Operation Manual For Freeze Dryer

FDL (-55°C) Series

(Please read the operation manual carefully before operating the machine)
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I Summary

1. Production Information

Vacuum freeze drying technique, named Lyophilization which is the technique for pre-freezing the watery material first, then make moisture sublimation under the vacuum. The biological and chemistry of Lyophilized goods is unchanged, which is easy to long term time storage. The lyophilized goods can resume the original status when water them. So freeze-drying technique can be applied to the fields of medicine, foodstuff, chemistry and biological science, etc.

FDL series freeze dryer has 5 configurations, as follows: Standard type: The samples will be dried after be pre-frozen.

Top-press type: Pre-freezing and drying the material in the bottle, then fasten down the bottle cap by manual under the vacuum condition after the freeze drying, which is equivalent to the vacuum package.

Manifold type: The samples inside of special bottles are connected with freeze drying cover by rubber valve after pre-frozen. The customer can change different type special bottles any time during freeze drying process through switching valve, so different kind of samples can be freeze dried together, and 8 different capacity bottles can be hang together also, which is
high drying efficiency.

Manifold and top-press type: The freeze drying cover can hang special bottles to freeze dry samples together with freeze drying of Penicillin bottles, which the freeze drying efficiency will be increased.

2, Product Characteristics:

① The machine adopt Danfoss compressor, the refrigerant system is fast cooling speed, and temperature cold trap during operation, which have better ability of the adsorb liquid water.

② LCD touch control system, it is easy for operation and formidable function.

③ The control system can store the freeze drying data automatic, it can be viewed in the form of curves. It is clear for the whole operation process of freeze drying.

④ The drying cabinet is the colorless transparent organic glass lid, it is clear to observe the samples and the whole process of freeze drying operation.

⑤ The vacuum pump is connected with main engine through international KF quick and safe interface.

⑥ The performance of the machine is stable and easy for operation,
with low noise also.

⑦ Pre-freeze function: the customer can keep the stainless steel plate with samples on the pre-freezing rack, then put the pre-freezing rack into cold trap with thermo insulation tap, then begin to pre-freeze.

3, Working Conditions

① Environment temperature: 10℃-30℃; Relative humidity: ≤70%; Power: AC220V±10%/ 50Hz. The working environment should be no conductive dust, explosive, corrosive gases and strong electromagnetic interference.

② Storage conditions:

Environment temperature: -40℃-50℃, Relative humidity: ≤90%, The storage conditions should be well-ventilated, no corrosive gases.

③ The safety classification: Grade I and B type.

4, Product Specification:

<table>
<thead>
<tr>
<th>Model</th>
<th>FDL-10N-50-BA</th>
<th>FDL-10N-50-8M</th>
<th>FDL-10N-50-TD</th>
<th>FDL-10N-50-TD-MM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold trap temp (℃)</td>
<td>-5/-80 (without loading)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vacuum degree (Pa)</td>
<td>≤10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drying area (m²)</td>
<td>0.12</td>
<td>0.075</td>
<td>0.12</td>
<td>0.075</td>
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<tr>
<td>Water capture capability (Kg/24h)</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
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</table>
### Tray Layer

<table>
<thead>
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<th>4</th>
<th>3</th>
<th>4</th>
<th>3</th>
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<tbody>
<tr>
<td>Tray specification (ϕ×h) mm</td>
<td>200×20</td>
<td>200×20</td>
<td>200×20</td>
<td>200×20</td>
</tr>
<tr>
<td>Load material/tray (ml)</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
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<tr>
<td>Drying time (h)</td>
<td>24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manifold</td>
<td>/</td>
<td>/</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>External dimension (W×D×H) mm</td>
<td>582×625×530</td>
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<td></td>
<td></td>
</tr>
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</table>

### Installation

Diagrammatic Sketch

① The vacuum pump is connected with host machine by vacuum pressure tube, the both side of vacuum tube will be used standard hoop, there is one rubber sealing ring in side of each hoop, it should put amount
of vacuum grease on sealing ring before fasten the hoop.

②There is one main power socket on the back of host machine, one end of the power line should be put in this main power socket, another end of power line should be connected with the electric power socket. There is another power socket on back side of host machine which is for vacuum pump, the power line of vacuum pump should be connected with this power socket.

③Please read the vacuum pump manual carefully and check the vacuum pump well before operation, to confirm that the pump oil has been added inside of pump. Don’t operate the vacuum pump without oil, the oil line must not be lower than the oil mirror middle line.

④The “O” sealing ring on side of cold trap should be kept clean, put a layer of vacuum grease before operation.

### III Operation

| Note: Please Confirm the power and Vacuum pump connection is ready before operation |
1, The operation of control panel

This machine adopts color LCD touch screen operation, large capacity FAT32 file system to store all the data values for one month at least. USB interface: Running data can be connected USB disk to store in Computer, the panel can display the temperature of the sample, the cold trap temperature, vacuum degree and other working parameters in curve.

① Turn the main power switch on, the display panel shows the "Main screen" (Picture 1).

Picture 1  Main Screen

② Touch on the screen to enter the “Main Operation Screen”（Picture 2）
③ The display information in Maine Operation Screen

1 - Control bars: can control the compressor, vacuum pump, vacuum meter on or off. Equipment state bars will countdown display counting time. (In order to protect the compressor, refrigeration machine can reopen after 300s delay from last closed)

2 - Equipment status bars: compressor, vacuum pump, vacuum gauge display white color which means off (Picture 2), red color means running (Picture 3)
3 - Run time: recording the running time of the refrigeration system
4. Real-time data display: display data in real time for samples temperature, the cold trap temperature, and vacuum degree
5 - Parameter curve column: display parameter curve real-time for sample, cold trap, and vacuum degree;
6 - Page key touch: touch the arrow keys, can view real-time state for several hours, the curve and the curve of the historical data.
7 - The button for current data curve and historical curve conversion: touch the button, can check freeze-drying curve in last month, the curve and data will be automatically deleted after one month.
8 - State transition button: touch this key can display current and historical curve.

![Real-time status](image)

Picture 3: Running Screen
④ The History Data Screen

Picture 4: History Data Screen

1 - USB disk interface: Put the USB disk into this interface, the data of any day can be copy.

2, Historical curve to choose the date bars: touch “▼” to choose the data within a month for view and storage of the data.

3 - USB disk storage button: put the USB disk connection well, choose the data, touch USB disk storage button, the data will be copied to the USB disk

4 - Storage cue bars: after touching the "USB storage" button, will prompt you to data storage is successful within 5 seconds, will display "file copied successfully" on the screen, otherwise
means copy failure.

2. The freeze drying operation

① Samples placement
Put the samples on the trays, then put the samples and the trays in the racks, then put the temperature sensor on the tray, then put the rack with samples into cold trap, keep the insulation lid on the cold trap to begin the pre-freezing, it should keep some time after the samples are frozen.

② Sample pre-freezing:
A, Turn on the main power switch, the display panel will show picture 1.
B, Touch the screen, and into Picture 2, touch "compressor" button, then pre-freezing start (advise 4 hours at least).
C, Take the racks out together with the samples after the samples completely frozen.

③ The sample drying
A, Take the freeze-drying rack out from the cold trap, then put the supporter plate on the cold trap port, then place the freeze-drying rack on the supporter plate (Standard type and manifold type can refer to FDL-10N-50-BA and FDL-10N-50-TD), or put the samples on the drying rack, then put the drying rack on the cold trap directly (Top
press type and manifold top press type can refer to FDL-10N-50-8M) B, Put the sensor into the sample tray, then put the drying cabinet cover up the drying rack.
C, Tighten the drainage and inflation valve
D, Touch "Vacuum Meter" button, the screen display the vacuum degree 110KPa, then touch the "vacuum Pump" button, vacuum pump begin to run. The vacuum degree in the display panel will begin to decline rapidly, The drying officially start when vacuum degree is less than 10Pa, (Advise drying time is more than 20 hours, it can be adjust depending on the customer requirement as per different drying requirement

| Note: the lower end of the drying cabinet must touch well with the "O" sealing ring |

④Take out the samples from drying cabinet
A, Check the sample curve and visual sample is completely dry, touch "Vacuum Meter" to switch off the vacuum meter, then loosen the drainage and inflation valve, touch the "Vacuum Pump" button to switch off the vacuum pump.
B, Remove the drying cabinet which is acrylic glass cover, take out the sample trays from freeze drying rack, then do package for drying samples. Touch "Compressor" button to switch off
refrigeration system.

The freeze drying operation is finished

⑤Shut down operation

A, Switch off the “Main Power” button, then the machine is no power.

B, Remove the electric power plug, and vacuum pump plug.

C, Clean the cold trap with soft cloth, and clean sample plates and rack, drying cabinet, etc.

D, Cover the vent hole when the vacuum pump does not work to prevent the dust into the vacuum pump.

⑥Water Drainage Operation:

Loosen the drainage and inflation valve, the water will be out after the ice melt into water in the cold trap, then using a container to collect the water.

Note: Please observe and confirm the water in the cold trap is emission clean, otherwise affect the use effect!

3, Operation for freeze drying

◆The freeze drying operation for standard type (FDL-10N-50-BA)

①Put the samples on the trays, then put the samples and the trays in the racks, then put the temperature sensor on the tray, then put the rack with
samples into cold trap, keep the insulation lid on the cold trap to begin the pre-freezing, it should keep some time after the samples are frozen.

② Take the freeze-drying rack out from the cold trap, then put the supporter plate on the cold trap port, then place the freeze-drying rack on the supporter plate. Put the sensor into the sample tray, then put the drying cabinet cover up the drying rack.

③ Tighten the drainage and inflation valve, touch "Vacuum Meter" button, the screen display the vacuum degree 110KPa, then touch the "vacuum Pump" button, vacuum pump begin to run. The vacuum degree in the display panel will begin to decline rapidly, The drying officially start when vacuum degree is less than 10Pa.

④ Check the sample curve and visual sample is completely dry, touch "Vacuum Meter" to switch off the vacuum meter, then loosen the drainage and inflation valve, touch the "Vacuum Pump" button to switch off the vacuum pump.

⑤ Remove the drying cabinet which is acrylic glass cover, take out the sample trays from freeze drying rack, then do package for drying samples. Touch "Compressor" button to switch off refrigeration system.

◆ The freeze drying operation for top-press type (FDL-10N-50-BA)

① Put the samples into penicillin bottle, then put the bottles on the
trays, put the bottles and the trays in the racks, then put the temperature sensor on the tray, then put the rack with samples into cold trap, keep the insulation lid on the cold trap to begin the pre-freezing, it should keep some time after the samples are frozen.

②Take the freeze rack out from the cold trap, take the penicillin bottles trays from the freeze rack, and put the trays and bottles into drying racks, then put the drying rack on the cold trap port, Put the sensor into the sample tray, then put the drying cabinet cover up the drying rack.

③Tighten the drainage and inflation valve, touch "Vacuum Meter" button, the screen display the vacuum degree 110KPa, then touch the "vacuum Pump" button, vacuum pump begin to run. The vacuum degree in the display panel will begin to decline rapidly, The drying officially start when vacuum degree is less than 10Pa.

④Check the sample curve and visual sample is completely dry, Turn the handle which is above the organic glass cover, make the screw rotation to drive trays down one by one, the bottle caps will be pressed into the bottle, achieve vacuum closures. Touch "Vacuum Meter" to switch off the vacuum meter, then loosen the drainage and inflation valve, touch the "Vacuum Pump" button to switch off the vacuum pump.

⑤Remove the drying cabinet which is acrylic glass cover, take out the
sample trays from freeze drying rack, then do package for penicillin bottles. Touch "Compressor" button to switch off refrigeration system.

◆ The freeze drying operation for manifold type (FDL-10N-50-BA)

① Put the sample into the lyophilized bottles selected, then put the lyophilized bottles into one deep freezer (less than -40 °C), keep the sample completely frozen and maintained for a period of time, it is better to keep the drying bottle edge rotation if possible, so that uniform samples of frozen in the bottle wall, accelerate drying

② Take the freeze-drying rack out from the cold trap, then put the supporter plate on the cold trap port, then place the freeze-drying rack on the supporter plate. Put the sensor into the sample tray, then put the drying cabinet cover up the drying rack.

③ Take out the lyophilized bottles from the deep freezer, and connect the lyophilized bottles with the drying cabinet through the switch valve, put the valve into the lyophilized bottle center, turn round the valve wing to keep it vertical down, then the lyophilized bottle is connected with the drying cabinet.

④ Tighten the drainage and inflation valve, touch "Vacuum Meter" button, the screen display the vacuum degree 110KPa, then touch the "vacuum Pump" button, vacuum pump begin to run. The vacuum degree in
the display panel will begin to decline rapidly, The drying officially start when vacuum degree is less than 10Pa. If the lyophilized bottle is required to replace during drying operation or take off the lyophilized bottle after drying operation, please turn round the switch valve and keep valve swing vertical upward, then the lyophilized bottle is communicated with the atmosphere, the bottle is inflation with air at the same time, drying cabinet is isolation with lyophilized bottle, then remove lyophilized bottle.

⑤if the samples drying finished, take off the lyophilized bottles first, then do air inflation, switch off the vacuum meter and vacuum pump, remove the drying cabinet and do samples package. Do not take off the drying cabinet together with lyophilized bottles together

◆The freeze drying operation for FDL-10N-50-TD-MM
Refer to the above information of FDL-10N-50-8M and FDL-10N-50-TD

IV Notices

①Working environment temperature should be less than or equal 30℃; Relative humidity should be less than or equal 80%;

②The vacuum pump should be placed at the ground in order to maintain certain height difference with the host machine, which can prevent oil back to pump in case of power off. It should loosen the
drainage and inflation valve and inflate the air into the host machine if
the power is off suddenly, and take out the samples as soon as possible,
confirm the samples to be stored well.
③When shut down the machine, please inflate the host machine, then
switch off the vacuum pump in order to prevent the oil back to pump.
④The drying cabinet (acrylic glass cover) is connected with host
machine by “O” sealing ring, please confirm the “O” sealing ring clean.
⑤The user socket should be earthed. Don't clean the organic glass
cover and “O” sealing ring by organic solvent, Pay attention to the
contact surface of the organic glass cover and “O” sealing ring to avoid
injury, stroke, etc.
⑥ Don't switch on or off the power and refrigerator frequently, please
wait for 3 minutes at least if restart the machine.

![Notes: The vacuum pump oil should be replaced regularly after working 200 hours, confirm maintain the host machine and vacuum pump well for running safe and stable.]

V Common breakdown and elimination

<table>
<thead>
<tr>
<th>No.</th>
<th>Failure phenomenon</th>
<th>Reason and Solution</th>
</tr>
</thead>
</table>

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The vacuum degree can’t be less than 15Pa</td>
<td>Check the connection between vacuum pump and host machine, check the hoop is correct connection or not.</td>
</tr>
<tr>
<td>2</td>
<td>Check the bottom of organic glass cover is clean and damage or not.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Check the “O” sealing ring is clean and damage or not, the place of the “O” sealing ring is right or not.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Check the vacuum pump work or not, the oil of pump is clean or not</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Check the inflation valve is tightly or not.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>High temperature for cold trap</td>
<td>Check the environment temperature is high or not, check the heat dissipation is bad or not. Confirm the machine to be placed in suitable temperature and well ventilated place</td>
</tr>
<tr>
<td>7</td>
<td>Please contact with the service engineer if the refrigeration system is failure</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>the leakage of vacuum pump oil</td>
<td>Check the vacuum pump and replace it if any spare parts damaged</td>
</tr>
<tr>
<td>9</td>
<td>Check the vacuum pump is placed obliquely or not</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>No power for host machine</td>
<td>Check main power line is in the socket or not</td>
</tr>
<tr>
<td>11</td>
<td>Check power fuse whether burn out, change new fuse if the fuse burn out</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Check the main power switch on or not</td>
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</table>
VI Packing list

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Unit</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Host machine of Freeze dryer</td>
<td>Piece</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Lyophilized rack</td>
<td>Piece</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Trays (S、P type/T、TP type)</td>
<td>Piece</td>
<td>4/3</td>
</tr>
<tr>
<td>4</td>
<td>Drying rack(T、TP type)</td>
<td>Piece</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Drying cabinet (acrylic glass cover)</td>
<td>Piece</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Vacuum Pump</td>
<td>Piece</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Connection Pipe</td>
<td>Piece</td>
<td>1</td>
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<tr>
<td>8</td>
<td>Pump Oil</td>
<td>Bottle</td>
<td>1</td>
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<tr>
<td>9</td>
<td>Connection hoop (including sealing ring)</td>
<td>piece</td>
<td>1</td>
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<td>10</td>
<td>Operation Manual</td>
<td>Piece</td>
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<td>11</td>
<td>Vacuum grease</td>
<td>box</td>
<td>1</td>
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</tbody>
</table>

VII Guarantee and maintain

①The guarantee is one year free from the date of installation

② We are responsibility for tenured attendance.

③Please keep all the accessories of machine well, check it
unmistakable, send the repair card by return to company sales department in order to enter company technique service record, provide service for you during your operation
## Conformity Certificate

<table>
<thead>
<tr>
<th>Name:</th>
<th>Freeze Dryer</th>
</tr>
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<tbody>
<tr>
<td>Model:</td>
<td>FDL-10N-50 (−55°C)</td>
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<tr>
<td>BA</td>
<td>☐</td>
</tr>
<tr>
<td>8M</td>
<td>☐</td>
</tr>
<tr>
<td>TD</td>
<td>☐</td>
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<table>
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<table>
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