex type, 2-channel communication. The typical block configuration diagram is shown below. The DATA+ and DATA- of each unit, and inter-wire of the same signal name are connected. Communication will not be possible if connected reversely. RS-485 has 2 lines (DATA+ and DATA-) and both output 1 data signal with differential motion (balanced transmission). Therefore, has excellent noise resistance against common mode noise. Half duplex means, sent data and received data exist on these 2 lines, thus when data is sent from 2 nodes at the same time, the receiving side will not be able to receive the data properly. Therefore, the following procedure is used for communication.

- 1) Node side (900) is at communication stage.
- 2) Host designates the address of node and sends the command.
- 3) The designated address of the node responds according to the command.

As such the state when both sent and received data do not exist at the same time is called half duplex.

(Full duplex: Both sending and receiving are possible at the same time)



The transmission line that is ideal in terms of noise immunity is a twisted pair shielded wire, but theoretically a parallel 2-core wire can be used.

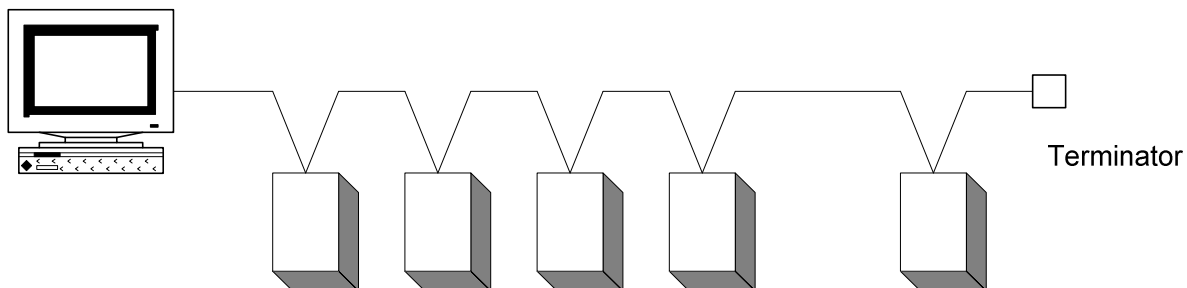
In addition, in order to repress returning wave and harmonize impedance, it is ideal to insert terminal resistance of 100 Ω at both ends of the channel path

11-3-3-5 Wiring Method

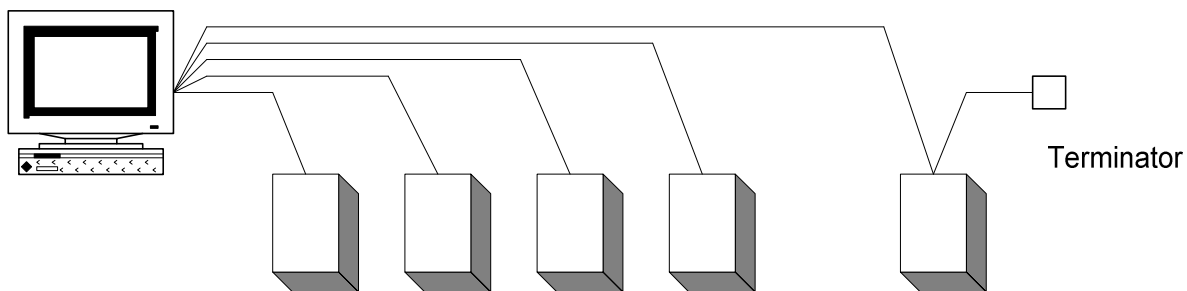
RS-485 enables multi-drop connection. (Multi-drop connects equipment (nodes) in sequence on 1 channel path)

The following diagrams show both proper and bad examples of connection. It operates in any short distances, however, caution is needed when wiring long distances.

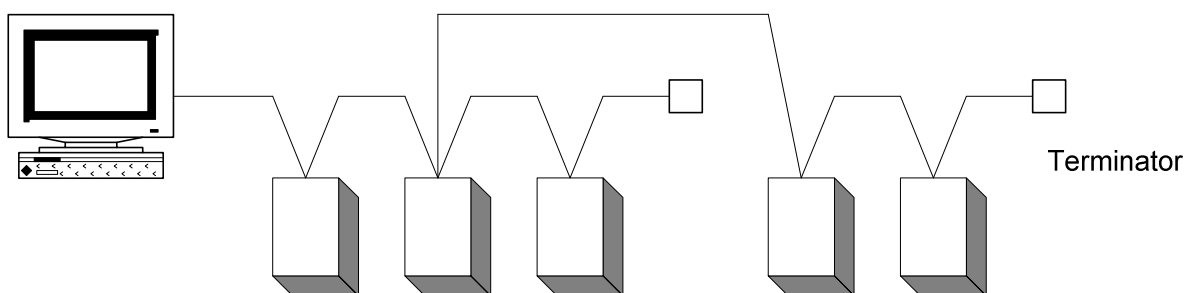
When laying communication channel line on to a device, avoid access to or parallel wiring of, power lines, high voltage cables and high frequency cables. Risk of causing malfunction.



Correct connection



Incorrect connection -1



Incorrect connection -2

11-3-3-6 Basic Data Format

:	AD0	AD1	CMD	D0		Dn	CHKH	CHKL	CR
---	-----	-----	-----	----	-------	----	------	------	----

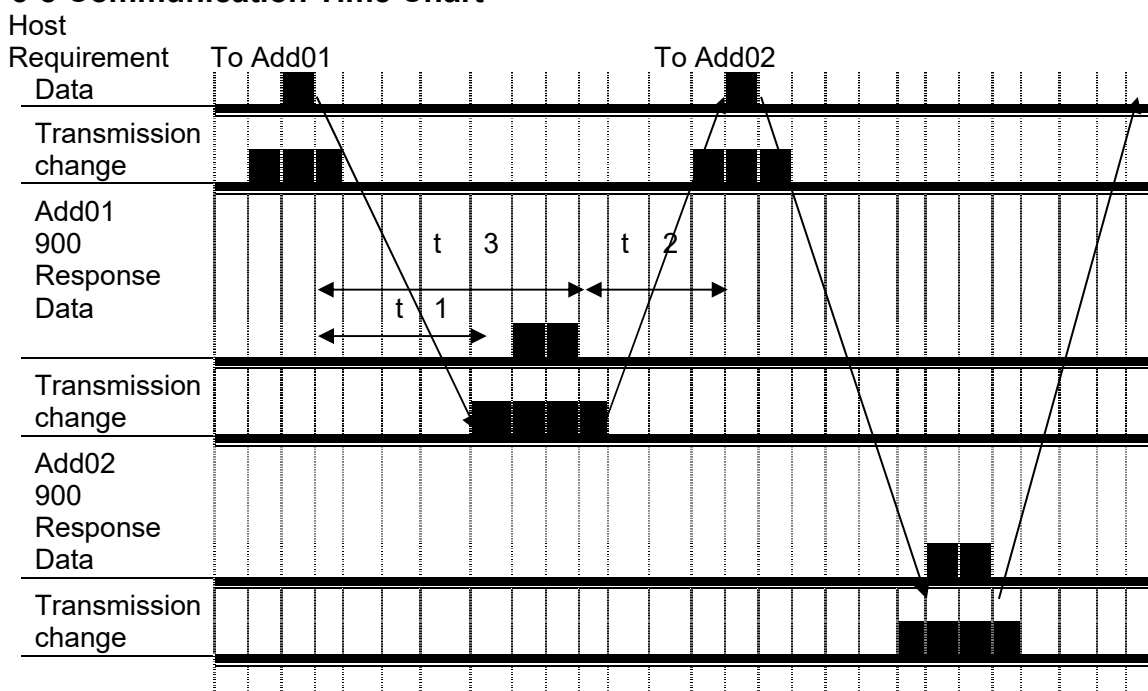
: : Colon
AD0 : Equipment address/higher 4 bit (capital letters 0 – 9)
AD1 : Equipment address/lower 4 bit (capital letters 0 – 9)
CMD : Various commands (capital letters/caution to lower case letters)
D0 : Data <4 bit> (capital letters: 0 – 9, A - F)
Dn : Data <4 bit> (capital letters: 0 – 9, A - F)
CHKH : Higher 4 bit of checksum (capital letters: 0 – 9, A - F)
CHKL : Lower 4 bit of checksum (capital letters: 0 – 9, A - F)
CR : Carriage return

- * The checksum will be the exclusive theory sum (XOR) of up to AD 0 – Dn. All ASCII codes must be converted in hexadecimal.
- * Routine of several tries of software is recommended.

11-3-3-7 List of Commands

Same commands as (Section 11-3-2-3) RS-232C.

11-3-3-8 Communication Time Chart



To Add01 : Request of data from host to address No. 01 equipment
 Add01_900 Response : 900 of address No. 01 replies

To Add02 : Request of data from host to address No. 02 equipment
 Add02_900 Response : 900 of address No. 02 replies

Transmission change: 485 driver switches send and receive modes because of half duplex communication type. Some equipment may take long delay time to return to receive mode after sending data. (This equipment changes to receive mode after about 5ms)

When data is sent while other equipment is maintaining send mode, 2 drivers on bus will turn to send modes and the data will not be received properly.

In order to avoid such situation, when the equipment receives "CR" data sent by the host, starts sending data only after keeping an interval of approximately 20ms(t_1) and more.

Therefore, the host release the bus approximately within 20ms(t_1) after sending the data. (It needs to be changed to a receive mode)

Depending on the measurement control state at that time, the 900 may delay the response. The host must have the receiving time out (t_3) to be 100ms or more from the time host sends the data to receive the response data of "CR"

900 with other address are also receiving their own sent data.

Non-related data are deleted from received memories after receiving data.

The 900 cannot receive data properly, if the host side makes any request during this operation.

Therefore, after receiving sent data of "CR" from 900, the next data must be requested with an interval of 20ms(t_2).

11-3-3-9 List of ASCII Codes

					B7	0	0	0	0	1	1	1	1
					B6	0	0	1	1	0	0	1	1
					B5	0	1	0	1	0	1	0	1
B4	B3	B2	B1			0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	TC7(DLE)	(SP)	0	@	P	`	p	
0	0	0	1	1	TC1(SOH)	DC1	!	1	A	Q	a	q	
0	0	1	0	2	TC2(STX)	DC2	"	2	B	R	b	r	
0	0	1	1	3	TC3(ETX)	DC3	#	3	C	S	c	s	
0	1	0	0	4	TC4(EOT)	DC4	\$	4	D	T	d	t	
0	1	0	1	5	TC5(ENQ)	TC8(NAK)	%	5	E	U	e	u	
0	1	1	0	6	TC6(ACK)	TC9(SYN)	&	6	F	V	f	v	
0	1	1	1	7	BEL	TC10(ETB)	'	7	G	W	g	w	
1	0	0	0	8	FE0(BS)	CAN	(	8	H	X	h	x	
1	0	0	1	9	FE1(HT)	EM	)	9	I	Y	i	y	
1	0	1	0	A	FE2(LF)	SUB	*	:	J	Z	j	z	
1	0	1	1	B	FE3(VT)	ESC	+	;	K	[	k	{	
1	1	0	0	C	FE4(FF)	IS4(FS)	,	<	L	\	l		
1	1	0	1	D	FE5(CR)	IS3(GS)	-	=	M	]	m	}	
1	1	1	0	E	SO	IS2(RS)	.	>	N	^	n	-	
1	1	1	1	F	SI	IS1(US)	/	?	O	_	o	(del)	

11-4 Each Data

Each data will be saved on micro SD card installed in to the TABLET.

11-4-1 Description (Explanation) of each data

Files inside the micro SD card are composed by few folders.

Do not touch the files that are not described below as it is used to move the system.

And do not add or change file name of folders which are as below.

In case the micro SD card is not installed in the TABLET, Folder is made automatically in Internal memory of TABLET (Internal Storage / Android / data / heliot900).

Folder	File	Detail
Error / errorlog.csv	errorlog.csv	Saved data of ERROR in csv file that occurs in the HELIOT. Refer to Section 11-4-2 for the saved data.
GaugeLog / Serial No / YYYYMMDD (Folder name is initially set as "YYYYMMDD". If folder name is changed as described in Section 5-1_11, the changed folder name is shown there.)	yyyymmdd.csv	Print file prints the measurement value (leak rate) for test. When test is completed, test measurement value (leak rate) at the time is automatically saved. By touching LEAK RATE DISPLAY during test, the test measurement value at the time will be saved. Each folder saves one file. File name will be saved by the date, and the number of test (0000 to 9999 in sequence) that has performed will be saved in a file. Refer to Section 11-4-3 for the saved data. Files are divided into each folder by serial number.
GaugeLog / Serial No / YYYYMMDD (Folder name is initially set as "YYYYMMDD". If folder name is changed as described in Section 5-1_11, the changed folder name is shown there.)	yyyymmdd_xxxx.csv	Measurement data file is saved from the start to stop time of test in one file. File name is saved by the date and number of test (0000 – 9999 in sequence) that has performed. Refer to Section 11-4-4 for the saved data. Files are divided into each folder by serial number.
Startup	Startuplog.csv	Sensitivity data of every start up by csv file. Refer to Section 11-4-5 for the saved data.

11-4-2 Error Log record example

DATE	TIME	ERR.CODE
2018/6/19	17:30	N27u
2018/6/18	15:38	N27u
2018/6/16	14:31	C17u
2018/6/10	16:02	W13t
2018/6/10	16:01	C21u
2018/4/24	14:47	N27u
2018/4/24	14:47	C02u
2018/4/24	14:45	C02u

11-4-3 Gauge Log Print Record Example

[DateTime]	[No.]	[Valve]	[LeakRate]	[OK/NG]	[InnerPirani]	[Temperature]
14:42:37	1	FINE	1.00E-12	OK	2.53E+00	26.1
15:23:21	2	ULTRA	6.35E-10	OK	4.00E-01	26.1
15:32:07	3	ULTRA	5.57E-10	OK	4.00E-01	26.1
15:50:13	4		1.00E-10	OK	4.90E+03	26.4
16:02:03	5	FINE	1.77E-09	OK	2.77E+00	28.7
16:15:20	6	FINE	1.46E-09	OK	2.01E+00	28.7
16:18:42	7	ULTRA	6.44E-10	OK	4.00E-01	28.7
17:02:39	8	FINE	2.62E-09	OK	2.53E+00	28.5

It shows test result (test measurement value). 0001 up to 9999 are in sequence.

Blank column in [Valve] shows result of when test is completed.

11-4-4 Gauge Log Measurement Data Record Example

[DateTime]	[LeakRate]	[InnerPirani]	[Temperature]	[TMPTemperature]
10:42:37	1.00E-12	1.00E+04	29.4	34
10:42:38	1.00E-12	5.01E+03	29.4	34
10:42:38	1.00E-12	5.01E+03	29.4	34
10:42:38	1.00E-12	4.53E+03	29.4	34
10:42:38	1.00E-12	3.98E+03	29.4	34
10:42:38	1.00E-12	3.98E+03	29.4	34
10:42:39	1.00E-12	3.64E+03	29.4	34
10:42:39	1.00E-12	3.20E+03	29.4	34
10:42:39	1.00E-12	3.20E+03	29.4	34
10:42:39	1.00E-12	2.82E+03	29.4	34
10:42:39	1.00E-12	2.57E+03	29.4	34
10:42:40	1.00E-12	2.57E+03	29.4	34
10:42:40	1.00E-12	2.28E+03	29.4	34
10:42:40	1.00E-12	2.00E+03	29.4	34
10:42:40	1.00E-12	2.00E+03	29.4	34
10:42:40	1.00E-12	1.85E+03	29.4	34

11-4-5 Startup Log record example

Serial No.	START-UP DATE	TEMP. [°C]	Pumping Down [sec]	TMP Start-up [sec]	Ion Volt [V]	ULTRA Flow	Unit	DATE
5	2018/6/8	24.9	15	108	232.5	1.05E-12	0	2018/6/8
5	2018/6/11	25.6	15	107	229.6	1.09E-12	0	2018/6/11

FINE FLOW	Unit	DATE	GROSS FLOW	Unit	DATE	SNIFFER FLOW	Unit	DATE
8.71E-12	0	2018/6/8	3.02E-10	0	2018/6/8	1.60E-12	0	2018/7/1
9.00E-12	0	2018/6/11	3.12E-10	0	2018/6/11	1.60E-12	0	2018/7/1

11-5 Screen shot



Touching the camera button  at the bottom left of the tablet screen can capture screen shot. Data is not saved if no micro SD card is found in the tablet. Check to see that micro SD card is installed before taking screen capture.

Captured data will be saved in micro SD / Screenshots with a file name of Screenshot_YYYYMMDD-HHMMSS.

11-6 Loading method of the data

There are 2 ways to load the data from the micro SD card.

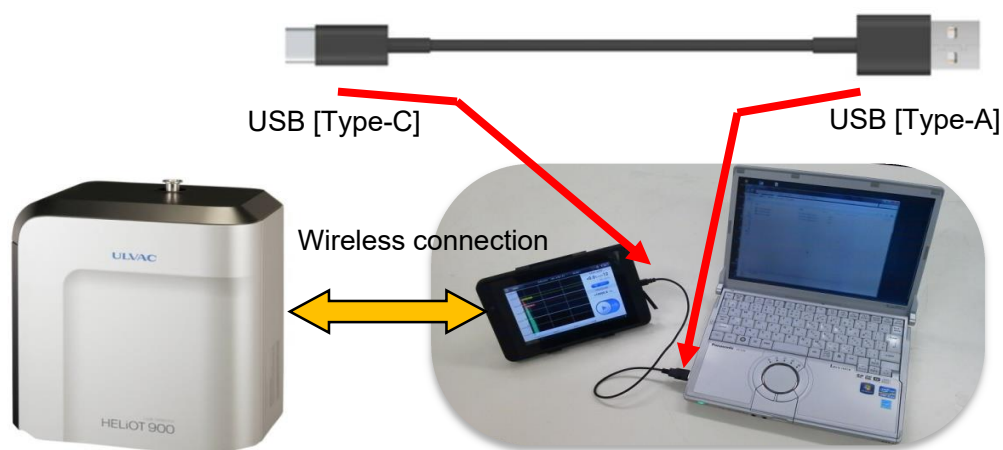
11-6-1 micro SD

After switching off the TABLET, Remove the micro SD card from the TABLET. Insert the micro SD card to an exchange adaptor such as right picture type and check the data file inside of PC.



11-6-2 USB Communication cable

Data file can be loaded connecting the TABLET and PC using the USB communication cable. By the wireless connection of HELIOT main body and TABLET, data administration can be performed when HELIOT is running / processing.



12. Guarantee

This instrument has been shipped from our facilities after rigorous in-house testing. Should any malfunction or trouble occur due to defective parts, or should the unit be damaged due to an accident or mishap during transit, please contact ULVAC or any ULVAC authorized agent. ULVAC guarantees the instrument against any defect in performance or manufacturing for 1 year from the time of delivery. Any malfunctions or troubles occurring as a result of defects in the design or fabrication of the instrument within the warranty period will be serviced by ULVAC free of charge. However, for service carried out at a location other than the original location of delivery because the instrument was moved either within Japan or overseas, there may be instances when ULVAC will be compensated for various costs such as transportation or the dispatch of personnel. Please be aware that any malfunction or trouble caused by the operation of the instrument in a manner contrary to the instructions listed in the operations manual, malfunction caused by careless handling (for example, damage to the turbo molecular pump as a result of having suddenly injected air into the unit while testing was in progress), by having reconfigured or remodeled the unit without prior approval by ULVAC, by accidents caused by natural disasters and acts of God, or by consumable parts, are not guaranteed under this warranty.

[List of consumable parts] (the items below are not covered under warranty)

- 1) O-rings and gaskets
- 2) Hoses and tubes
- 3) Ion source (type: IS-BA1)
- 4) Pirani vacuum gauge head (type: WP-01)
- 5) Turbomolecular pump oil reservoir
- 6) Rotary pump oil (oil for 901W1: model R-2, oil for 904W2: model SMR-100)
- 7) Oil mist filter for 901W1
- 8) Built in lithium-ion battery for tablet (Tablet type)
- 9) RTC battery (Panel mount type)
- 10) Vent filter
- 11) Air-cooling fan and air-cooling fan filter
- 12) Sniffer probe Metal tip element sintered: for sniffer AS/BS unit
- 13) Microseparator (type: MS-80): for Sniffer unit BS9/BT9
- 14) Diaphragm pump: For Sniffer unit BS9/BT9*1
- 15) Dust filter: For Sniffer unit BS9
- 16) Dust filter: For Sniffer unit BT9

(*1) Guaranteed up to 10000hrs of operating time if within 1 year of shipment from ULVAC Inc.

[About calibration leak value variations]

The output of the calibration leak, which is the sensitivity calibration standard, undergoes temperature compensation by the internal temperature sensor according to the customer's settings. For calibration leak output value attenuation as well, it also undergoes time compensation according to the amount of time elapsed from the calibration date. However, in order to maintain an even more accurate measurement environment, prepare a calibration leak managed separately by yourself. Measuring the managed calibration leak and checking if the appropriate indicated value is obtained is recommended.

If recalibration of the calibration leak is requested, your nearest service center will perform recalibration for a charge at the same time as a scheduled overhaul by bringing the unit back to the factory, or by bringing in only the calibration leak. A calibration certificate can also be issued for a fee by request.

[About purchasing repair parts and consumables]

Please contact the nearest service center for the purchase of repair parts and consumables.

Form: A00315268-02-00

ULVAC Components / Certificate of Decontamination

This is a certificate of decontamination for repair and inspection request of ULVAC Components. All material must be certified as decontaminated and this certificate must be submitted to your closest local ULVAC service center or sales office prior to shipment.

Please consult with your closest local ULVAC service center or sales office if our components are used with toxic gases or contaminated with reactive products or substances produced by reaction.

Product model:

Model:

Serial No.:

Application:

Remarks:

Contaminant (Check an applicable box.)

☐ I guarantee that above returned item(s) is not contaminated with harmful substances.

☐ Above returned item(s) is contaminated with the following harmful substances.

	Name of contaminant (molecular formula)	Characteristics
1		
2		
3		
4		
5		

To: ULVAC

Attn: _____

Date: / / (YYYY/MM/DD)

Your company

Division

Contact

Phone

Fax

E-mail

Please pack returned item(s) carefully before shipment. Any accident occurred during transportation to us and during disassembly caused by contaminant is under your responsibility. It is also to be understood that ULVAC may decline to repair returned item(s) depending on the type of contaminant and degree of contamination, and return it to you.

To be filled in by ULVAC	Received by	
Request for MSDS: Yes/No		
ULVAC job No.		



Declaration of Conformity



We, Company:ULVAC,Inc.

of Address: 2500 HAGISONO, CHIGASAKI-SHI,KANAGAWA-KEN, 253-8543
JAPAN

This declaration is issued under the sole responsibility of the manufacturer.
In accordance with the following Directive:

2014/35/EU	Low Voltage
2014/30/EU	Electromagnetic Compatibility
2011/65/EU+(EU)2015/863	RoHS Directive

declare under our sole responsibility that the product,

Type of Product	: LEAK DETECTOR
Model Name	: HELIOT 901W1/901D2/904W2/904D3/904D4 With SNIFFER A-unit or B-unit

to which this declaration related is in conformity with the following standards:

EN IEC 61326-1:2021

Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements

EN 61010-1:2020+A1:2019

Safety requirement for electrical equipment for measurement, control and laboratory use.General requirement

EN IEC 63000:2019

Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

following the provisions of

The person stated below will keep the following technical documentation:

- operating and maintenance instructions
- technical drawings
- description of measures designed to ensure conformity
- other technical documentation, e.g. quality assurance measures for design and production

Person authorized to compile the technical file:

(Name and address) Chris Goebel
ULVAC GmbH
Klausnerring 4 85551 Kirchheim b. München, Germany

18.Juiy, 2023
Chigasaki,Japan

Toyoaki Nakajima
Senior Manager of Components Business HQ

T. Nakajima

(date & place)

(name, function, signature)

We, Company:ULVAC,Inc.

of Address: 2500 HAGISONO, CHIGASAKI-SHI,KANAGAWA-KEN, 253-8543
JAPAN

This declaration is issued under the sole responsibility of the manufacturer.
In accordance with the following Directive:

2016 No.1101	Electrical Equipment (Safety) Regulations 2016
2016 No.1091	Electromagnetic Compatibility Regulations 2016
2012 No.3032	The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

declare under our sole responsibility that the product,

Type of Product : **LEAK DETECTOR**
Model Name : **HELIOT 901W1/901D2/904W2/904D3/904D4**
With SNIFFER A-unit or B-unit

to which this declaration related is in conformity with the following standards:

BS EN 61010-1:2010+A1:2019

Safety requirement for electrical equipment for measurement, control and laboratory use.General Requirement

BS EN IEC 61326-1:2021

Electrical equipment for measurement, control and laboratory use – Electromagnetic compatibility requirements

following the provisions of

The person stated below will keep the following technical documentation:

- operating and maintenance instructions
- technical drawings
- description of measures designed to ensure conformity
- other technical documentation, e.g. quality assurance measures for design and production

Person authorized to compile the technical file:

(Name and address) Chris Goebel
ULVAC GmbH
Klausnerring 4 85551 Kirchheim b. München, Germany

18.Juiy, 2023
Chigasaki,Japan

Toyoaki Nakajima
Senior Manager of Components Business HQ

T. Nakajima

(date & place)

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HELIOT 900 SERIES RECOMMENDED ABBREVIATIONS LIST:

- B.G. =BACK GROUND
- S.D.=STORAGE DEVICE
- AS= "A" TYPE SNIFFER
- BS="B" TYPE SNIFFER
- BT="B" TYPE SNIFFER WITH TUBE CONNECTION
- I/O= INPUT/OUTPUT
- Pa m³/sec= PASCAL CUBIC METERS PER SECOND
- l/min= LITERS PER MINUTE
- He= HELIUM
- V= VOLTS
- Hz=HERTZ
- ISO=INTERNATIONAL STANDARDS ORGANIZATION
- m=METERS
- mm=MILLIMETERS
- C=CELCIUS
- F=FAHRENHEIT
- Ø=DIAMETER
- W1=WET TYPE ROTARY VANE PUMP #1
- D2=DRY TYPE PUMP #2
- Mbar l/sec=MILLIBAR LITERS PER SECOND
- Torr l/sec=TORR LITERS PER SECOND
- lusec=LITER MICRONS PER SECOND
- sccm=STANDARD CUBIC CENTIMETERS PER MINUTE
- mol/s=MOLS PER SECOND
- Oz/a=OUNCES PER YEAR (ANNUM)
- g/a=GRAMS PER YEAR
- %XR= PERCENT OF CONCENTRATION OF STANDARD LEAK
- Amp=AMPERAGE OF ION MEASUREMENT
- ppm=PARTS PER MILLION