

DZF----6000 Series

DZF-

Vacuum Drying Oven

(Controlled by Microchips with Timing Function)

Instruction



Safety notes



The matters listed hereunder are vital, which you are advised to abide by.

Safety notes:

! Danger (Risks of constituting serious loss of property or injuries)

1. This product must be properly grounded and be kept away from electromagnetic interfering sources (the neutral wire must not be used as the grounding wire).
2. Before operating this device, please confirm whether the voltage of the power supply meets the requirements of the product.
3. An independent power socket should be used specifically for the product. Make sure the plug and socket are both properly grounded.
4. It is not allowed to pull out or plug on the power plug without switch off the power when the device is in operation.
5. It is not allowed to take the liberty to lengthen or shorten the power wire at the user's convenience.
6. It is prohibited to dry or to bake substances that are flammable, explosive or volatile or corrosive.
7. It is prohibited to fill in inert gases or other gases during the heating phase to prevent explosion. The users must take all responsibilities for any consequences if he decides to breach this rule.
8. When the device is operating above 80°C, the operator must not touch the door, viewing window and surrounding surfaces to

avoid scald.

9. It is prohibited to repair the device unless authorized. In case of our authorized repairing, professional repairpersons shall conduct the repairing.

! Precaution (Risks of constituting serious loss of property or injuries)

1. This Instruction must be completely read and understood before operation.
2. When pulling the power plug out, you must not pull the power wire directly.
3. The power plug must be pulled out in one or more of the following circumstances:
 - 3.1 When changing the fuse;
 - 3.2 When a fault occurs to the device and ready to be checked and repaired;
 - 3.3 When the device is to be left idle for a long time;
 - 3.4 When moving the device
4. After the device is powered on, the upper limit alarming function must be adjusted or confirmed.

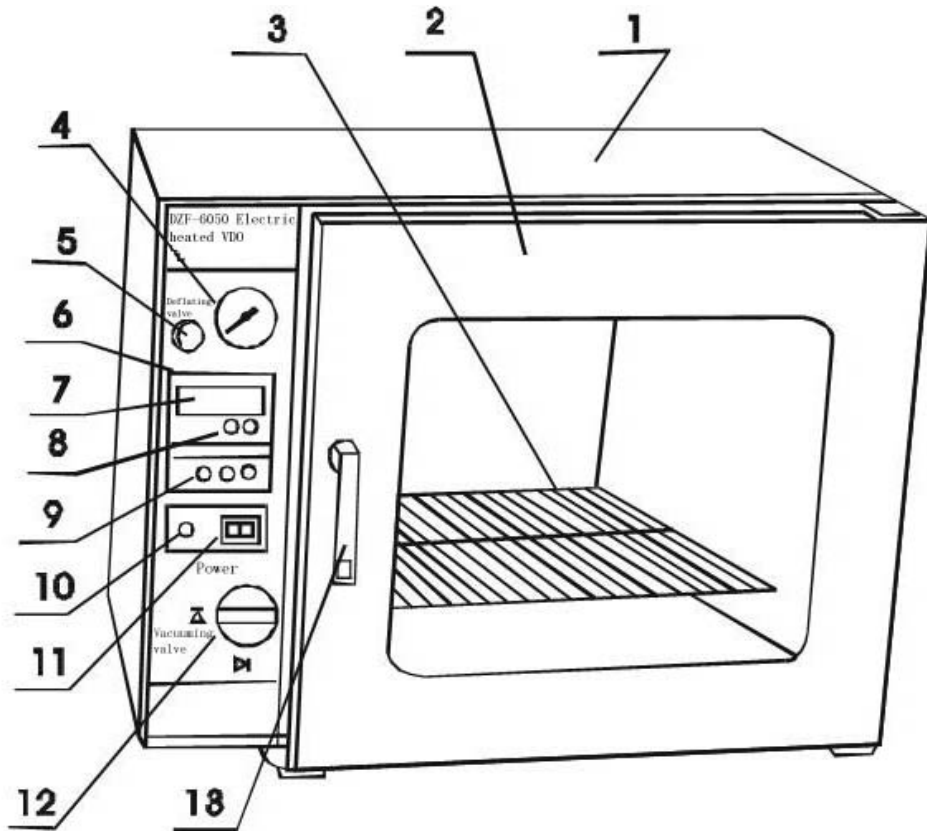
! Attention (Risks of undermining the service hours or causing failure of the device)

1. The device must be placed on a hard and sturdy surface and must be kept horizontal.
2. Certain clearances are required all around the device (clearance of 50 cm must be reserved up, down, left and right of the device).
3. The device is allowed to be operated under certain conditions. (See Article 1 in Chapter VI for details).
4. The operator must not open/shut the door of the device with violence. Otherwise, the door may fall off and cause injuries.

Contents

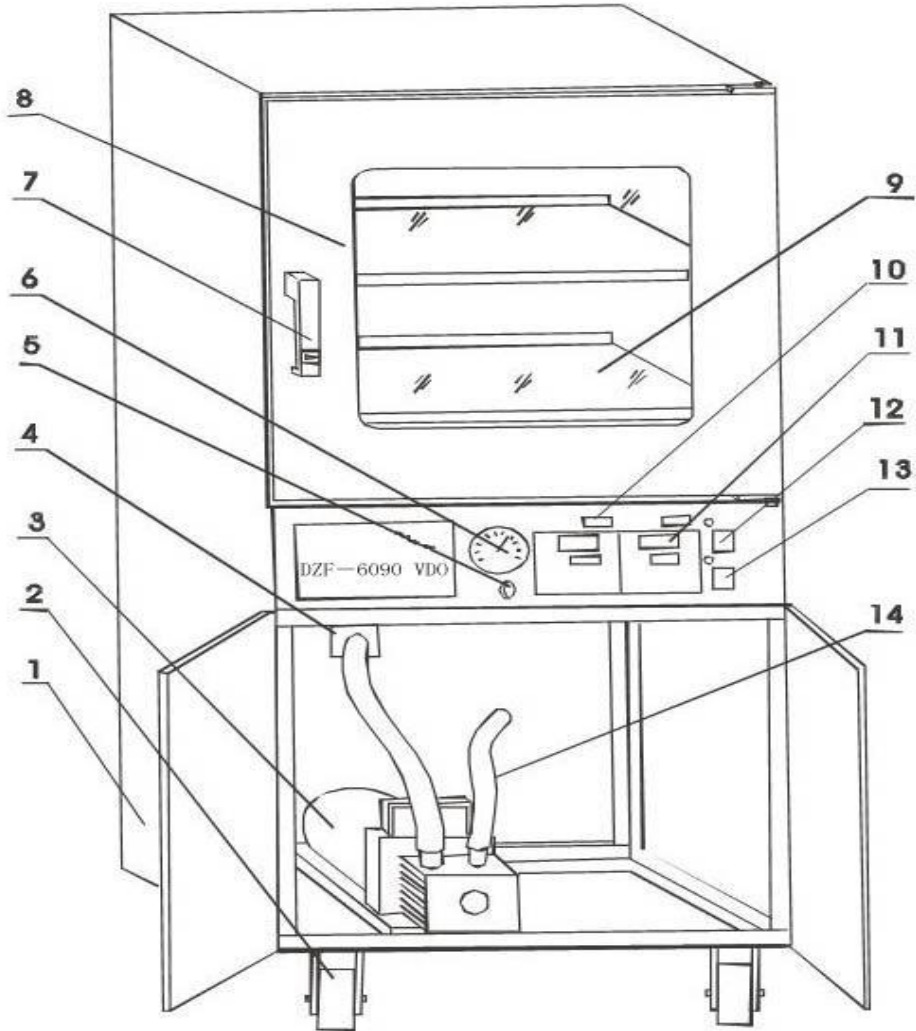
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I. Schematic Figure (A)



- | | | |
|---------------------------|--------------------|----------|
| 1. Housing | 2. Door | 3. Shelf |
| 4. Vacuum gauge | 5. Deflating valve | |
| 6. Temperature controller | 7. Display | |
| 8. Indicator | 9. Function key | |
| 10. Power indicator | 11. Power switch | |
| 12. Vacuuming valve | 13. Handle | |

Schematic Figure (B)



Note: DZF-6210 VDO incorporates 3 sets of controllers, heaters and sensors.

- | | | | |
|---|-----------------------------|----------------------|-------------------|
| 1. Housing | 2. Universal wheel | 3. Vacuuming pump | 4. Solenoid valve |
| 5. Deflating valve | 6. Vacuuming gauge | 7. Handle | 8. Door |
| 9. Shelf | 10. Temp. controller switch | 11. Temp. controller | |
| 12. Vacuuming pump switch | | 13. Power switch | |
| 14. Connecting pipe for vacuuming pump (inner dia. 16mm, wall thickness 10mm) | | | |

DZF-6210, 6090 VDO

II. Application scope:

This device is used for drying and heating processes under vacuum conditions at laboratories in enterprises, schools and scientific institutions. Heating and drying under vacuum condition shows the following advantages:

- a. Drying temperature can be lowered. (Low pressure and low temperature).
- b. Oxidation of some articles after heating can be avoided with no damages done by dust.
- c. Slaughter of biological cells caused by heated air can be avoided.

III. Technical specifications (See Table One)

IV. Structure and working principle

Except for Type 6090 and Type 6210 that are in vertical style, all other species in DZF-6000 vacuum drying ovens (or VDOs) are in desktop style and are composed of 4 parts, namely, the oven housing, chamber (working chamber), vacuuming system and temp-controlling system.

The housing is made of high-quality thin sheets with a plastic-jet surface, presenting a colorful appearance. The chamber is made of galvanized steel board or stainless steel boards. The corners of the chamber are shaped in semi-circular arcs. Super-fine glass wool is used as insulation between the housing and chamber. A double-layer-bulletproof-glass viewing window is equipped, which makes it easy to observe the items being dried in the oven. Mounted on the inside of the door is a piece of thick reinforced glass and there's a long cylindrical door buckle. Adjust the distance between the buckle and the thick enforced glass to let door press against the rubber sealing ring tightly so that no air leakage will occur when vacuuming the oven. (Attention: the rubber sealing ring is not oil resistant!)

The vacuuming system is composed of a vacuuming pump, vacuum gauge and vacuum valve (Type 6090 and 6210 VDOs are equipped with vacuuming pumps and vacuum valves are replaced by solenoid valves) and deflation valve. According to users' requirements, the drying (cleaning) filtering tank or air-inlet valves are optional. Vacuuming pumps for other VDO types are optional too. (The suction velocity of the vacuuming pump selected shall be above 2L/S).

The temp.-controlling system is composed of a sensor (Pt100 resistance), a temperature controller and a heater, etc. After the temperature controller receives resistance variation signals from the sensor (100 ohms at 0°C, 0.3ohms/°C), the PV screen displays the actual temperature measured in the chamber. When the output signal falls below the preset value, the bi-directional thyristor is activated, giving adequate power to the heater to generate heat. On the other hand, when the bi-directional thyristor transmits no electric power, the heater doesn't work. The temperature controller has a PID to adjust its output features. Its output power is adjustable and the temperature measuring errors can be corrected with timing function available. Besides, there are light alarm and automatic

cut-off when the preset safe temperature is exceeded.

Except Type 6020, 6050 adopts chamber heating, heaters of all other types are installed in the shelves. The temperature of shelves in Type 6090 and 6210 is controlled through 2 and 3 temperature controllers respectively.

Technical Indexes of DZF-6000 Series VDO (Table I)

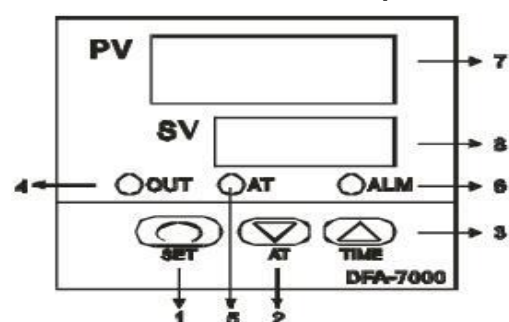
Types	6210	6090	6050	6020
Voltage of power	220V/50HZ		110V/60HZ	
Power consumed	1900W	1150W	1400W	1000 W
Temperature range	50~250℃			
Temperature fluctuation	±1℃			
Vacuum degree	<133Pa			
Shelves (Layers)	3	2	2	1
Dimension of chamber (mm)	560x600x640	450x450x450	415x370x345	300x300x275
Material of chamber	1Cr18Ni9Ti			

Notes:

All the technical data are obtained with a mercury thermometer $\pm 0.1^\circ\text{C}$ in accuracy under the environmental temperature of 25°C , relative humidity below 85% and vacuum degree above 0.1Mpa. The bead of the thermometers is in good contact with the surface of the shelf in the oven.

V. Operation of temperature controller:

Function of the controller's panel



1. Function key
2. Numerical increasing key---entering the self-adjusting mode
3. Numerical increasing key--- energizing time
4. Indicator for main control output
5. Indicator for self-adjusting
6. Indicator for upper limit alarm
7. Displaying window for measured values
8. Displaying window for preset values

Table of Parameter Setting:

Prompts	Names	Setting range	Description	Default value
SO	Preset value	Full range	User setting the controlling target	Self-set
SHP	Alarming	Full range	When the deviation of measured value exceeds the alarming value, the output is disconnected and the alarm lights up simultaneously.	2
TI	Setting the temperature maintaining time	9999 min	Set at 0, no timing (continuous output). When the time reaches the preset value, the gauge stops controlling and the indicator at the lower row goes out.	Self-set
P	Proportion band	0-9999	Adjustment of proportion effects. The greater the value P is, the lower the system gain is.	
I	Integrating time	0-9999	Constant for integrating effects. The greater the value I is, the weaker the integrating effect is.	
D	Differential time	0-9999	Constant for differential effects. The greater the value d is, the stronger the differential effect is. And the excessive adjustment can be overcome.	
T	Controlling cycle	99s	Relay 20S, SCR or SSR	2
SC1	Sensor for zero point tuning	-99.9~+99.9℃	Used to rectify the measuring errors caused by the thermocouple's compensation wiring of the sensor.	
SC2	Sensor for full range tuning	-99.9~+99.9℃	Used to rectify the measuring errors caused by the thermocouple's compensation wiring of the sensor.	
LOCK	Electronic lock	0-2	0-unlocked, 1-preset parameters locked, 2-all locked	0 or 1

● How to change the controlling specifications:

It is generally unnecessary to change the specifications because the products have undergone strict test before they are allowed to leave the factory. However, in case that the product is used under harsh conditions where the ambient temperature is not suitable for the operation of the device, or when the upper and lower limits of the temperature range is reached, due to the difference from the testing point ex-work, there might be disparity of the displayed temperature from the actual value. If the deviation exceeds the permissible technical scope, modification shall be done to restore the device to the

original condition. The procedure is as follows:

First refer to the following formulator to calculate the full range deviation value, then hold the function key “SET” for 5 seconds. The gauge will enter Menu B. Refer to the Table of Parameter Setting listed above. When the prompt icon “SC2” is shown, press “▲” or “▼” to modify the value to the actual value of temperature on the shelf. Afterwards, hold “SET” for another 5 seconds to return to the standard display mode.

Full range modification formulator: Modified Value=(Error×Range of the Gauge) /Preset Value

※ **Pay attention when testing:** mercury thermometers with accuracy 0.2~0.5 should be used for the testing of temperature on the shelf. The testing should be done under vacuum state. Otherwise, if the test is done in the presence of air, large temperature fluctuation will occur, causing difference between the displayed value and actual temperature value on the shelf.

- Self-adjusting function:

When the temperature control is not ideal, PID parameter can be modified through the self-adjusting function. The procedure is as follows. First set the temperature at 70~80℃ before pressing SET for confirmation. Hold ▼ for 5 seconds until the self-adjusting indicator AT (yellow) lights up. Release the key and the gauge enters PID self-adjusting mode. After 2 cycles of fluctuation, the self-adjusting process is completed and the AT indicator goes out. The new PID parameter is now automatically saved and the device works as per the new PID parameter. At this time, simply adjust the temperature to the desired working temperature.

- Manual setting of PID parameters: P is the proportion band, which can be increased if overshoot occurs. If it is necessary to increase the temperature rising rate, decrease the proportion band. I denotes the integrate time. If the fluctuation of temperature is excessively large, the integrate time shall be prolonged. If too small, then shorten the integrate time. D is the differential time, usually set at 1/5 to 1/4 of I.

VI. How to use:

1. Requirement on the environment:

- a) The temperature range is (5-40) °C
- b) The RH shall be less than 85%
- c) The power should be AC220V±10% 50HZ(AC110V±10% 60HZ)
- d) No violent vibration and corrosive gases exist in the surrounding

2. Debugging of vacuuming effect

- (1) Shut the door of the oven and tighten the handle. Shut the deflating valve (turn the hole on the rubble plug 90 degrees relative to the hole on the deflecting valve).

Open the vacuuming valve (turn it 90 degrees counterclockwise). The vacuuming valve might be very tight for the first use. Apply force when turn it.

- (2) Use the enclosed vacuum pipes (spe. $\Phi 13 \times 8 \text{mm}$) to connect the inlet of the VDO (outer dia.: $\Phi 10 \text{mm}$) and the vacuuming pump, Type 2XZ-2. Connection has already been done for Type 6090 and 6210. Connect the power for the vacuuming pump and deflation starts. When the reading on the gauge reaches -0.1MPa , shut the vacuuming valve before switch off the power supply to the pump so as to avoid the backflow. (No vacuuming pump exist for Type 6090 and 6210, therefore, the power for the vacuuming pump can be shut off directly). After this, the VDO is in vacuum state.

3. Adjustment of the vacuuming oven

After the debugging of vacuuming effect, the following operations can be done:

- (1) Switch on the power of the VDO. At this time, the indicator for power lights up (For Type 6090 and 6210, the temp. controller shall then be switched on). The temp. controller starts the self-diagnosis. PV display shows the measured temperature in the working chamber. The indicator OUT on the temp. controller should be on, indicating the gauge is in heating work mode.
- (2) Modification of the set temperature
 - a. Press the function key SET for the temp. controller once. When the PV display shows SO, operate “▲” or “▼” to modify the preset temperature (For Type 6090 and 6210, respectively 2 and 3 gauges should be modified and following processes are similar).
 - b. After the modification is done, press SET one more time. When the PV display shows TI (if timing function isn't in use, leave $\text{TI}=0$), press SET one more time to render the PV display to show the working temperature and SV display to show the new preset temperature. The gauge indicator OUT lights up. At this time, the gauge reenters the heating working mode.
- (3) When the temperature in the working chamber approaches the preset value, the indicator OUT blinks, indicating that the heating has entered PID adjusting phase. It is a normal phenomenon if the measured temperature exceeds the preset value or sometimes is lower than the preset value. When the measured temperature approaches or is equal to the preset value, after another 1-2h, the working chamber enters thermostatic status and the drying phase starts.

Notes: When the required temperature is low, two settings can be done. For example, when the required temperature is 70°C , the first setting can be 60°C . When the temperature overshoot and falls, set it one more time for 70°C . By so doing, the overshoot can be avoided and thermostatic status can start soonest.

- (4) When the drying is completed, shut the power. If the fast temperature reduction is required, open the deflating valve to make the vacuum degree 0. Wait for around 5 minutes before opening the door of the VDO. (Immediate opening of the door might fail)
4. If the substance in the working chamber is very humid, the moisture generated might affect the performance of the vacuuming pump. Therefore, it is advisable to add a drying filter between the VDO and pump. We are able to provide such a component connecting to drier of outer dia. 16 with dimension of $\Phi 120 \times 300$ mm (specified in contract). For Type 6090 and 6210, this device is already mounted.
5. If during the drying process, it is necessary to fill inert gases such as nitrogen, this requirement shall be specified in the contract and a gas-inlet valve must be equipped.

Attention:

1. If the vacuuming pump is normal and the technical requirements are all met, but vacuuming cannot be done, the power for the pump must be shut off immediately. Then use the supplied spanner to turn the door buckle one pitch inside to shorten it. Then restart the vacuuming process.

The VDO must not be used as an electric heating oven since when the working chamber isn't under vacuuming state, the measured temperature is largely difference from the actual temperature in the chamber.

VII. Notes:

1. The housing of the VDO must be properly grounded to insure safety in use.
2. The VDO shall be used in an environment where the relative humidity is below 85% with no ambient corrosive gases, strong vibration source or solenoid field.
3. The chamber of the VDO isn't explosion resistant or corrosion resistant. Objects that are explosive, flammable or liable to emit corrosive gases shouldn't be dried in the VDO.
4. The vacuuming pump can't work non-stop for a long time (for normalized work, maximum time is 30 minutes and for atmosphere exposure, 3 minutes maximum). As a result, when the vacuum level has reached the requirement, the vacuuming valve shall be first shut off before switching off the pump, which can be switched on again later when the vacuum level can't meet the requirements for the drying. By so doing, the service hour of the vacuuming pump can be prolonged.
5. If the objects to be dried are very humid, it is advised to equip a filtering device between the VDO and the vacuuming pump to prevent the damage to the pump caused by the moisture.

6.If the objects are to be changed into light and small granules after drying, a fencing screen shall be mounted on the suction nozzle inside the chamber to prevent dried granules from entering the vacuuming pump or the solenoid valve and cause damages to them.

7.After many service hours, the VDO might fail to vacuum. To solve this problem, change door sealing or adjust the buckle’s protruding length. When the VDO’s drying temperature is above 200°C, there might be air leakage (except for Type 6020, 6050). When this occurs, dismount the cover located at the back of the housing and use an inner hex spanner to loosen the seat of the heater and change the O-shaped sealing ring or fasten the seat of the heater.

8. If it is difficult to turn the rubber plug of the deflating valve, apply grease as lubricant, such as Vaseline.

9. Save for maintenance purpose, the cover on the left side must not be opened (except for Type 6090 and 6210) to avoid any damages to the electric controlling system.

10. The VDO shall from time to time be kept clean. It is strongly prohibited to clean the glass on the door with any chemical that reacts with it. A soft cotton cloth can be used for the cleaning.

11. If the VDO is to be kept idle for a long time, the exterior galvanized parts shall be cleaned before applied with neutral grease to prevent rusts. A plastic film anti-dust hood shall be added. The VDO shall be kept in a dry room to prevent the damages caused by moisture.

VIII. Trouble Shooting (Refer to Table II)

Troubles	Possible causes	Solution
No power supply after switching on	No power supply in the socket	Check and see if the circuit is disconnected and if the socket is OK
	Plug of the power wire isn’t connected properly or breakage with the wire	Plug it again or repair the power supplying wire
	Fuse not installed or melted	Check and see if there’s a short-circuit with the VDO, change the fuse (fuse can melt when there’s a short-circuit with the power transformer of the gauge, the heater, or with the ground).
PV display shows “HHHH”	Defective temperature sensor Pt100	Check Pt100 and change it if it is defective
	Loose wiring of the temperature sensor	Reconnecting the wire
	Improper measuring range of the gauge	Reset

Troubles	Possible causes	Solution
No temperature rise	Preset temperature too low	Set the temperature SV above 50°C
	Loose wiring of the output circuit of the gauge	Reconnecting the wire
	No output signal from the temperature controller or defective SCR.	Change the defective part
	Defective heater (open circuit or short circuit)	Change the defective part
	Timing function is enabled or wrong setting	When the timed period is due, reset the timer.
Temperature out of control or temperature overshoot occurs	Output of temperature controller out of control	Defective gauge or BTA, change it
	Unqualified application condition	SV≥50°C
	Poor contact of the Pt sensor	Removing contact resistance
	Incorrect data setting	Reset relevant data, such as P, I, D and T etc.
Excessive deviation of measured temperature from the actual value	No vacuum level	Vacuums by suctioning the air
	Bead of the thermometer isn't placed on the shelf	Place it on the shelf one more time
	Change on gauge or parameters	Modified P, I, D and T values
Vacuuming failure	Incorrect type or specification of the vacuuming pump	Select a pump which has suction rate above 2L/sec
	Loose connection pipes or joints, too thin inner diameter	Select connecting pipes with appropriate inner diameter. Joints shall be tightened.
	Defective vacuum gauge	Change it
	Door of VDO isn't closed tightly	Adjust the door buckle
	Rubber of the door sealing aged and lost elasticity	Change the sealing
	Incorrect position of the deflating valve and vacuuming valve	Adjust their positions
	Defective solenoid valve (Type 6090 and 6210)	Change the solenoid valve
Air leakage (vacuum level reduce to 0.08Mpa from 0.1Mpa within 24 hours)	Leakage on various pipes	Check and change
	O-shaped sealing ring of the heater distorts, resulting in loose pressing, not applicable for Type 6020, 6050 .	Use an inner hex. spanner to fasten the seat of the heater located at the back of the chamber or change the O-shaped sealing ring
	Incorrect position of the deflating valve	Correct the position
	Leaking vacuuming valve	Change it
	Solenoid valve cannot be properly shut and it leaks (applicable for Type 6090 and 6210)	Change it

IX. Figure of electric principle (Figure 1 and 2)

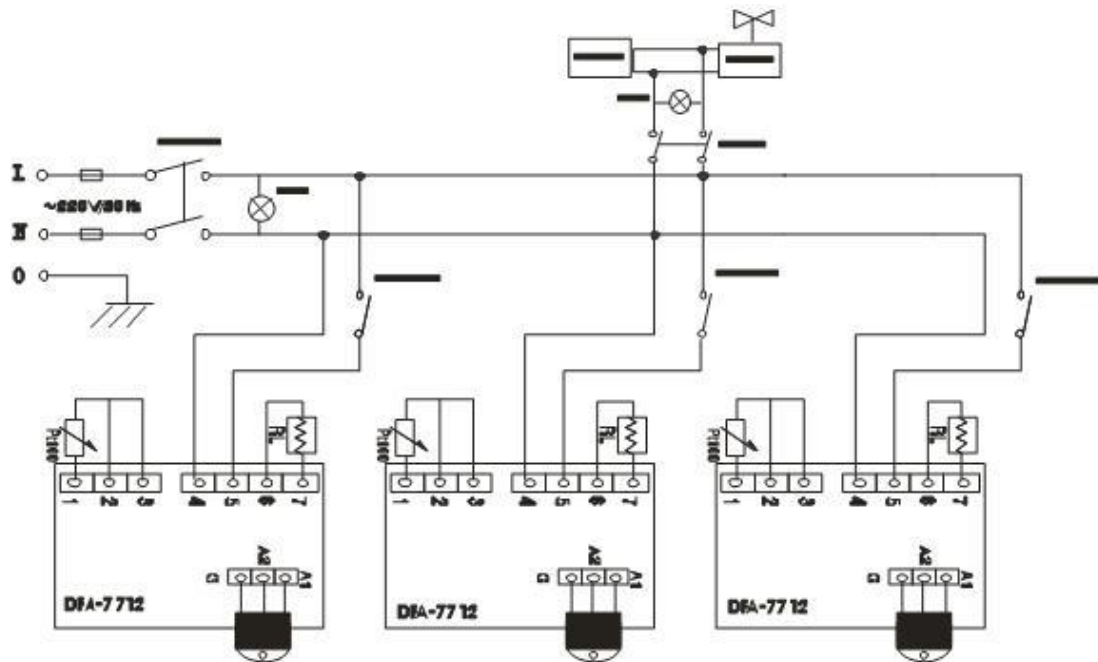


Figure 1. Wiring Figure for vertical style products such as Type 6090-6210

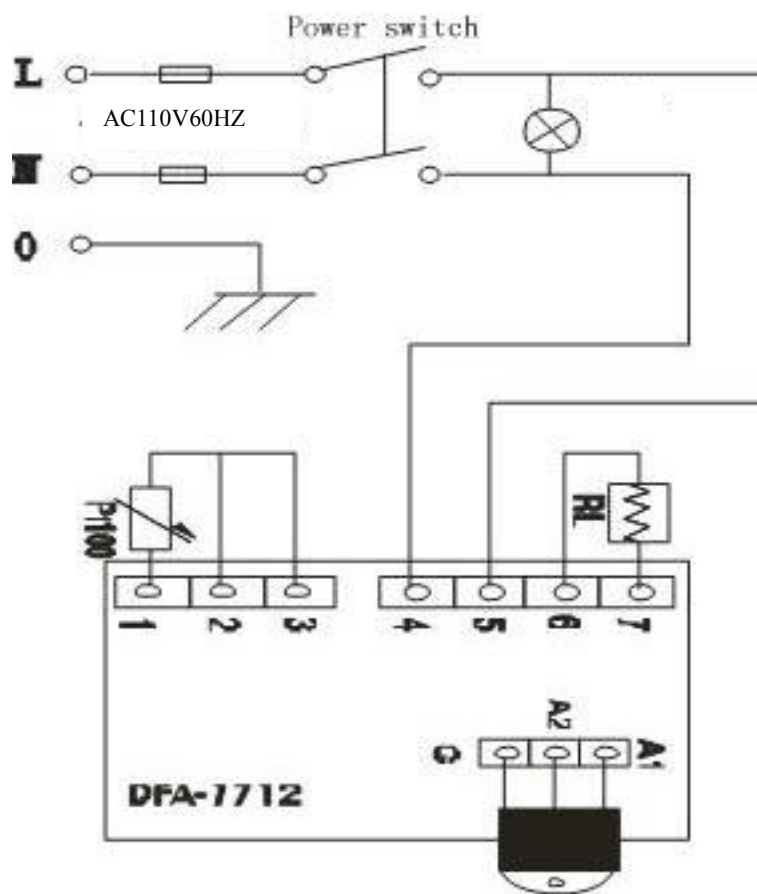


Figure 2. Wiring Figure for desktop style products such as Type 6020-6050

Packing list

S/N	Category	Name	Unit	Quantity	Remarks
1	Main part	VDO	Set	1	
2	Document	Instruction	Copy	1	
3	Document	Packing list	Copy	1	
4	Document	Certificate of Compliance	Copy	1	
5	Document	Letter of Guaranty	Copy	1	
6	Document	Warrant Card	Copy	1	
7	Spare part	Fuse	Unit	2	Available for Type 6090 and 6210
8	Accessory	Spanner	Unit	2	

Product Quality Compliance Certificate

Product name: Vacuum Drying Oven Type and specifications: DZF-

Code of product: _____

Inspection Date: _____

Inspector: _____

This product has passed the inspection and its various specifications are proven compliant with the criterion. Therefore, it's allowed to leave the factory.

This product is covered by a one-year warranty and repairing service is available throughout the service period of it. Should you have any questions, please don't hesitate to contact us.