

VLT-ST Vacuum Leak Tester

(Standard Model)

Using Manual



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Safety Notes



AT2E has been making every effort to supply customers with equipments that designed with the highest standards of safety when it leaves the factory. All the equipments have been well inspected before delivery. However the responsibility to be shifted to the customers' end for the safe installation and operation of such equipments, especially to follow the safety precautions listed below:

- ✧ Ensure the power supply that to be connected to the instrument matches the power supply requirement stated on this manual.
- ✧ Ensure the A/C circuit that feeding to the instrument has been properly earthing and well protected by an appropriate rated fuse or circuit breaker.
- ✧ Use only the qualified extension cords, check all the exposed wiring and cable for corrosion or loose connection periodically.

ALWAYS remove hands from test area before initiating a test sequence. NEVER initiate a test on a piece of test equipment without first verifying that all shields, guards, and latches have been closed and secured. ALWAYS tag, disconnect, and remove from service a piece of test equipment that is not in proper working order.

1. Introduction

VLT-ST Vacuum Leak Tester is used to simulate a vacuum environment for the testing objects, the purpose is to perform the leak test, pressure estimation, observe the morphological variation and fatigue strength of testing objects, etc. The VLT-ST model adopted the easy operating digital indicating auxiliary, it is able to simulate different testing conditions, so that provides rich and reliable data for the tests.

2. Working principle

There are two ways for the VLT-ST Vacuum Leak Tester to generate the negative pressure. One is external electric vacuum pump, to supply the vacuum source externally to the instrument for generating negative pressure. The other is internal mechanical vacuum generator, to supply the instrument with positive pressure, then through the vacuum generator inside the instrument to convert it into negative pressure, so that to supply the negative pressure for testing.

For the controlling, there is a digital pressure indicator and a digital timer for performing the logical control, simple and convenient.



External electric vacuum pump



Internal vacuum generator

3. Technical data

- 1) Measure range: -950 mbar~0 bar
- 2) Accuracy: 0.1 mbar
- 3) Pressurization speed: adjustable
- 4) Negative pressure source: optional for A. External electric vacuum pump, B. Internal mechanical vacuum generator
- 5) Dimension: 470 x 330 x 205 mm
- 6) Weight: 13 kg
- 7) Power supply: AC 100~240V 50Hz/60Hz
- 8) Power: 100VA
- 9) PMMA box size range: 200 x 200 x 200 mm to 1000 x 1000 x 1000 mm. In order to confirm the vacuum box and vacuum source, please specify the size when ordering.

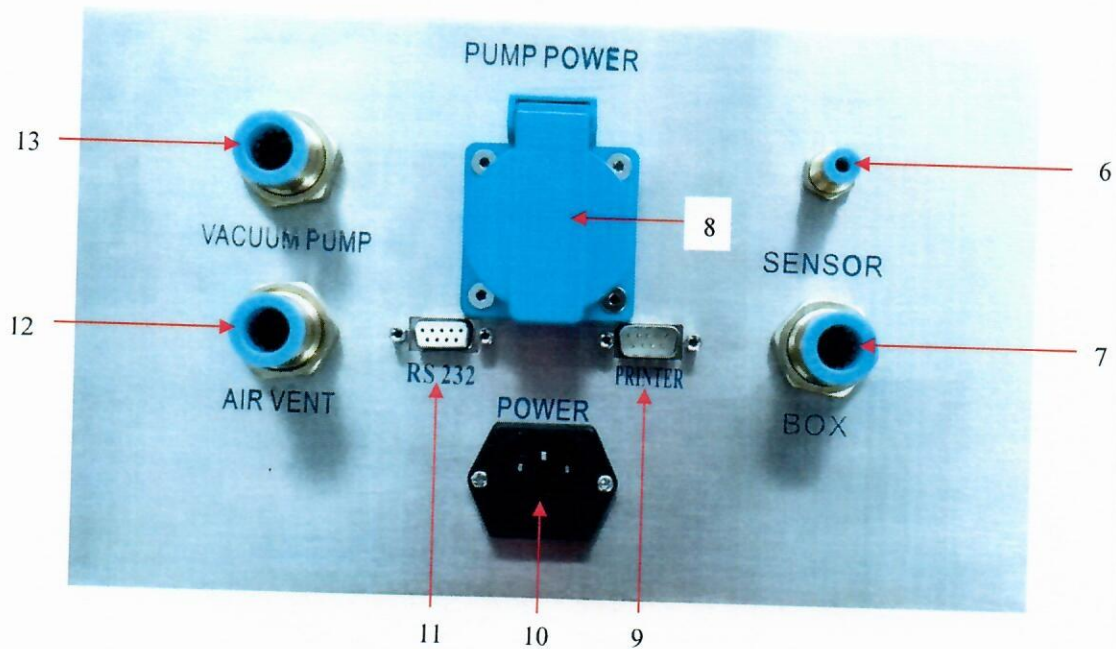
4. Working environment

- 1) Power supply: AC 100~240V 50Hz/60Hz
- 2) Air source: A. External vacuum pump: only request the power supply, B. Internal vacuum generator: 6-8 bar positive pressure. The lower of the vacuum level is, the higher of the positive pressure is needed. Otherwise the pressurizing process will be longer.
- 3) Relative working humidity: $\leq 85\%$.
- 4) Recommended working temperature: $5^{\circ}\text{C} - 40^{\circ}\text{C}$

5. Electric box

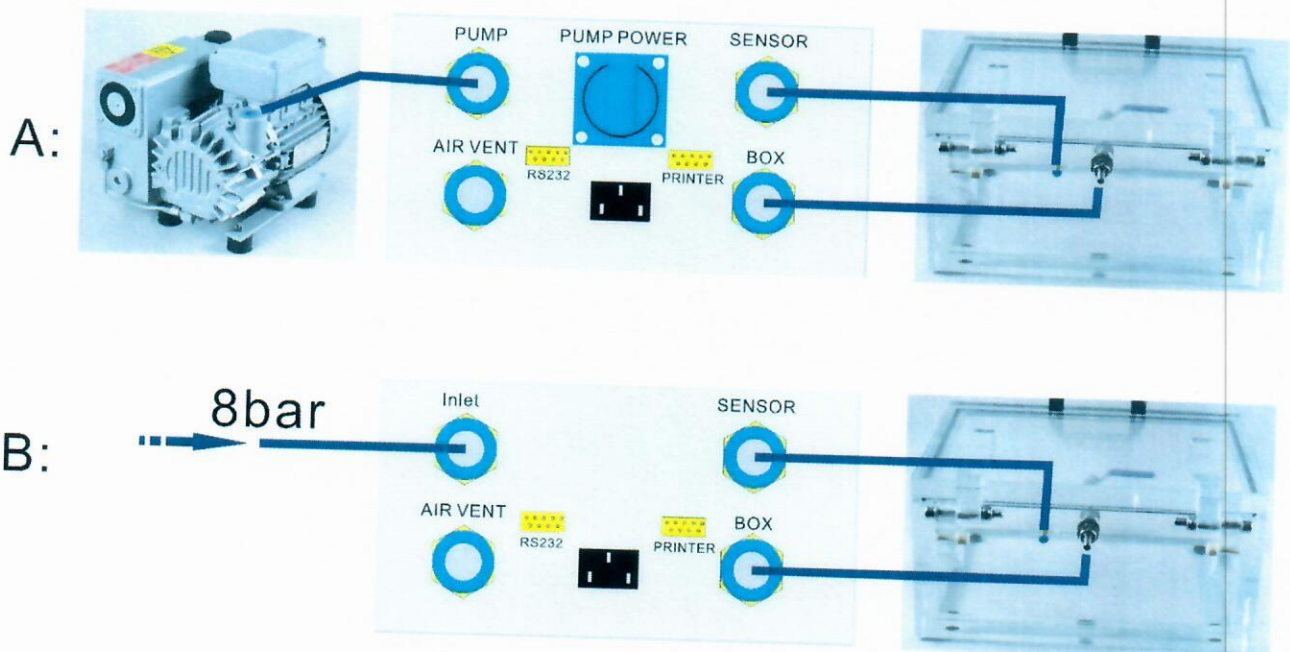


1). Touching screen 2). Door lock 3). Emergency stop button 4). Power switch 5). Start switch



- 6). Pressure sensor nozzle (connect to the vacuum box) 7). Vacuum box nozzle 8). External vacuum pump power supply plug (this plug will not exist when using the internal vacuum generator)
 9). Communication port for mini-printer 10). Power supply 11). RS232 communication port for PC
 12). Air exhaust nozzle 13). Air-in of the external vacuum pump (if used the internal vacuum generator, this nozzle is for the air-in of positive pressure source)

6. Piping installation



A is for external vacuum pump model, B is for internal vacuum generator model.

7. Testing

A. Operation of external vacuum pump model:

- 1) Turn on the power switch, instrument will perform the self-inspection for once. Around 3 seconds later, the self-inspection is finished, and the instrument is ready for performing tests.
- 2) Place the samples into vacuum box and close the door.
- 3) Press the “START” button, instrument will start the vacuum process. As the process goes on, the negative pressure inside the box will build-up, until reached the predefined value, system will stop pressurization and activate the timer for pressure holding. Please note that during the vacuum process, the air inside the box can not reach the homogeneous status rapidly, so after the vacuum is stopped, the negative pressure inside the box will increase a little. For example, like the instant pressure reached -500mbar, after stopped the vacuum, it increase to -485mbar, then reaches the homogeneous status and become stable. It is because when the vacuum stopped, the air inside the box will flow to reach a homogeneous status, it is a normal phenomenon. The faster of the pumping speed when generating the vacuum, the more obvious for this phenomenon, so it was suggested that do not adjust to a very high vacuum speed.
- 4) After the holding time is finished, system will release the pressure automatically. Wait until the displaying pressure shows “0”, the test is finished.

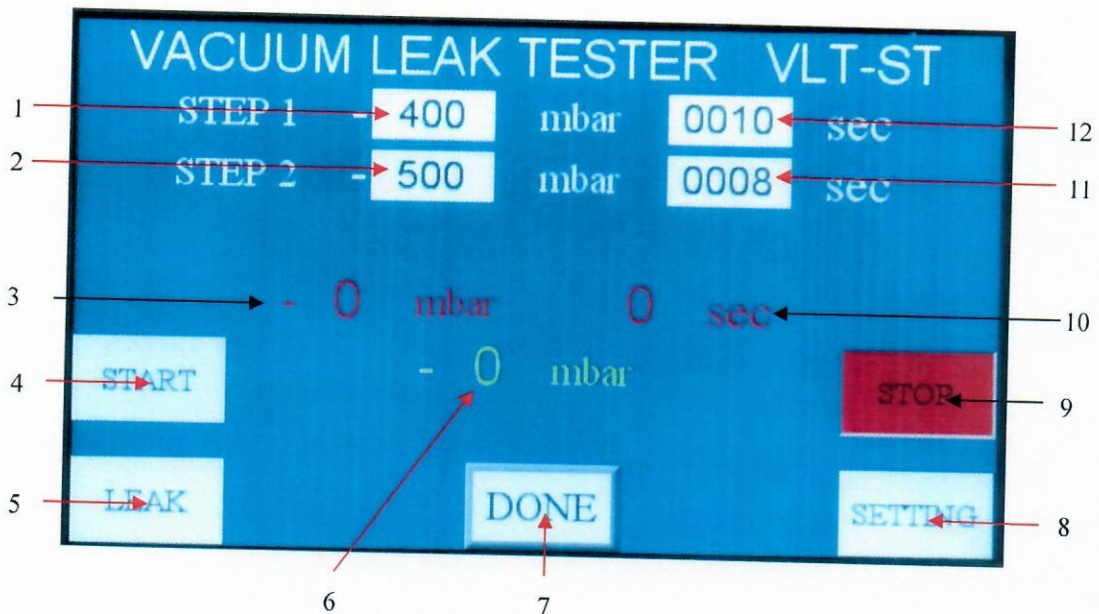
B. Operation of internal vacuum generator model:

- 1) Turn on the power switch, instrument will perform the self-inspection for once. Around 3 seconds later, the self-inspection is finished, and the instrument is ready for performing tests.
- 2) Place the samples into vacuum box and close the door.
- 3) Open the positive pressure source to enable the vacuum generator to generate the negative pressure.
- 4) Press the “START” button, instrument will start the vacuum process. As the process goes on, the negative pressure inside the box will build-up, until reached the predefined value, system will stop pressurization and activate the timer for pressure holding. Please note that during the vacuum process, the air inside the box can not reach the homogeneous status rapidly, so after the vacuum is stopped, the negative pressure inside the box will increase a little. For example, like the instant pressure reached -500mbar, after stopped the vacuum, it increase to -485mbar, then reaches the homogeneous status and become stable. It is because when the vacuum stopped, the air inside the box will flow to reach a homogeneous status, it is a normal phenomenon. The faster of the pumping speed when generating the vacuum, the more obvious for this phenomenon, so it was suggested that do not adjust to a very high vacuum speed.

- 5) After the holding time is finished, system will release the pressure automatically. Wait until the displaying pressure shows “0”, the test is finish. And please close the positive pressure source.

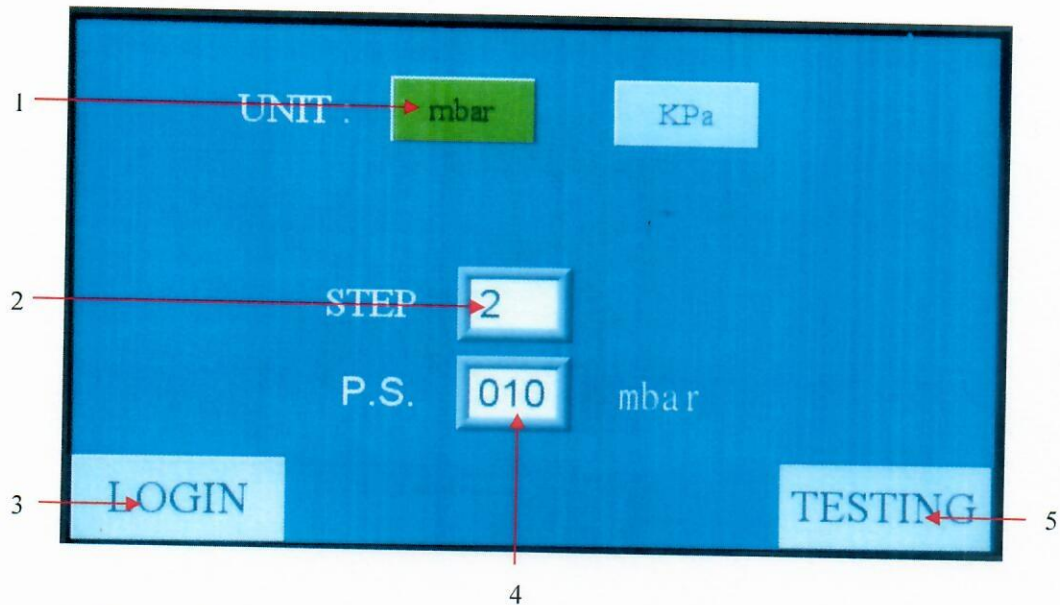
8. Instruction of interface

1) TESTING interface



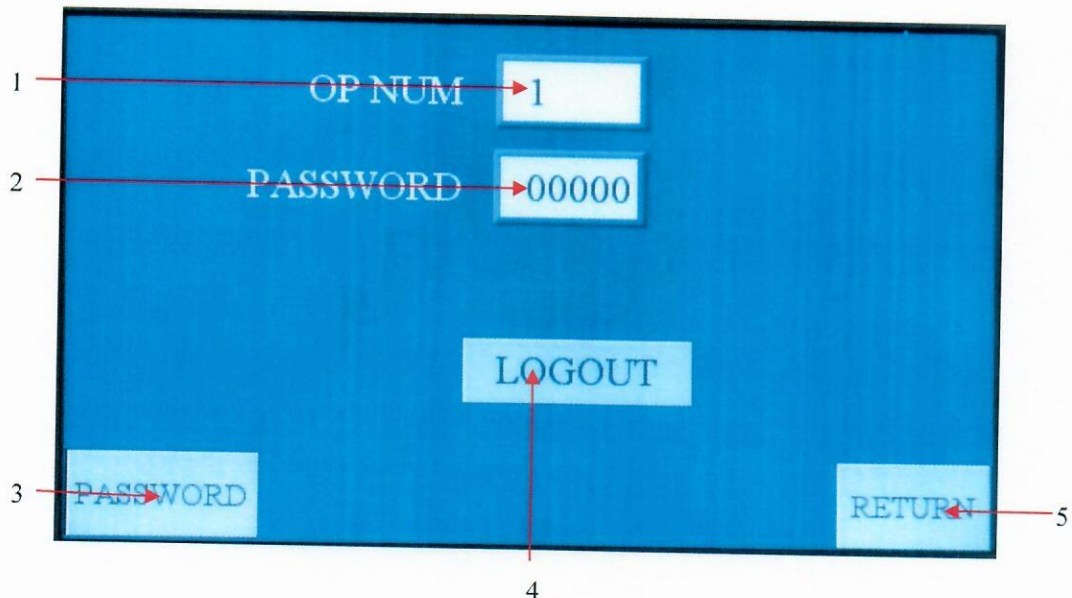
1. Target vacuum of step 1: Press the number to set the vacuum which is going to be reached of step 1.
2. Target vacuum of step 2: Press the number to set the vacuum which is going to be reached of step 2.
3. Peak value: Display the peak value of vacuum during a test.
4. START button: Press it to start a test.
5. LEAK button: Press it to stop the test and LEAK light will be on accordingly.
6. Real-time value: Display the real-time value during a test.
7. DONE light: Indicate the test has been done.
8. SETTING button: Press it to enter the setting interface.
9. STOP button: Press it to stop the test.
10. Holding time: Display the holding of each step.
11. Holding time of step 2: Press the number to set the time when is going to be held as soon as reaching the step 2 vacuum.
12. Holding time of step 1: Press the number to set the time when is going to be held as soon as reaching the step 1 vacuum.

2) **SETTING interface**



1. UNIT setting: Press the button to switch the demanded units
2. STEP setting: Press the number to set the number of the step.
3. LOGIN button: Press it to enter the operator setting interface.
4. Pressure supplement setting: Press the number to set the deviation which activates the pressure supplement. For example: as per the above, the pressure supplement setting is 10 mbar. And the step 1 vacuum is -200 mbar. When reaching -200 mbar, the tester starts to hold the vacuum for 10 seconds. During the holding time, if the vacuum becomes -190 mbar which is 10 mbar higher than -200 mbar, it will activate the tester to start vacuuming again to the target of -200 mbar.
5. TESTING button: Press it to return to testing interface.

3) **LOGIN interface**



1. Operator number: Press the number to change the operator. There are 5 operators for options (input the number from 1 to 5).
2. PASSWORD: Input the password of the corresponding operator. The passwords are 11111/22222/33333/44444/55555 for operators 1/2/3/4/5.
3. PASSWORD modification: When inputting the correct password of selected operator, the PASSWORD button will pop up. Press it to modify the password of the current operator.
4. LOGOUT button: Press it to logout the current operator.
5. RETURN button: Press it to return to the setting interface.

9. Attention

- 1) Calibration to the instrument is for the authorized personnel only!
- 2) The vacuum speed should not set too fast, the high vacuum speed may cause the inhomogeneous to the pressure inside the box, when reaching the predefined pressure value, it may cause a wide range pressure variation. If the vacuum speed is slow, the relative pressure will be more stable. There is a regulating valve inside the cabinet for controlling the air flow speed, by adjusting the knob it is able to adjust the vacuum speed. (please find the reference picture as below)

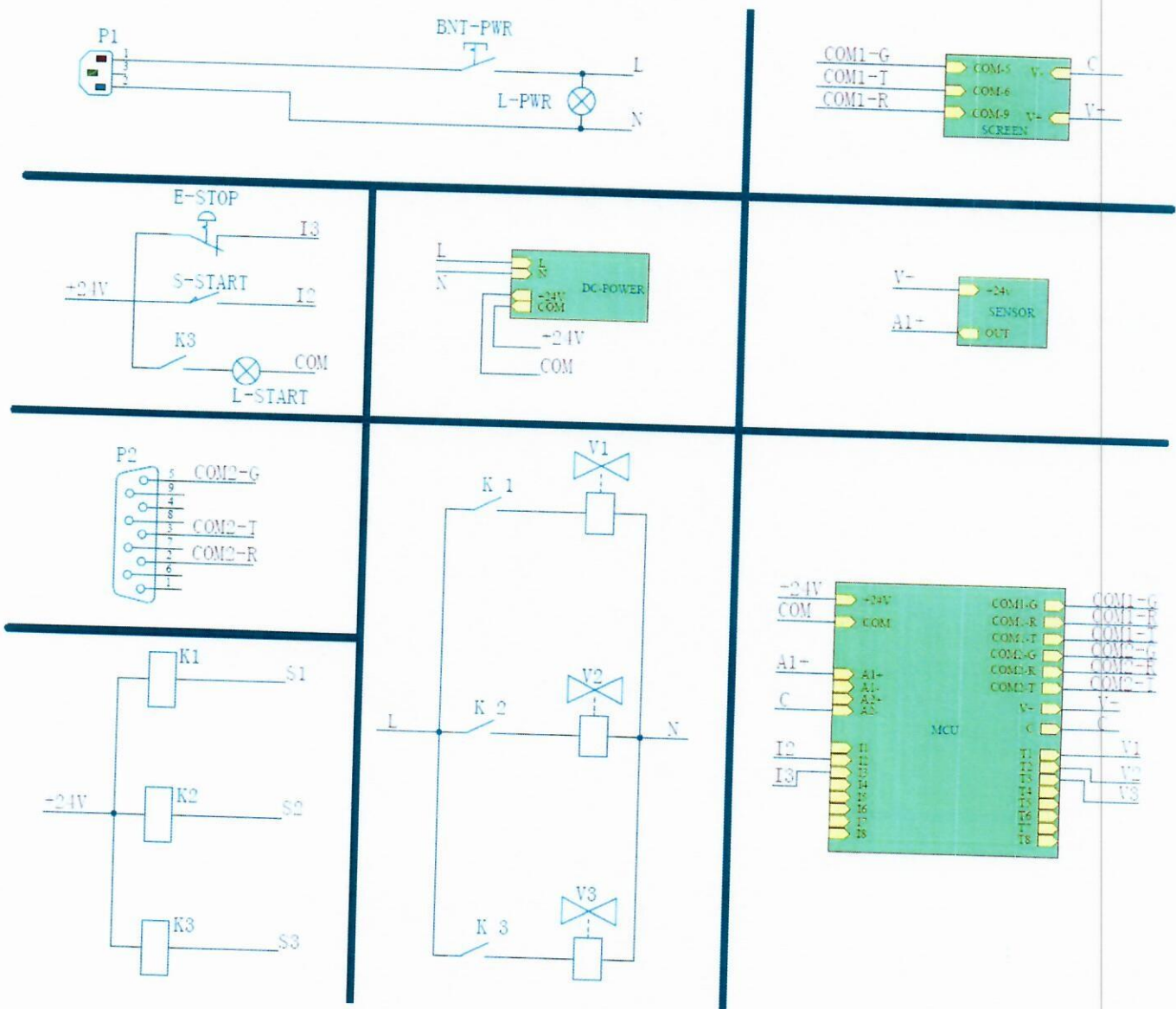


- 3) Please ensure the air tubes have been connected tightly. The instrument has been well tested for the internal air circuit tightness before delivery, users should also make sure the external air circuit tightness when operating.
- 4) Adjusting of the electric and pressure system is for the authorized personnel only
- 5) If the instrument will not be used for a long time, it should be electrified around 1 – 2 hours every half month and run the cycles for several times, so that to avoid the electrical components failure and corrosion to the mechanical part.

10. Troubleshooting

- 1) After the power is on, instrument still can not start. Please check whether the power supply is well connected, whether the voltage is AC 100~240v.
- 2) Air leakage. If the vacuum keeps away from the target and the deviation is over 50 mbar during holding time, please check whether the external and internal piping is loosen.

11. Electric circuit diagram



12. Packing list

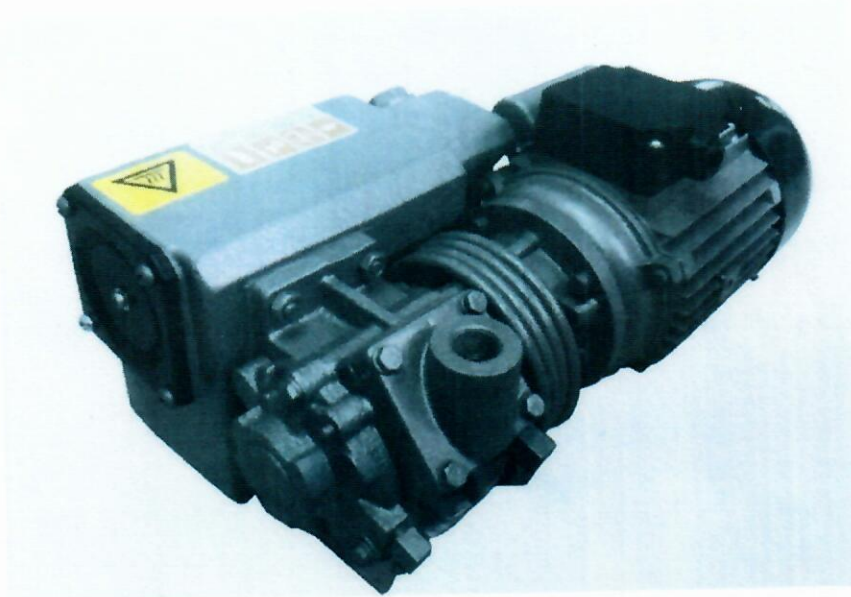
Part No.	Description	Qty.
VLT-ST-01	Mainframe with PMMA box	1 set
VLT-ST-02	12x8 air tube	1.5 meters
VLT-ST-03	4x2.5 air tube	1.5 meters
VLT-ST-04	8x5 air tube	2 meters
VLT-ST-05	Key of main frame	2 pcs
VLT-ST-06	Fuse (2 A)	1 pc
VLT-ST-07	Power Cable (Mainframe)	1 pc
	Using manual	1 pc

13. Optional accessories

Part No.	Description	Qty.	Remark
VLT-ST-08	Vacuum pump (optional for 16#, 20#, 25#)	1 set	optional
VLT-ST-09	Vacuum generator (optional for VA330, VA370, etc.)	1 pc	optional
VLT-ST-10	Vacuum box (custom made)	1 pc	optional

Vacuum Pump

Using Manual



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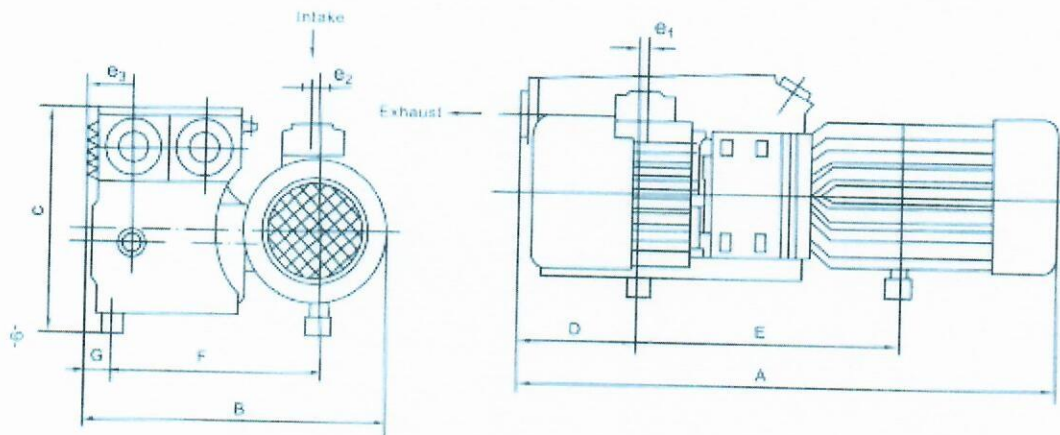
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1. Application

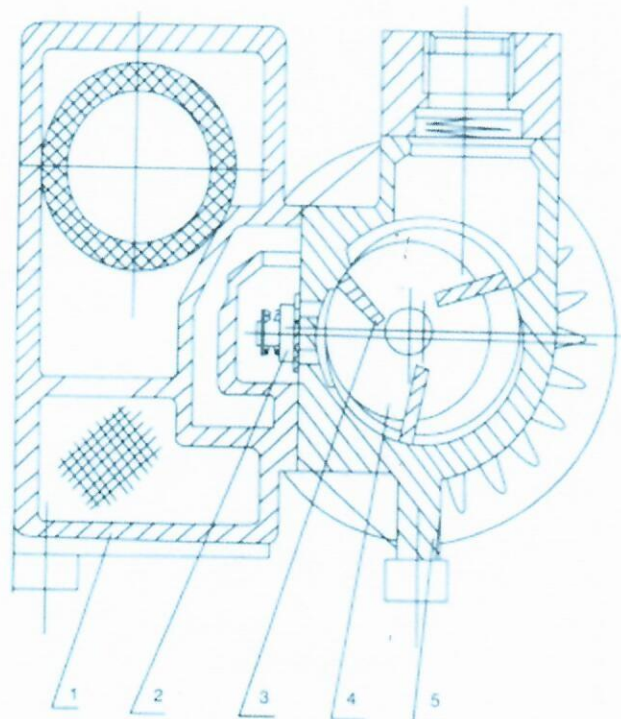
The vacuum pump is able to work at any inlet pressure. Therefore, it has a much wider range of application than convention rotary vane vacuum pumps. It is designed for use in the fields of coarse or fine vacuum range. It is not designed for pumping of corrosive, poisonous, aggressive or explosive gas. Other agents should not be transported

2. Structure and specifications



Pic 1 Outside view

Item	A	B	C	D	E	F	G
Dimension (mm)	412	235	210	70	230	130	25



Pic 2 Structure diagram

Subject	Specification
Intake speed (m ³ /h)	20
Limit vacuum (Pa)	2x10 ²
Motor Power (Kw)	0.75
Pump Speed(r/min)	2900
Intake port dimension(in)	1/2
KG	19
Power supply	220VAC 50/Hz

3. Operation

1) Installation

Vacuum pump does not need foundation and other fixing device since it can operate steadily. It is able to work on any horizontal surface. 3 quakeproof bottom studs are arranged on the bottom of the pump and the motor, each of studs has threaded hole for mounting onto a machine in order.

Please install the vacuum inlet filter on the main frame.



The environment temperature of the pump installation position should not higher than 40° C, and a clearance greater than 300mm should be kept from the pump to wall or other matters for good ventilation. Adequate space should also be arranged for oil window and filter for observing the oil level and replacing the filter.

The dust cover on the intake port of the pump should be removed before connecting to a conduit, and the sectional dimension of the connection pipeline should not be smaller than that of a connection port of the pump. The intake speed of the pump may be lowered if the intake pipe is too narrow, an overload pressure may be generated for a higher intake pressure if the exhaust pipeline is too narrow, and may thus shaft seal damage and leakage. An intake filter should be added at the pump port is the intake gas includes dust and particulate matters.

2) Connection

The rotation direction must be checked by the arrow on the hosing after completing the wiring of motor.

The rotation direction should be checked by the arrow on the hosing after completing the wiring of motor.

intake port should be opened during the direction checking, and turn on the motor instantaneously. The pump should be turned off immediately for wrong direction, and switch any two of three power terminal plugs. It should be noted that : if the pump operates continuously in the wrong direction, it may lead to damage of the pump and motor. The rotation direction must be checked again each time after changing the power connection location.

3) Pump starting

The vacuum pump always leaves the factory without oil inside. Therefore the pump must be charged with oil before start-up. The oil should be added up to 3/4 of height of the oil window through oil filler, and the oil level during operation of the pump should not lower than 1/4 of the height of the oil window. The pump may work properly immediately after starting. The oil level in the oil window may be lowered slightly. Oil should be added if the oil is insufficient, and the pump should be turned off during oil filling.

4) Pump turn-off

Disconnect the power to turn off the pump. A check valve is arranged within the intake port of the pump. When the pump is turned off, a pressure difference may be created under the combining action of the intake holes within the pump to close the intake port automatically, and thus may prevent the pump oil returning to a pumped system, and keep a vacuum within the pumped system.

4. Maintaining

1) Oil level

Check the oil level during pump operation, and the lowest oil level should be the 1/4 of the height of the oil window, and the highest oil level should be the 3/4 height of the oil window. Oil should be added in a timely manner for shortage, and the pump should be turn off during adding oil.

2) Oil cleanliness

The pump should be turned off and checked for pollution weekly. It may determined o replace the oil according to the color and viscosity of the oil. It should be noted that the oil replacement must be performed when the pump is hot. Therefore, the pump must have been operated for at least for 15 min before oil replacement, and then turn off the pump and drain the coil. If the coil is polluted severely, after drain the polluted oil, the pump should be turned on and add new oil slowly through the intake port, and operate for 10 min, and then drain the oil again. If the oil is still very dirty, repeat the above procedures until the drained oil is clean.

3) Intake port strainer

The metallic strainer plugging the intake port serves to prevent external particles entering the pump. The strainer should always be kept clean to avoid causing lowering of the intake speed of the pump.

4) Exhaust filter

The working life of the exhaust filter depends on the service condition of the pump. If the pump is used in a clean gas, it may be determined whether to replace the exhaust filter by the existence of smoke at the exhaust port. Generally, it should be replaced annually. The replacement circle should be shortened if the pump is used in a dirty gas.

5) Oil filter

The oil filter should be replaced each time after oil replacement for better filtering effect.

6) Storage

For long term out of service, the oil in the pump should be drained, and the pump should be cleaned thoroughly and add a desired amount of cleaning oil and enclose the intake port to prevent dust entering.

5. Troubleshooting

Problem	Cause	Remedies
The pump cannot start	1) The motor does not rotate	Check the motor for voltage, check wiring and winding of the motor for short circuit, check motor protection switch for open circuit(or un-reset).check power voltage or motor voltage for compliance
	2) The oil temperature is too low	Heat the pump oil higher than 12°C.
	3) The pump or motor is stuck	Turn the pump or motor respectively by hand to find the fault
The pump cannot achieve the specified limit vacuum	1) Inappropriate pump size	Check the size of pumped container or the exhaust air amount, and calculate the pump to be selected
	2) Inappropriate measure method or measure tube	Replace measure method or gauge tube
	3) Measure tube is blocked	Check and dredge the tube
	4) Poor vacuum sealing	Leakage test
	5) The oil is contaminated	Replace oil
	6) Oil seals leakage	Replace oil seals
	7) The intake strainer is blocked	Clean intake strainer
	8) Inadequate oil	Add by the specific oil amount
	9) The intake flapper is stuck	Check intake valve place movement
	10) The blade is stuck or damaged	Replace blade
	11) Wore rotor and blade	Replace oil tube and assemble again
	12) Oil tube leakage	Replace oil tube or assemble the oil tube again

Problem	Cause	Remedies
The vacuum within the system lowers when the pump is turned off	1) Poor sealing of vacuum system	Conduct leakage test to find the leakage
	2) The intake flapper is stuck	Assemble again to make it rotate smoothly
The current is too high during pump operation	1) The environment temperature is too low	Viscosity or heat the oil
	2) Wrong pump rotation direction	Correct the direction, it should rotate in the anticlockwise direction when viewed from the motor fan side
	3) Exhaust filter is block	Replace exhaust filter
	4) Too much oil in the pump	Check oil level, and drain the excess oil
The noise increases during pump operation	1) Coupler intermediate driven body wore	Replace intermediate driven body
	2) Blade wore	Replace blade
Oil smoke or oil spot at the exhaust port	1) The oil level is too high	Drain the redundant oil
	2) Inappropriate installation position of exhaust filter or the exhaust filter material is broken	Reinstall or replace exhaust filter
	3) Exhaust filter is blocked	Replace filter
The pump is stuck during operation	1) Long term operation without oil	Check oil level
	2) Blade broken	Replace blade
	3) Foreign matter in the pump	Dismantle to check and remove foreign matter