DAIHAN Scientific
YOUR PARTNER *in* LABORATORY

Lab Scale Bench - top
Freeze Dryer

Certifications by - - -

- ☑ **ISO 9001 Certified.**
- ☑ **PL Insurance. (Product Liability Insurance)**
- ☑ **Patented(No. 10-0554098) Jog Shuttle Control System.**

User Manual

(Version 2.2.2)

written for
UniFreez™ FD-8, FD-16 models

"UniFreez™ FD-8" Bench-top Freeze Dryer, 8Lit.

Sales & Basic A/S :
By the Nearest Official Distributors.

Table of Contents

1. General

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1.1 Precautions Before Use

Thank you for purchasing the Bench-top Freeze Dryer.

This manual describes the performance and usage instructions of the product, and the precautions in the handling. Please carefully read this manual, before using the product. The following warnings should be strictly adhered to: (The following warning sign is marked in the part that is required user attention, so please safely use the product after being well-acquainted with the meaning.)

	**Warning** Failure to follow the instructions may result in injury. **Caution** Failure to follow the instructions may result in product failure. **Proximity Caution** Keep clear of the product during use.
	**Notification** Do not disassemble or modify the product or use it for purpose other than its intended function.
	**Caution: High Temperature** High-temperature heating, pose a risk of burns.
	**Danger of Explosion** If volatile, explosive chemicals are used, there is a danger of explosion.
	This symbol indicates Protective earth (ground).
	This symbol indicates power "OFF" on the power on/off switch.
I	This symbol indicates power "ON" on the power on/off switch.
N	This symbol indicates the connection point of the neutral conductor on the installed unit.
	This symbol indicates alternating current Voltage.

1. General

1.2 Product introduction

The fast and safe cooling technology was applied to this product and the compact design of product enables users the application of this product to diverse fields.
This product was developed and manufactured considering the best possible ease for use and safety, and has the following features.

1. The ergonomic design and the compact structure of the product will enable the suitable application of the product to be mounted on test beds or on mobile stands.
2. The CFC-Free environmentally friendly design was realized in the product.
3. The rigid urethane foam insulation was applied to maximize the adiabatic effect by preventing the leakage of cold or thermal bridging phenomena.
4. The power consumption was minimized by the design enabled the optimal control of the temperature inside the cold storage together with the extended life of the device that secured the safe and convenient tests.
5. The innovative refrigeration technology was applied that enabled the fast reach to -80°C in a short time.
6. Depending on the types of containers of samples, the manifold or the Dry Chamber can be conveniently replaced freely.
7. Both the manual and automatic process controls are enabled.
8. The Digital LCD screen with advanced specification is built in and it displays the status of this product.
9. Because multi-functional Jog-Dial knob is built-in, it is easy to manipulate.
10. This product provides the user's convenience and high-class design by applying UI with touch-button method.
11. Because the timer function that can be set up to 99 hours and 59 minutes (99:59) is built-in, it provides various experimental environments to user.
12. PL(Product Liability) Insurance

1. General

1.3 Product Configuration

- Selection Guide

Freeze Dryer Unit

Connection Set

Vacuum Pump

12 port Manifold

8 port Acrylic Chamber + Unheated shelve

Stand

Valves

straight Glass Tube (for Middle & Large Size Cap)	Bend Glass Tube (for Middle & Large Size Cap)	Bend Plastic Tube (for Small Size Cap)
		

Large Size Cap (of 500ml, 700ml, 1000ml Flask)			Middle Size Cap (of 200ml, 300ml Flask)		Small Size Cap (of 40ml, 80ml Flask)	
						
1000ml Flask	**700ml Flask**	**500ml Flask**	**300ml Flask**	**200ml Flask**	**80ml Flask**	**40ml Flask**
						

2. Installation

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2.1 Product Installation

* Caution of Installation

1. Please be careful when transporting the product because it is heavy.
2. Please do not lay the product on the floor or subject it to shock. It can cause damage inside the product.
3. Please install the product in a hard, flat, and stable place.
4. Please do not install the product in a place where it is exposed to direct sunlight, or in the dangerous places.
5. If there is no regular interval between this product and the wall of the installation space, its cooling power becomes weak, and the power will be wasted, so this product should be installed in a place at least 20 cm apart from the rear wall and 20 cm or more apart from the side walls, and there should be an interval of 100 cm or more from the ceiling.
6. To minimize the risk of short circuits, do not install the product (in the) places where it will be subjected to the inflow of moisture or organic solvents on the regulator part or inside of the body.
7. This product was manufactured for normal operation at a rated voltage, so please check the voltage status before installing the product.
8. The power plug of this product contains a ground. Please connect it to a grounded power outlet. If the ground is unstable, it may cause electric shock.
9. If there is no ground in the power outlet, it must be installed by an electrical company. Please do not connect the ground wire to water pipes, gas pipes (explosive, inflammable risk), or the ground of a telephone line or a lightning rod (lightning hazards).

* Installation Process

1. After receiving the unit and locating it in the specified location, remove the packaging.
2. Check the unit for any transport damages. If any such damages are found, please contact the deliverer of the product.
3. This Product is not equipped with casters. Units should be moved using a cart. Ensure that no damage is sustained by the units during transport. It is recommended that units are moved by at least 2 people and by lifting units up holding the indicated positions in the figure below.

4. Pay attention to the "Installation Precautions" section installed to allow easy access to a wall outlet.
5. By using the "Vacuum Connection Set", the mainframe and vacuum pump can be connected.

NW25 Connection Set	
	Centering (NW25 x 2ea)
	Clamp (NW25 x 2ea)
	Hose (NW25 2m)
	Pipe Adapter (NW25 x 2ea)
	Pipe Ties x 2ea

NW16 Connection Set	
	Centering (NW25 x 2ea, NW16 x 2ea)
	Clamp (NW25 x 2ea, NW16 x 2ea)
	Hose (NW16 2m)
	Pipe Adapter (NW16 x 2ea)
	Pipe Ties x 2ea
	Reducer x 2ea

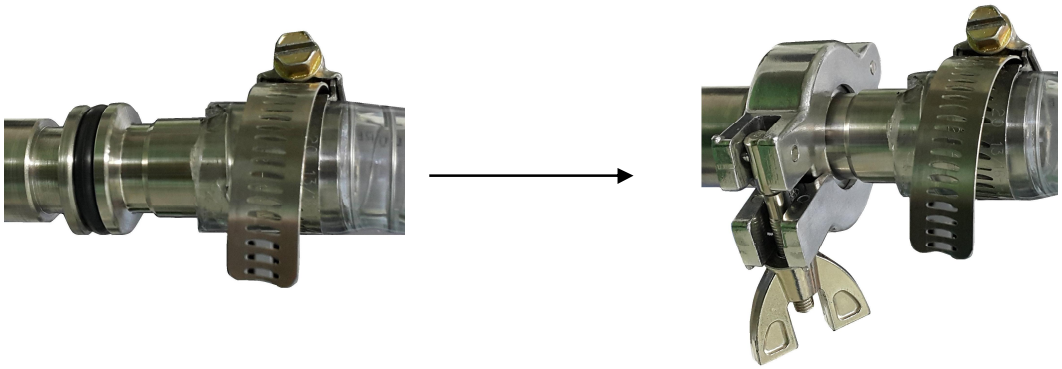
6. The vacuum pump should be installed on a place enables convenient attachment/detachment, check, or cleaning works; and the ambient temperature should be taken into account when the vacuum pump is fixed on each mounting position. Besides, please use the materials of vibration proof or rubber for the vibration free installation of the device.

7. Please install stoppers for unuse halls when you have unuse halls in manifold and acrylic dry chamber.

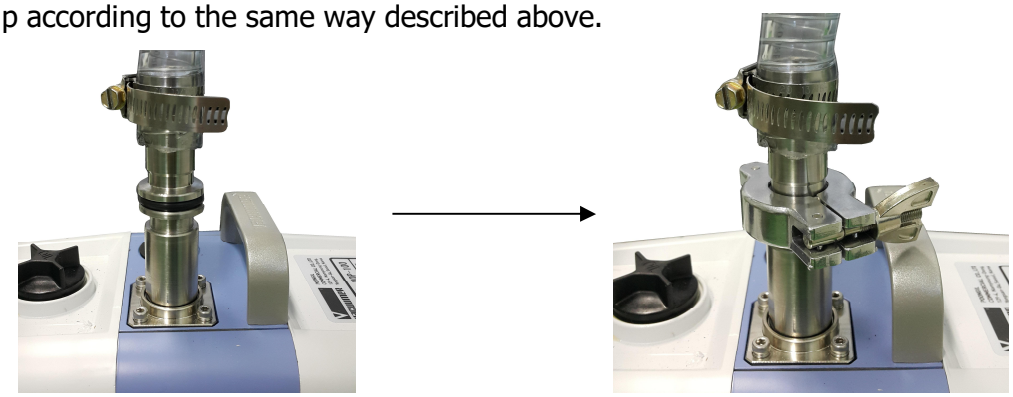
* Pump Connection Instructions

1. Find the connection pipe placed on the back of the mainframe and insert the 'Centering'.

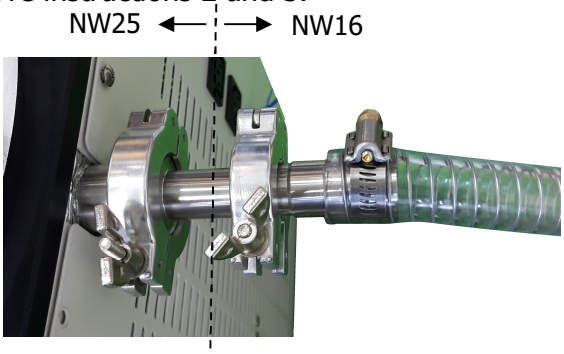
2. Engage the Adapter connected with the hose with the part of Centering and fix the two parts by using the Clamp.



3. The Adapter placed on one end of the hose should be connected to the suction pipe of the Pump according to the same way described above.



4. In the case using the NW16 Size Connection Set, connect the "Reducer" in the middle of the connection described in the above instructions 2 and 3.



5. Check the Oil Level Gauge and fill the Vacuum Pump Oil to the level right beneath the maximum limit before the use of vacuum pump.
6. The application of Oil Mist Trap is recommended to prevent the smoking phenomenon from the exhaust of the pump.
7. Please change the Pump Oil frequently for the stable operation of the pump.

*** Usage Instructions of Vacuum Handle Valve**

Slightly open

Closed

Fully open

1. As upper figure, please adjust "Vacuum Handle" in order to operate.

2. If handle located at 12 o'clock, small hall will open.

3. If handle located at 6 o'clock, valve open completely.

4. If handle located except of 6 and 12 o'clock, valve will close.

2. Installation

2.2 Product Specifications

Models / Spec.	UniFreez™ FD-8	UniFreez™ FD-16
Chamber & Max Condenser Capa.	Chamber : 8 Lit., Max Condenser : 10 Lit.	Chamber : 16 Lit., Max Condenser : 20 Lit.
Sublimation Rate (Lit/day)	3 Lit/day	6 Lit/day
Max. Temperature	Cold Trap : -90℃	
Set Temperature Range	-60℃ ~ -90℃	
Pressure Range	10 ~ 0.03 torr	
Compressor & Defrost-type	Compressor : 1/2 HP Defrost-type : Manual	Compressor : 3/4 HP Defrost-type : Manual
Controller	Digital Fuzzy Control with Jog-Dial(Turn & Push) & Touch Button	
Display	Digital LCD with Back-Light Function	
Material	Stainless-steel(SUS304)	
Dimension(mm) & Weight	Exterior : w460×d620×h520, Net Weight : 50kg	Exterior : w520×d680×h600, Net Weight : 60kg
	Packing Dimension : w560×d760×h700, Gross Weight : 62kg	Packing Dimension : W620×d820×h750, Gross Weight : 77kg
Electrical Reqts.	1 Phase, AC 120V, 60Hz or AC 230V, 50/60Hz	

□ **Product Liability (PL) Insurance Admission**

DAIHAN Scientific (Co., Ltd.) is a member of Product Liability Insurance (PL Insurance), so that its customers can trust our products, (believe and use its products,) by preparing against the accident which can be occurred during using the products by self-production.

[Contents] ……

Insurance Type: Product Liability Insurance

Publishing Office: Machinery Insurance Cooperative

Limit of Indemnity: 100 million won for Persons and Objects

Secured Area: Worldwide (excluding North America)

Emergency Contact: **DAIHAN Scientific (Co., Ltd.) (TEL:** 080-008-3000, FAX: 033-737-7575)

(TEL: 02-369-8516, FAX: 02-369-8521)

3. Product Usage

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3.1 Precautions for Use

	Please be familiar with the user manual before using this product, and operation should be performed only by qualified personnel
	Please never tilt or lay the product doing during transportation, which the function of mounted cooling-related devices can be degraded, and problems can be result. Install the product in a place where the floor is hard and flat. Failure to do so can cause accidents. by negligence.
	This product should be connected to a appropriate power source that it is generally used. Please use a lower power source than the regulation load permitted.
	If the installation place was moved, do not connect the power immediately. It should be connected at least 30 minutes after moving. If you use this product immediately after moving, it may cause failure of the critical parts relevant to the Product.

- **Warning**

	This product should be operated in a room with temperature maintain between 5°C and 40°C. Long-term use in an environment that exceeds the allowable range may cause a malfunction.
	Please do not damage or distress the power cord. (Please do not hurt on the power cord, or process it, or force bend it, or pull it, and tie it.) Also, if heavy objects are placed over the power cord, or the power cord is inserted in between objects, the power cord can be damaged and may cause fire or electric shock.
	Please do not directly spray water on the product or wash it with water, to avoid short circuits or electric shock.
	Please do not touch or manipulate the electrical parts such as the power plug with wet hands electric shock.
	Do not install the product where it can get damp or in a dusty environment. It may cause overheating or short circuit. – Pollution Degree 2
	Do not install the product in a location at an altitude of over 2,000 meters (6,562 feet).
	Please do not put goods or water containers on this product. If they fall down, people can be injured, or it may cause poor insulation and short circuit by water overflow.

	Do not use outdoors avoid overheating or electrical faults. The use in the place where the sun continuously shines and can get rained on it is prohibited. It may cause overheating or electrical fault of the product.
	Do not operate this product near a heater or an air-conditioner.
	Please do not use flammable or volatile products in the vicinity of the product to minimize the risk of firer. Please do not use the flammable spray such as lacquers and paint, or volatile, flammable chemicals and its similar product, in the proximity of the product. They may cause the ignition due to the spark of switch.
	Please avoid the disassembly or modification of this product by a non-authorized person to avoid serious electrical problems and to retain the warranty service of DAIHAN Scientific Co., Ltd.
	This device must be connected to an earthed power supply. Protective conductor terminal.
	Please regularly check whether dust or dirt are on the power plug and completely connect the plug. If the plug is covered with dust, or the connection is not complete, it will cause an electrical shock or fire.
	Please separate the power plug from the outlet for safety when the product is unused for long periods of time to avoid overheating or ignition due to dust.
	When disconnecting the power plug, it must be grasped by the hands and then pulled. Grasping only the cord and then disconnecting it may cause overheating or ignition because of internal lines being disconnected.
	If unusual noise or signs of abnormal behavior are found during use of this product, please immediately contact the supplier or DAIHAN Scientific (Co., Ltd.) after turning off the power supply and disconnecting the power line.
	When moving the product, please move it so that the power cord and the product are not damaged after disconnecting the power plug from the electrical outlet, in order to avoid the electrical shock or the ignition due to the damage to the cord.
	When moving the product, please move it so that the power cord and the product are not damaged after disconnecting the power plug from the electrical outlet. It may cause electrical shock or ignition due to damage to the cord.
	If removing the power plug, please wait 10 minutes or longer until plugging it in again. If you just plug it in again, it may cause a malfunction by placing a burden on the Product.

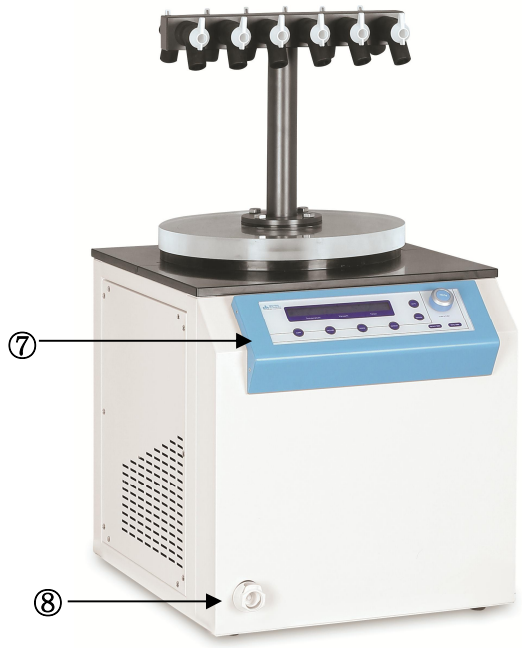
	The device should be set at a well ventilated place. Be sure the holes on the side or rear surface of the body are blocked by a wall or an object. And do not operate the device at a poor ventilated place or use closed. It may cause a fire or damage of the device as not to release heat or insufficient ventilation may result.
	Set the device a lightening place. When you set the device at a dark place, it may cause an unexpected accident by mistake in operation.
	Mains supply voltage fluctuations up to +/- 10% of the nominal voltage Pollution degree : 2 (Applicable RATED POLLUTION degree.)
	The maximum relative humidity is 80% at 31°C and 50% at 40°C.
	If a product was transported or stored in high humidity condition, please check packaging condition before use. If the carton or wooden box is waterlogged, please contact the deliverer or our technical service engineer. Do not operate the unit before checking with an engineer, otherwise it may cause an electrical shock or a fire.
	The Sound Level of the buzzer is maximum 60dB in 1 meter distance when an error is detected.
	Do not plug the exhaust hole of the pump and do not run the pump with an attachment disturbing the gas exhaustion otherwise the pump would burst. Or the inner pressure of the pump would increase and eventually cause damages to the main frame and oil level gauge of the pump or, the motor would be overloaded.
	Do not run the pump without filling the pump oil into the pump. Do not let the pump left in moisturized condition. Otherwise, the corrosion of the components of pump would be facilitated.
	Never insert a finger or other things into the opening of the pump motor. Never touch the rotating part of the motor in an operation mode. Otherwise an electrical shock, injuries, or fire would occur.
	Never touch the motor, pump, or pipeline during an operation or right after the operation of the pump to avoid the burning or scalding from the high heat on the mainframe of the pump.

※ All of the circuits, electrical or mechanical parts and configurations used in this product are the technical assets of DAIHAN Scientific (Co., Ltd.). Only technicians of the technical support team at DAIHAN Scientific (Co., Ltd.) or technicians approved through the education from DAIHAN Scientific should be allowed to repair this product.

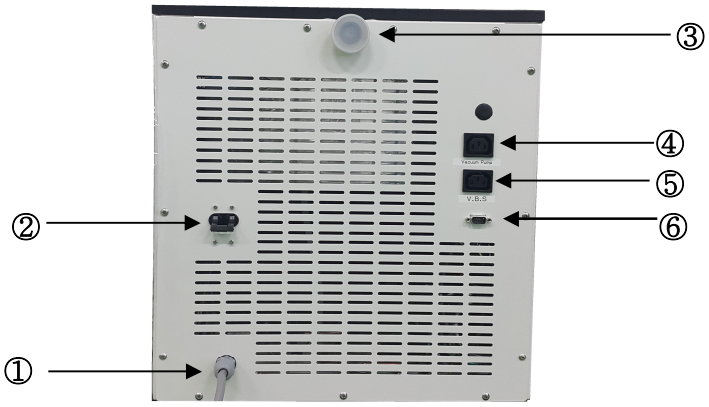
3. Product Usage

3.2 Names of Each Part

- **Outside**



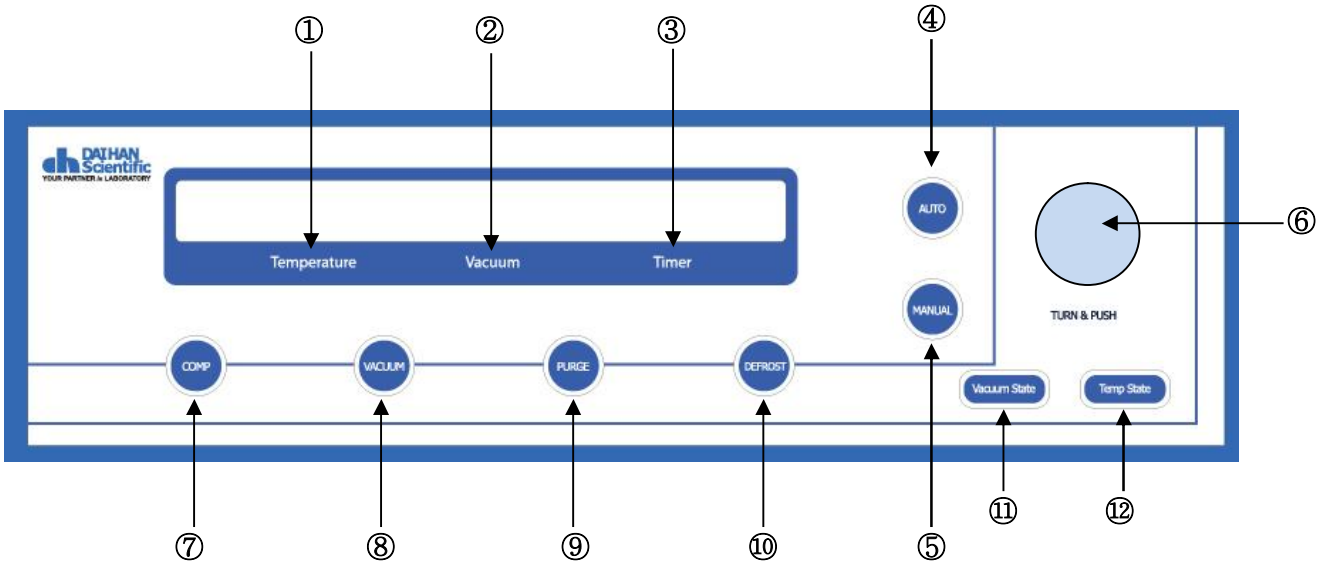
<Fig.3.2.1> "UniFreez™ FD-8"
Ultra Low Temperature Freezer



<Fig.3.2.2> Back side of Freeze Dryer

NO	Names	Description
①	Power Connection	Power Cord Apply
②	Power Switch	Power ON/OFF
③	Suction Pipe	Vacuum Pump Connection Part
④	Vacuum Pump Power Inlet	Power Input Part of Vacuum Pump
⑤	VBS Power Inlet	Power Input Part of VBS
⑥	RS232 Port	Cable Port for PC Connection
⑦	Controller	Product Operation Control & Check
⑧	Drain Valve	Drain after Defrosting

- **Controller**



<Fig.3.2.3> Controller for Freeze Dryer "UniFreez^{TM} FD-8"

NO	Names	Description
①	Display Temp Value	Indication of Set Temperature Level and Current Temperature Level
②	Display Vacuum Value	Indication of Set Vacuum Level and Current Vacuum Level
③	Timer Display	Set Timer & Indication of Remaining Time
④	Auto Run Button	Selection Button for Automatic Operation Mode
⑤	Manual Run Button	Selection Button for Manual Operation Mode
⑥	Jog Dial Knob	Set Value(s) & Start/Stop of Operation
⑦	Manual Comp ON/OFF Button	Manual Operation Button of Refrigerator
⑧	Manual Vacuum ON/OFF Button	Manual Operation Button of Vacuum Pump
⑨	Purge ON/OFF Button	Vacuum Release Button
⑩	Defrost ON/OFF Button	Defrosting Operation Button
⑪	Vacuum State LED	Vacuum Status Indication
⑫	Temp State LED	Temperature Status indication

<Table.3.2.2> Controller for Freeze Dryer

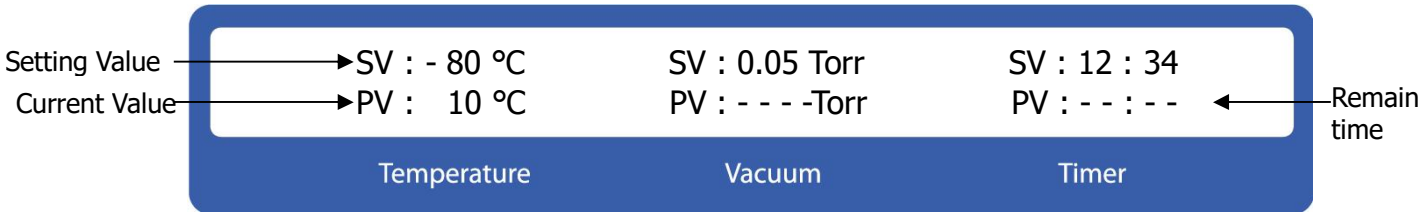
3. Product Usage

3.3 Usage Instructions

- Connect the power supply cord of vacuum pump to the backside of the product and then connect the power supply cord of the product to the plug on the wall.
- Users may select the "Auto Run Mode" or "Manual Run Mode" depending on the protocol of each test.

① Auto Run Mode

The 'Auto Run Mode' enables the automatic sequential operation of the Freezing-Drying process according to the set values inputted to the Timer.



1. With the touch of the "Auto" button, the LED of "Auto" button will be lighted and then the vacuum pump will be switched into the Auto Run Mode.

2. In the display window, users may see each set value of the "Temperature", "Vacuum", and "Timer".

A. Temperature Setting

1) The setting of temperature will be enabled by clicking the push button of the Jog-Dial Knob.
2) The set values of temperature will range -60°C ~ -90°C and the temperature can be set by the unit temperature of 1°C.
3) The Jog-Dial Knob can be rotated clockwise or counterclockwise to adjust set values.
4) Click the push button of Jog-Dial Knob once to move to the mode to set the vacuum level.

B. Vacuum Level Setting

1) The set values of vacuum level will range 9.99Torr ~ 0.03Torr and the vacuum level can be set by the unit of 0.01Torr.
2) The Jog-Dial Knob can be rotated clockwise or counterclockwise to adjust set values.
3) Click the push button of Jog-Dial Knob once to move to the mode to set the Timer.

C. Timer Setting

1) The set values of Timer will range 00:00 ~ 99:59 and the Timer can be set by the unit of 1 minute.
2) If the set value of Timer is set "00:00" then the vacuum pump will run continuously with set values of temperature and vacuum level.
3) The Jog-Dial Knob can be rotated clockwise or counterclockwise to adjust set values.
4) Click the push button of Jog-Dial Knob once to finish the input of all set values.

3. Push the Push Button of Jog-Dial Knob for 2 ~ 3 seconds to Start the Vacuum Pump.

A. Freezing Phase (Compressor Run)

1) With the Start of the Vacuum Pump, only the "Freezing" phase will be initiated.

SV : - 80 °C	SV : 0.05 Torr	SV : 12 : 34
PV : 10 °C	PV : - - - -Torr	PV : 12 : 34

⟷

SV : - 80 °C	SV : 0.05 Torr	SV : 12 : 34
Freezing . . .		

2) During the process of "Freezing" phase, the fixed set value will be displayed, and the displays of current value and "Freezing …" will appear alternately.

3) The LED of "Comp" button will be blinking until the current temperature reaches set temperature, and when the current temperature reaches the set value then it will be lighted continuously.

4) The LED of "Temp State" will be remaining red if current temperature is lower than set value; and when it reaches the set temperature then the vacuum pump will signal with buzzing sound and the light will turn into green.

5) Along with the current temperature reached the set value, the phase of "Drying" will then be initiated automatically by keeping the set temperature continuously.

B. Drying Phase (Vacuum Pump Run)

SV : - 80 °C	SV : 0.05 Torr	SV : 12 : 34
PV : - 80 °C	PV : 1.00 Torr	PV : 12 : 34

⟷

SV : - 80 °C	SV : 0.05 Torr	SV : 12 : 34
Drying . . .		

1) During the process of "Drying" phase, the fixed set value will be displayed, and the displays of current value and "Drying …" will appear alternately.

2) The current value of vacuum level starting from the value below 9.99 Torr will be displayed.

3) The LED of the "Vacuum" button will be blinking until the current vacuum level reaches set vacuum level, and when the current vacuum level reaches the set value then it will be

lighted continuously.

4) The LED of "Vacuum State" will be remaining red if current vacuum level is lower than set value; and when it reaches the set vacuum level then the vacuum pump will signal with buzzing sound and the light will turn into green.

5) Along with the current vacuum level reached the set value, the operation cycle set by the timer will then be initiated automatically by keeping the current temperature and vacuum level continuously.

C. Operation Cycle set by Timer

SV : - 80 °C SV : 0.05 Torr SV : 12 : 34 PV : - 80 °C PV : 0.05 Torr PV : 00 : 00	SV : - 80 °C SV : 0.05 Torr SV : 12 : 34 Timer Complete . . .

1) When the cycle of operation set by timer expires then the buzzing sound will be generated for 30 seconds; and the displays of current status and "Timer Complete" will appear alternately.

2) The current temperature and vacuum level will be remaining unchanged with the expiration of the timer.

4. The current temperature and vacuum level will be remaining unchanged with the expiration of the timer for the safety of specimens. Thus users may terminate the test by stopping the operation of vacuum pump. Push the pushbutton of the Jog-Dial Knob for 2~3 seconds to stop the operation of vacuum pump.

5. Functions like the "Purge" or "Defrost" can only be enabled after the complete stop of all operations. Users may then select an operation of desirable function.

A. Purge Operation

1) Push the "Purge" button then an LED of the button will be lighted and the internal vacuum release operation will be initiated.

SV : - 80 °C SV : 0.05 Torr SV : 12 : 34 Running Purge . . .

2) During the running of the operation of "Purge", the message of "Running Purge" will be displayed, and functions of the other buttons will be deactivated.

3) If the level of vacuum is released sufficiently then touch the "Purge" button again to stop the operation. Then the light of LED of the button will out and the operation of

internal vacuum release will be terminated. (The vacuum pump will be automatically stopped after the operation for maximum 5 minutes.)

B. Defrost Operation

1) Push the "Defrost" button then the defrost operation programmed for 3 minutes will be initiated.

SV : - 80 °C	SV : 0.05 Torr	SV : 12 : 34
Running Defrost . . .		

2) During the running of the operation of "Defrost", the message of "Running Defrost" will be displayed, and functions of the other buttons will be deactivated.

3) Along with the completion of the defrost operation, the set value and the current value will be displayed.

4) After the completion of Defrost operation, remove the water collected by the defrost operation through the Drain Valve.

5) If the vacuum pump is planned to be put into additional tests after completing the "Defrost" operation, then please avoid an execution of additional "Defrost" operation and keep the vacuum pump cool for the tests.

② Manual Run Mode

1. With the touch of the "Manual" button, the LED of "Manual" button will be lighted and then the vacuum pump will be switched into the Manual Run Mode.

2. In the display window, users may see each set value of the "Temperature" and "Vacuum".

3. In the 'Manual Run Mode', functions of the timer will be disabled.

A. Temperature Setting

1) The setting of temperature will be enabled by clicking the push button of the Jog-Dial Knob.

2) The set values of temperature will range -60°C ~ -90°C and the temperature can be set by

the unit temperature of 1°C.

3) The Jog-Dial Knob can be rotated clockwise or counterclockwise to adjust set values.
4) Click the push button of Jog-Dial Knob once to move to the mode to set the vacuum level.

B. Vacuum Level Setting

1) The set values of vacuum level will range 9.99Torr ~ 0.03Torr and the vacuum level can be set by the unit of 0.01Torr.
2) The Jog-Dial Knob can be rotated clockwise or counterclockwise to adjust set values.
3) Click the push button of Jog-Dial Knob once to finish the input of all set values.

4. Users may turn on or off the vacuum pump manually after setting the values of temperature and vacuum level.

A. Freezing Operation (Compressor Run)

1) Touch the "Comp" button to initiate the Freezing operation.

SV : - 80 °C	SV : 0.05 Torr	SV : 12 : 34
PV : 10 °C	PV : - - - -Torr	PV : 12 : 34

2) The LED of "Comp" button will be blinking until the current temperature reaches set temperature, and when the current temperature reaches the set value then it will be lighted continuously.

3) The LED of "Temp State" will be remaining red if current temperature is lower than set value; and when it reaches the set temperature then the vacuum pump will signal with buzzing sound and the light will turn into green.

4) If the current value reaches the set value then the current value reached the set value will be kept on continuously.

5) Touch the "Comp" button again to stop the Freezing operation.

B. Drying Operation (Vacuum Pump Run)

1) Touch the "Vacuum" button to initiate the Drying operation.

SV : - 80 °C	SV : 0.05 Torr	SV : 12 : 34
PV : - 80 °C	PV : 1.00 Torr	PV : 12 : 34

2) The current value of vacuum level starting from the value below 9.99 Torr will be displayed.

3) The LED of the "Vacuum" button will be blinking until the current vacuum level reaches

set vacuum level, and when the current vacuum level reaches the set value then it will be lighted continuously.

4) The LED of "Vacuum State" will be remaining red if current vacuum level is lower than set value; and when it reaches the set vacuum level then the vacuum pump will signal with buzzing sound and the light will turn into green.

5) If the current vacuum level reaches the set value then the current vacuum level reached the set value will be kept on continuously.

6) Touch the "Vacuum" button again to stop the Vacuum Pump

5. Functions like the "Purge" or "Defrost" can only be enabled after the complete stop of all operations. Users may then select an operation of desirable function.

A. Purge Operation

1) Push the "Purge" button then an LED of the button will be lighted and the internal vacuum release operation will be initiated.

SV : - 80 °C SV : 0.05 Torr SV : 12 : 34 Running Purge . . .

2) During the running of the operation of "Purge", the message of "Running Purge" will be displayed, and functions of the other buttons will be deactivated.

3) If the level of vacuum is released sufficiently then touch the "Purge" button again to stop the operation. Then the light of LED of the button will out and the operation of internal vacuum release will be terminated. (The vacuum pump will be automatically stopped after the operation for maximum 5 minutes.)

B. Defrost Operation

1) Push the "Defrost" button then the defrost operation programmed for 3 minutes will be initiated.

SV : - 80 °C SV : 0.05 Torr SV : 12 : 34 Running Defrost . . .

2) During the running of the operation of "Defrost", the message of "Running Defrost" will be displayed, and functions of the other buttons will be deactivated.

3) Along with the completion of the defrost operation, the set value and the current value will be displayed.

4) After the completion of Defrost operation, remove the water collected by the defrost operation through the Drain Valve.

5) If the vacuum pump is planned to be put into additional tests after completing the "Defrost" operation, then please avoid an execution of additional "Defrost" operation and keep the vacuum pump cool for the tests.

* ERROR Message

- If Error situations are occurred, the Error warning is displayed on the idle screen.

ERROR Message	Cause	Remedy
Error 1	Informs the time to be displayed the temperature of abnormal value due to the abnormality of Temperature Sensor.	Please contact the service center.
Error 2	The value informs if the temperature exceeds the range.	Please contact the service center.
Error 3	Informs the time to be displayed the vacuum of abnormal value due to the abnormality of Vacuum Sensor.	Please contact the service center.

<Table 3.3.1 > ERROR Message Table

4. Products Management

4.1 Accessories

4

Image	Ordering Number	Information
	DH.Frd01034	T-type Manifold, 12-port, for Connecting 3/4〃 Vacuum Handle Valve, with Silicon Stopper
	DH.Frd02010	Acrylic Dry Chamber, 8-port, for Connecting 3/4〃 Vacuum Handle Valve, with Silicon Stopper
	DH.Frd02020	3-stage Shelf, Stainless-steel(STS), for Acrylic Dry Chamber
	DH.Frd03010	3/4〃 Vacuum Handle Valve, Neoprene Rubber & PP, for Connecting Flask
	DH.GL28091	3/4〃 Glass Tube Adapter, Φ19/1.8t×L80mm for Connecting Middle & Large-size Flask Top
	DH.GL28092	3/4〃 Glass Bend-type Tube Adapter, Φ19/1.8t×L80mm, for Connecting Middle & Large-size Flask Top
	DH.Frd04010	3/4〃 PP Tube Adapter, Φ19/1.8t×L80mm, for Connecting Small-size Flask Top
	DH.Frd05010	Flask Top, Silicone, 3/4〃 Small-size Flask Top, for 40-/80-ml Flask
	DH.Frd05020	Flask Top, Silicone, 3/4〃 Middle-size Flask Top, for 200-/300-ml Flask
	DH.Frd05030	Flask Top, Silicone, 3/4〃 Large-size Flask Top, 00000 for 500-/700-/1000-ml Flask
	DH.GL12041	Glass Flask, DURAN Glass α3.3, 40ml, Φ40/2.3t×h80mm
	DH.GL12042	Glass Flask, DURAN Glass α3.3, 80ml, Φ40/2.3t×h120mm
	DH.GL12043	Glass Flask, DURAN Glass α3.3, 200ml, Φ65/2.2t×h100mm
	DH.GL12044	Glass Flask, DURAN Glass α3.3, 300ml, Φ65/2.2t×h140mm
	DH.GL12045	Glass Flask, DURAN Glass α3.3, 500ml, Φ90/2.5t×h125mm
	DH.GL12046	Glass Flask, DURAN Glass α3.3, 700ml, Φ90/2.5t×h165mm
	DH.GL12047	Glass Flask, DURAN Glass α3.3, 1000ml, Φ90/2.5t×h225mm
	V3.VOP100	Vacuum Pump, "VOP-100", 100/120Lit./min, 50/60Hz, 220V
	V3.VOP150	Vacuum Pump,"VOP-150", 150/180Lit./min, 50/60Hz, 220V
	DH.Frd06025	NW25 Vacuum Pump Connection-set, Tube / O-ring / Clamp
	DH.Frd06016	NW16 Vacuum Pump Connection-set, Tube / O-ring / Clamp / Adapter
	DH.Ca1002	2-stage Table Cart for Freeze Dryer & Vacuum Pump, with Stop-on Caster, w504×d604×h780m

4. Products Management Method

4.2 Maintenance and Management

Freeze Dryer was manufactured with the consideration of various situations that may occur during the operation. However, for long-term use with stable performance, please observe the following precautions:

1. This product should be operated in a room with as little moisture as possible, and the room temperature should be maintained between 5°C and 40°C.
2. If this product is not used for long periods of time, it should be stored by packaging after disconnecting the plug and drying it.
3. If parts should be replaced due to failure during use, only genuine parts provided by DAIHAN Scientific should be used.
4. The condenser and the refrigerator are very hot. Please be careful not to touch them when managing them.
5. Failures due to use beyond normal limits cannot be maintained or repaired.

CLEANING

1. Before cleaning the unit, disconnect the power cord from the wall socket. Otherwise, it may cause an electric shock or fire.
2. To clean the unit, a neutral detergent and soft cloth is recommended. Do not use coarse cloth, strong chemicals or organic solutions.
3. Do not use water, Benzene, Thinner or any alcohol for cleaning the product. It may cause discoloration, damage, an electric shock or fire.
4. If you expect damage by a chemical during cleaning, call technical support team.
5. Do not pour water directly into the unit. It may cause an electric shock or fire.
6. During cleaning of the chamber, be careful cleaning the corners to avoid injury.

- Cleaning Method of the Exterior

- Clean the exterior using a neutral detergent and soft cloth.
- Do not clean the display or Jog-Dial Knob aggressively as they may be damaged.
- Do not clean the unit aggressively. Otherwise, the coating or painting could be damaged.

- Cleaning Method of the Parts

- Clean the parts using a neutral detergent and soft cloth.
- Do not clean the unit aggressively. Otherwise, the coating or painting could be damaged.

* Regular Change of Pump Oil

- The property of pump oil will be changing in accordance with the operation of the vacuum pump. Thus users should check the level and quality of pump oil regularly by inserting the Oil Level Gauge into the reservoir to determine the degree of contamination or viscosity etc.

- Regular change of pump oil will prevent the vacuum pump from losing its performance and will extend the life of the vacuum pump.

- Continued operation with the pump oil containing much content of moisture will not only deteriorate the function of vacuum pump reaching set pressures but also will degrade the mechanical parts by the increased friction and thus that eventually will bring about the damage of the vacuum pump.

- The time to change the pump oil will come along with the turbid yellow color of the pump oil appearing on the oil level gauge.

[Procedure of the Change of Pump Oil]

Step 1: Disassemble the clamp connected to the vacuum line to separate the vacuum pump from the pipeline of mainframe.

Step 2: Open the suction line of the pump to air and run the vacuum pump for about 10 seconds. This will discharge the pump oil remaining inside the vacuum pump effectively.

Step 3: Prepare the container to collect the residual of pump oil remaining inside the vacuum pump and separate the Drain Plug. By separating the Drain Plug, the remaining residual of the pump oil will then flow out through the Drain line. Check the Oil Level Gauge to find whether the remaining residual of the pump oil has been flown out completely or not.

CAUTION: Be aware of the remaining residual of the pump oil that may overflow with the separation of the Drain Plug.

Step 4: Tilt the vacuum pump slightly forward to complete the drainage of the remaining residual of the pump oil and then reassemble the Drain Plug.

Step 5: Turn the stopper of the injection opening for the pump oil and separate it to supply the new pump oil into through the injection opening.

Step 6: Fill up the new pump oil to the level in the middle of the Oil Level Gauge (below the Maximum Level)

Step 7: Close the pump oil injection opening after completing the fill up of the pump oil by turning the stopper.

Step 8: Connect the vacuum line of the product to the vacuum line of the pump correctly by using the Clamp.

- In the case where the pump oil was contaminated seriously, the vacuum pump needs to be operated for few minutes to clean the inside of the vacuum pump. Depending on the degree of contamination, repeat this temporary operation again if necessary; and check the reaching pressure of the vacuum pump when the temperature of vacuum pump is felt warm with the temporary operation.

4. Products Management

4.3 If product Defect Occur

Situation	Confirmations and Solutions
If power does not turn ON.	Please check the connection of the power switch, and if there are not any troubles, check the power supply in the installation site of the device.
If the freezer is not operating,	- If the freezer is not operating although the freezer was operated at the corresponding temperature, because the freezer or the condenser may be failing, please request A/S.
If the freezer is operated but temperature has not fallen,	- Please check the thermostat setting. - Please make sure that direct sunlight or the material of high temperature exists close to the freezer. - Confirm that the ventilation around the instrument is good. - The same abnormal status as above does not exist, but if the temperature does not fall well, please request A/S.
If noise occurs from the freezer,	- Make sure that the installation is not wrong or the product is tilted. - Check that the back of the instrument is attached to the wall or it is not too close to the wall. - Make sure that foreign substance has not entered into the machine room at the bottom of this product and caused the noise by hanging on the cooling fan. * The longer the period of use of the freezer is, the more the noise becomes gradually louder. If there is no abnormal operation in that state, it is a normal phenomenon. If the freezer is operating in an abnormal state, the freezer should be replaced.
※ If you have any problem other than the above, please call technical service of manufacturer or an official agent.	

5. Product Assurance

5

5.1 Quality Assurance

CERTIFICATE

of
Quality Tested by Manufacturer
and Free Warranty up to 2 years
for Laboratory Instrument

Limited Warranty

1. This instrument has gone through our testing process about all functions before shipment.
2. This instrument is warranted for 2 years from purchasing date.
3. A breakdown caused by customer's improper use or natural disaster is excepted from this warranty.
4. This certification is only for international customers.

Item	**Lab Scale Bench-top Freeze Dryer**
Model No.	**UniFreez^{TM} FD-8**
Serial No.	
Date	
Customer	

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