

Programmable Vacuum oven

User Manual



52411-30,-31,-32,-33,-34,-35

1 Warranty

Thank you for purchasing a Cole-Parmer instrument. In normal use conditions, the instrument is guaranteed for a period of 24 months started from the date of purchase.

The warranty is valid only if the product is original. It does not apply to any product or parts of it that have been damaged due to incorrect installation, improper connections, improper use, accident or abnormal conditions of operation.

The manufacturer declines all responsibility for damage caused by failure to follow instructions, lack of maintenance and any unauthorized modification

2 Contents of package

The instrument is delivered complete with the following parts:

- Vacuum Oven (main unit).
- 2 stainless steel wire shelves (3 stainless steel wire shelves with 52411-34/35)
- Power supply cable
- Connecting vacuuming pipes (interior diameter: Φ 14mm thickness of the wall:8 mm)
- Wrench
- Vacuum pump(optional)
- User manual

3 Installation requirements and safety tips

3.1 Installation requirements

The instrument should be installed in follow conditions:

1. Ambient temperature between 41°F (5°C) and 104 °F (40°C) , and relative humidity maximum of 85%.
2. Atmospheric pressure: 86 ~ 106 KPa.
3. The instrument should be placed on a stable level with no serious dust, direct sunlight, or corrosive gases indoor.
4. Leave enough space around the product (more than 50cm). Do not place the instrument below the fire alarm.
5. Power feed between 110V ~ 120V/60Hz or 220V/50HZ.
6. Respect enough spaces around the instrument, and the weight of the instrument depends on number of shelves. Make sure the shelves will not be bended or deformed. Samples must directly with the shelf.

3.2 Electrical Installation



THIS EQUIPMENT MUST BE EARTHED

Before connection please ensure that the line supply corresponds to that shown on the rating plate located on the back of the unit.

Power requirements

Model	Wattage	Model	Wattage	Model	Wattage
52411-30	700W	52411-32	1400W	52411-34	2000W
52411-31	700W	52411-33	1400W	52411-35	2000W

Cord Connected Models

The unit will be supplied with a mains lead fitted with either US, EU, UK or Indian plug. Should the lead not be suitable for connecting to the mains power supply, replace the plug with a suitable alternative.

THIS OPERATION SHOULD ONLY BE UNDERTAKEN BY A QUALIFIED ELECTRICIAN

NOTE: Refer to the equipment rating plate to ensure that the plug and fusing are suitable for the voltage and wattage stated

UK / EU mains cable wiring is colored as follows:
 Brown – Live
 Blue – Neutral
 Green/Yellow - Earth

US mains cable wiring is colored as follows:
 Black – Live
 White – Neutral
 Green – Earth

Should the mains lead require replacement, cable of 1 mm²/18 AWG, 1.5 mm²/14 AWG of harmonized code HO5VV-F should be selected. This is dependent upon the power rating of the unit, see Section 4.3.

Hard Wired Models

The unit is fitted with a suitable cable which should be directly connected to a suitable rated supply terminal. (See wire colors above).

IF IN DOUBT CONSULT A QUALIFIED ELECTRICIAN

3.3 Safety instructions

3.3.1 Danger !



(The improper use of this unit may cause property damage and/or personnel injury)

1. The Product must be safely grounded (make sure not to use the ZL or neutral line as the earth wire).
2. Before use, make sure that the power supply has the voltage in compliance with the products' requirements.
3. The product should be connected to a separate power supply outlet and both the plug and outlet are properly earthed.
4. It is not allowed to pull out and plug in the power plug without turning off the switch.
5. Unauthorized extending, cutting, or changing the product's power cable or line is prohibited.
6. Do not use the instrument for inflammable, explosive, evaporative and corrosive articles.
7. Unauthorized repair is not allowed, and authorized repair should be carried out by professionals.

3.3.2 Warning!

(Possible to cause losses to properties or injuries to personages)

1. Make sure to read and understand the Product's Operating Instructions thoroughly before any operation of the product.
2. 304 stainless steel is not acid-proof, so please note the anti-corrosion measures. And do not use acidic medium box!
3. Carefully pulling the power table when taking out the power plug.
4. In any of the following cases, the power cord must be removed:
 - Replacement of fuse.
 - ending for checking and repair in case of any breakdown with the product.
 - The product will not be used for a long period of time.
 - In movement.
5. After the product is turned on, the upper deviation alarm function must be adjusted or confirmed.

3.3.3 Caution

(Abnormal operation may influence the products lifespan)

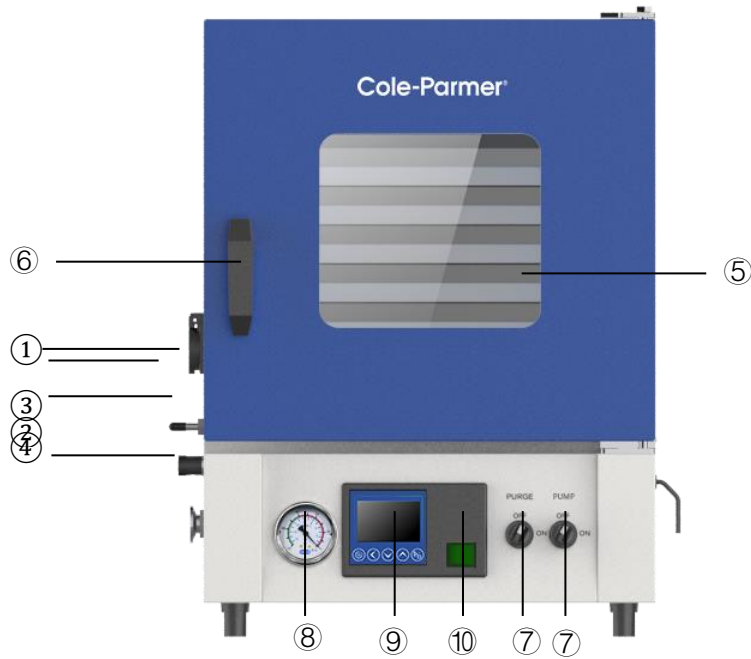
- The product should be placed on solid surface to keep it in horizontal.
- Respect 50cm minimum distance around the instrument to make sure it could be powered off easily under emergency conditions.
- Aggressively opening or closing the door may cause damage to the door, oven or injury to users.

Cole-Parmer®

52411Programvacuumoven_ver_1.1

4 Product introductions

4.1 Function introduction

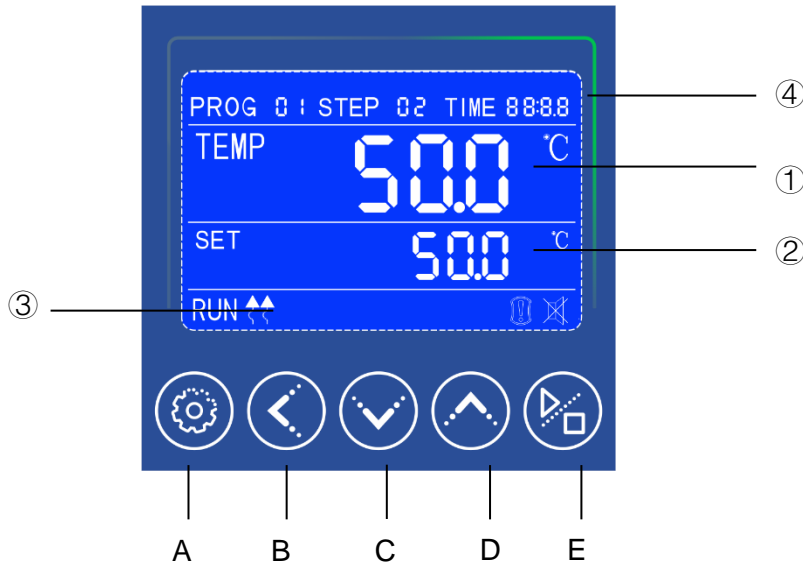


Products sketch map

- | | | |
|---------------------------------|----------------------|---------------------|
| ① vacuum pump electrical outlet | ② Air inlet | ③ Balance hole |
| ④ vacuum KF-25 Flange | ⑤ Observation window | ⑥ Door lock Handle |
| ⑦ pump switch and purge switch | | ⑧ Vacuum gauge |
| ⑨ Controller | | ⑩ LED lights switch |






4.2 Display and commands

4.2.1 Display introduction



- ① TEMP area (PV): Showing measured temperature.
- ② SET area (SV): Showing set temperature.
- ③ Heating lamp: It lights up when it has heat output.
- ④ TIME: Time display window, it will display running time or parameter value.

4.2.2 Command keys introduction

- A  Used for setting parameters, the parameter setting mode could be quit by pressing the set button for more than 3 seconds or more.
- B  Used for moving the digits of setting value, internal parameters and checking ambient temperature.
- C  Used for setting value, Modification of various parameters, or start / stop auto-tuning.
- D  Used for modifying set value, internal parameters or to check the remaining period.
- E  Press it for 3 seconds for operating or stopping the controller.

4.3 Specifications

Product name	Vacuum Oven		
Model	52411-30 52411-31	52411-32 52411-33	52411-34 52411-35
Chamber Volume	24L-	51L	91L
Temperature Range(°C)	Amb+10°C~200°C	Amb+10°C~200°C	Amb+10°C~200°C
Temperature Range (°F)	Amb+18°F ~392°F	Amb+18°F ~392°F	Amb+18°F ~392°F
Temperature Stability	±1°C/±1.8°F	±1°C/±1.8°F	±1°C/±1.8°F
Temperature Resolution	0.1°C/0.1°F	0.1°C/0.1°F	0.1°C/0.1°F
Max. degree of vacuum	133Pa	133Pa	133Pa
Fuse / Circuit breaker	120V-10A Circuit Breaker, 220V -10A Circuit Breaker.	120V-20A Circuit Breaker, 220V –10A Circuit Breaker.	120V-20A Circuit Breaker, 220V - 16A, Circuit Breaker.
Shelves	2	3	3
Work chamber material	stainless steel	stainless steel	stainless steel
Maximum of Shelves	5	8	10
Interior Dimension (W*H*D, mm)	300*275*300	415*345*370	450*450*450
Exterior Dimension (W*H*D, mm)	445*620*580	580*705*675	610*810*805
Interior Dimension (W*H*D, in)	11.81*10.83*11.81	16.34*13.58*14.57	17.72*17.72*17.72
Exterior Dimension (W*H*D, in)	17.52*24.4*22.83	22.83*27.75*26.57	24.02*31.89*31.69
Max. load	20Kg	20Kg	20Kg
N/W	60	95	145
Inert gas air inlet	has	has	has
Electrical Requirement	120V/60Hz 220V/50Hz	120V/60Hz 220V/50Hz	120V/60Hz 220V/50Hz
Power Consumption	700W	1400W	2000W
Cable Replacement	120V – 14AWG 220V – 1.5mm ² /14AWG	120V – 12AWG 220V – 1.5mm ² /14AWG	

4.4. Summary of structure and function

The vacuum drying oven (hereinafter referred to as the vacuum case) is bench structure. The vacuum case consists of four parts: case, inner chamber (working chamber), vacuum pumping system and temperature control system.

The case is made of quality thin steel sheet with bright color plastic surface. The inner chamber is generally made of galvanized steel sheet or 304 stainless steel sheet. The inner chamber is in a square of semi-circle corners, and there is super-fine mineral wool filled in between the inner and outer case as heat insulating material. The door window is made of bulletproof glass OBW (Observation Window) for convenient observing the samples drying process in the case. There are one piece of thick armored glass and slide bush inside the case, which are used for connecting the door, so the slide bush plus spring the armored glass and door seal can even the stress and the firmly press the door to the rubber O-ring upon closing, without any air leakage in vacuum.

The vacuum pumping system is composed of vacuum pump (optional part), vacuum meter, vacuum valve and balanced opening. According to user needs, the case can be equipped with dry filtering tank (filter) or be provided with air inlet as an option (through which other gas can be input into the working chamber). ***If the vacuum pump is selected at the user's discretion, the pumping rate of the vacuum pump must be $\geq 2L/s$***

The temperature controller is the main apparatus of the temperature control system, which is a double-row LED MC smart controller composed of single chip unit and peripheral circuit. The Pt100 platinum is used as temperature-sensing element and the PID regulating mode is used to control the heating system. The temperature control apparatus also has such functions as timing control, temperature-control error correction and deviation alarming protection.

The heaters of resistance wire substructure are used for the electric heating system, which are all mounted inside the shelf panels.

This instrument is advantageous for high temperature control accuracy, less overshooting, less fluctuation and temperature deviation protection.

5 Operation

5.1 Switch on

1. Connect the power according to the power outlet with a protective ground connection.
2. Turn on the instrument by pressing the ON/OFF Button and the screen will light up. The display shows the initialization sequence before the instrument is ready to use.

NOTE: Every time you turn the instrument beeps intermittently, the icon of visual alarm and the word “end” appear on the display, indicating that a heating cycle had been done before. Press any button to silence the audible signal and the icon appears.

5.2 Vacuum debugging

1) Models 52411-30,-31,-32,-33 use accessories vacuum pipe (inner diameter: ϕ 16mm thickness: 10 mm) connected with the vacuum drying oven exhaust pipe (outer diameter: ϕ 16mm) and a vacuum pump (Air inlet outer diameter: ϕ 16mm; Pumping rate \geq 2L/s) . (We recommend users to connect drying chamber in middle) .

2) Close the door and screw to tight the handle, and close the balance port (twisted the hole on the rubber stopper and the hole on tube core of balance port slant 180°) , first turn on the vacuum pump power switch, Then open the vacuum valve (Clockwise rotation of 90°) . The vacuum valve switch may tight when first time to use, can rotating it with force. When the value of vacuum table reach to -0.1Mpa (As Figure 2 red arrow Location) When users need close the vacuum pump, the vacuum valve must be turned off first, then close the vacuum pump to prevent the oil of vacuum pump flow back into the working chamber.



Note: The vacuum gauge indicator does not indicate the absolute value about degree of vacuum, only indicates the relative value about degree of vacuum. You can see specific unit conversion in this picture.

3) Vacuum Oven calibration: Operate the follow steps for calibrating the degree of vacuum.




- ① Turn on the vacuum incubator, then the power indicator light will turn on;
- ② The temperature controller will enter the self-check mode automatically after 5 seconds, and the PV screen will show the measured temperature value. The SV screen will display setting temperature value. At this time, at light will turn on, When $PV < SV$, the heat light will turn on, it means enter heating state.


5.3 Single work step setting

In the Programmable version the instrument can manage until 8 programs with 8 steps each one in which temperature, timer and fan speed (if present) are settable.

Moreover them, it's possible to set a simple work cycle at single work step, with temperature, timer and fan speed (if present). This is called "PROG 0" .

5.3.1 Time Settings


1 . After confirming the temperature, the last value of the set time (timer) will start to flash. Set the desired value (hh:mm) by pressing  or  keys. It's possible for a quick movement between the digits by using  button.

2 . Confirm the set value with another press of  button.


NOTE: the value "00:00" indicates the operating mode is "continuous", that means once you start operating cycle by the START / STOP button, the system will continue maintaining the set temperature until it is stopped manually.

3 . If you set the timer, such as one hour, the instrument will reach the set temperature and maintain it for one hour.


5.3.2 Temperature Setting


1 . When the instrument is switched on, press the  button one time, and the set temperature value will start to blink. Set the desired temperature value (in Celsius degrees) by pressing keys.

2 . The  button works for a quick movement between the digits.

3 . Confirm the set value with another press of  button.

5.3.3 Start / Stop Operation

1 . After setting the operating parameters, press  button for (about 4-5 seconds) to start the heating cycle/cooling process with defined time in hh:mm or continue the process for (00:00). When the word "END" disappears on the right corner of the screen, the message "RUN" will appear in the left bottom and the system will display issues like contemporary, timer, temperature measured inside the chamber.


2. At any time, you can always manually stop the cycle by pressing the  button for (4-5 seconds).




3. Once timer runs out or after manual stop, the instrument beeps intermittently, the icon of visual alarm and the word "end" appear on the display. Pressing any button will silence the audible signal and the icon appears.

NOTE: the acoustic signal will not end until it is stopped by the operator, but the heating cycle will be terminated so the samples inside the instrument will remain exposed to the internal temperature of the chamber.


5.4 Programs setting




5.4.1 Calling programs

When the instrument is switched on, in standby or during a work cycle both, pressing shortly one time the SET/PROG  button, the word "PROG" and the program number (see Picture 5) start to blink together.

Calling the desired program by the   keys. Confirm pressing shortly one time the SET/PROG  button. The selected program is ready to start..




5.4.2 Modify a program






To modify a program it's necessary keep pressed for few seconds the SET/PROG  button: the word "PROG" and the program number start to blink together and after some moment only the program number blinks.



Now it's possible to choose the desired program to be modified by the   keys and to confirm it by a short press of SET/PROG  button.

Then the instrument enters in the modification mode and the temperature value of the first step blinks together the word "PROG" to indicate that you are in programming phase.









STEP 1

Set by the   and SHIFT  keys the temperature value of the first step. Press shortly

SET/PROG  to confirm it and pass to the next value (timer), always of the first STEP. Set by the   and SHIFT  keys the desired timer value of the first step and confirm by a short press of SET/PROG .

If the instrument is a forced air model, the next parameter to be set is the fan speed, adjustable by the   keys in (H=High, M=Medium, L=Low), otherwise you pass to STEP 2.

STEP 2

Set by the   and SIFT  keys the temperature value of the second step. Press shortly SET/PROG  to confirm it and pass to the next value (timer), always of the second STEP. Set by the   and SHIFT  keys the desired timer value of the second step and confirm by a short press of SET/PROG .


NOTE: if you do not want to use all 8 STEP of the program you are editing, it is necessary to communicate to the instrument the end of the program. To do this, simply set in the next step after the last step you want to use the time equal to "00:00"

EXAMPLE


If the last work step you want to use is the fifth, it's sufficient set in the sixth step the timer equal to "00:00", imposing in this way to the instrument to stop it at the end of the fifth step.



NOTE: to modify the program 0, recall it as explained in paragraph 5.3 and proceed to the various parameters (temperature, timer) as shown in paragraph

5.4.3 Start/stop of a program

After setting the program, simply call one of them and press the START / STOP  with long pressure (4-5 seconds) to start the selected program.

The word "end" at the top right of the display disappears, the message RUN appears on bottom left part and display shows simultaneously: program number, step in progress, timer, measured temperature inside the chamber, set temperature and fan speed if present (see Picture 5).



At any time you can always manually stop the cycle by pressing the START / STOP  button with long pressure (4-5 seconds).



Once the set program is finished or after a manual stop, the instrument beeps intermittently, the icon of visual alarm  and the word “end” appear on the display. Pressing any button will silence the audible signal and the icon  appears.

NOTE: the acoustic signal will not end until it is stopped by the operator, but the heating cycle is terminated so for the samples inside the instrument will remain exposed to the internal temperature the chamber

6 Functions with password access

6.1 Access to menu with password

Simultaneously pressing the SET / PROG  and SHIFT  for few seconds, you can access some functions and parameters that are password protected.




To access these submenus and avoid mistakenly entering in the operating parameters setting, it is recommended to firstly press the SHIFT  key, keep it pressed, and then press the SET / PROG  for few seconds.

After have made this keys combination, on the right top part of display instead of word TIME, “Lk” (lock) appears close to “0000” (password). Below the passwords and access sequence to the various parameters/functions

<i>PASSWORD</i>	<i>FUNCTION/ PARAMETER</i>	<i>DESCRIPTION</i>
0000	Pn	Number of program to which to apply the dy & Cy functions
	Cy	Number of repetitions of the work cycle
	dy	Delay of heating cycle start
0003	tm	Safety temperature limiter for samples protection
	Po	Restart mode after absence of power supply
	AL	Temperature range for over temperature alarm
	Pb	Temperature offset on single point
	PK	Temperature offset on the entire ramp
	PA	Temperature offset of the room temperature probe




6.2 Number of program to which apply the Delay and Cycle functions

In the Programmable version it's necessary to define to which program (from 1 to 7) apply the functions of starting delayed (Delay) and repetition of cycle (Cycle).

To do that it's necessary enter in the first submenu with password access (0000) and modify the parameter Pn (program number) by   keys and confirm the selected program by a short press of SET/PROG  button.

6.3 Repetition of a program

The instrument allows the repeating from one to more times of the selected program. After have chosen the program to which apply the function by the parameter Pn it's possible set the Cy value

(Cy) = 1, 2, 3,...with   keys and SHIFT  and confirm it pressing shortly SET/PROG .



NOTE: it's also possible set the continuous repetition of a program, setting it in continuous "loop", with the parameter Cy=0.


6.4 Delay of the program start

It's possible to set a delay (hour and minutes) of the program start.

After have chosen the program to which apply the function by the parameter Pn it's possible set the

desired delay value (hh:mm) pressing   keys. It's possible a quick movement between the

digits using the SHIFT  button. Confirm the set value with another press of SET/PROG  button. The display comes back to the standby screen (see Picture 5). Pressing the START/STOP

 button with long pressure (4-5 seconds) the instrument starts the program but it doesn't immediately heat: the word "end" and the set delay time alternately blink on the top right part of display, counting the wait time until the real starting of the program.

7 Maintenance and Cautions

- ① After using each time, power off and open the balance opening, wait for the vacuity to return zero before opening the case door (if it cannot be opened, wait for 5 minutes before opening again; opening by force may damage the door handle)
- ② During the running process, follow the principles to open the pump: to run, turn on the vacuum pump before opening the vacuum valve; before stopping, close the vacuum valve before turning off the vacuum pump to prevent the vacuum pump oil from backflow into the chamber.
- ③ Be attention to avoid any scald when drying the articles.
- ④ In order to prevent the dried article from changing, upon drying, take care about the article with light weight and small volume (as small particles) or dust in the working chamber, which may enter through the air extraction port to damage the vacuum pump (or electromagnetic valve) in the process of vacuuming. The product is provided with the filtering net to the vacuuming port at the bottom inside the working chamber, which the user is requested to clean frequently to avoid affecting the effect of air extraction.
- ⑤ In case of stopping to sue for long, make sure to clean the product in and out, and pull out the power plug and cover the anti-dust cover.
- ⑥ If the environment for storage is highly humid, it is necessary to regularly (about 1 month) to power on for heating up and dehumidifying the case.
- ⑦ Make sure the technical requirement do not change before using the product..
- ⑧ The parameters in ENGINEER SETUP menu inside the controller shall be adjusted subject to the consent of the Service Center of the company or by the professionals.
- ⑨ The aged door seal strips will cause improper sealing of the case and should be replaced generally every six months.

8 Troubleshooting

Failure phenomena	Possible reasons	Treatment
No power	The output power socket had no power,	Check whether the lines are connected well and whether the socket is well.
	The power plug is not inserted well in the socket or the line is cut off.	Re-insert the plug or repair the line.
	The fuse is broken or there is no fuse.	Check whether there is any short circuit; replace the fuse (short circuit for apparatus power transformer, short circuit for heater, short circuit for grounding and others short circuit all can cause breaking of fuse.
PV display" □□□□"	Temperature sensor Pt100 is damaged	Check Pt100, replace it
	Temperature sensor line is not connected well.	Connect lines again.
The temperature does not increase The temperature does not increase	Test scope of the apparatus is not correct	Re-set again.
	The set value is too low	Set temperature $SV \geq RT + 18^{\circ}F$ RT is environment temperature
	The output circuit of the apparatus is falling off.	Connect the lines again.
	Temperature controller has no output signal or is damaged or the controllable silicon is damaged,	Replace it.
	The heater is damaged (short circuit, or open circuit)	Replace it.
The temperature is out of control , the deviation and between tested temperature and measured temperature The temperature is out of control or there is offset or overshoot because of the error between tested temperature and real temperature	Use timing function or the setting is not correct.	ST=0 or ST= (heating time +constant temperature time
	The output of temperature controller is out of control.	Replace SRC
	Pt sensor doesn't connect well.	Get rid of grounding resistance.
	Relevant parameters are not correctly set.	Re-set relevant parameters, such as P and so on.
There is big difference between tested temperature	No vacuum situation.	Vacuuming.
	The mercurial thermometer	Replace it.

and real temperature.	head is not on the shelf.	
	The apparatus or parameter is changing.	Re arrange Pb、Pk parameters.
The cabinet cannot be vacuumed.	The vacuum pump is not of the correct model and size.	The vacuuming speed should not be less than 2 L/S.
	Various connecting pipe is too loose.	Replace it.
	The vacuum meter is damaged.	Replace it.
	The door is not closed well.	Adjust the door pin distance.
	The door airproof rubber is aged and lack of elasticity.	Replace it.
	Air release valve and vacuum vale is not in the correct place.	Adjust them.
Air leakage (the vacuum degree decreases to 0.092 MPa from 0.1Mpa within 24 hours.	There is air leakage in various connect pipes.	Check and replace it.
	the distortion of heater "O" shaped airproof circle causes air leakage.	Screw tight the heater seat (in the back of the inner bladder.) or replace "O" shaped airproof circle.
	The air release valve is not in the right place.	Place it in the right place.

Common degree of vacuum unit conversion table:

Conversion value Item	Unit KPa	" Hg	mmHg	Atm	allowable deviation
1 (bar)	100	29.53	750	0.987	±2.5%

9 Contact

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