

# Dinesh Kumar

Humidifier

1. Heater ON -

1. Fan Off 2. Heating Zeolite to release moisture which is absorbed. 3. Flap – open to exhaust water vapour.

2. Heater Off –

1. Fan ON 2. Air passes through Zeolite to absorb more water vapour inside cabinet. It reduces cabinet humidity. 3. Flap is closed.

The invention relates to a drying module for drying humid air. The module comprises a humid air inflow opening, a dry air outflow opening and a flow channel extending between the inflow opening and the outflow opening. The flow channel includes a drying chamber for accommodating a zeolite container containing zeolite particles, wherein the drying chamber has at least one dimension transverse to a humid air flow direction that is significantly larger than a dimension of the drying chamber parallel to the flow direction of the humid air.

Initialization :-

1. Heater on and flap open for 12 minutes. Heater temperature will be around 80-100 degree C within 7 minutes. Another 8 minutes required to make uniform temperature in dry cabinet.
2. After 20 minutes FAN will be ON & Flap will be closed. It runs for long 4 hour.
3. Now control goes over humidity sensor.
4. User sets minimum and maximum Humidity sensor level.
5. When humidity reaches maximum level, heater will be on & flap will be open for 10-12 minutes.
6. Heater will be off & flap will be closed. Fan will start. It runs till again humidity level reaches minimum.
7. When humidity is within range, system is idle.
8. This cycles repeats.
9. When door opens. Every control should be off.

# RECOMMENDED RH VALUES



**DRY CABINET**  
**9316134502**

CONDITION (RH%)	STORE ITEMS
1%RH - 20%RH	<ul style="list-style-type: none"> <li>• ELECTRONIC COMPONENTS • CHEMICALS</li> <li>• MSD • LED</li> </ul>
20%RH - 30%RH	<ul style="list-style-type: none"> <li>• IC • CHIP • SMT • WAFER • POISE</li> <li>• PRECISE INSTRUMENT • PCB • BGA</li> </ul>
30%RH - 40%RH	<ul style="list-style-type: none"> <li>• SEMICONDUCTOR • CAPACITANCE • RESISTORS</li> <li>• CIRCUIT BOARDS • FILAMENT • MEDICINE</li> <li>• NICKEL-CADMIUM BATTERIES • MOULD</li> <li>• ELECTRONIC MACHINE • BATTERY-CHIP</li> <li>• PRECISION MEASURING INSTRUMENTS • TEA</li> <li>• SEED • STAMPS</li> </ul>
40%RH - 50%RH	<ul style="list-style-type: none"> <li>• CAMERAS • LENS • MICROSCOPE • ENDOSCOPY</li> <li>• VIDEO CAMERAS • ROLL FILM • DISC</li> <li>• PHOTOGRAPHIC FILM • FLOPPY DISK</li> <li>• RIGID DISK • HARD DISK • DVDs</li> <li>• LEATHER • JEWELLERY</li> </ul>

## **WHY DESICCANT TECHNOLOGY BASED DRY STORAGE CABINETS ARE VIRTUALLY MAINTENANCE FREE?**

Desiccant technology uses highly porous crystalline material belonging to aluminosilicates class, called Zeolite. Zeolite desiccant is refreshed by controlled heating and allows the trapped moisture in it to escape thru the vents located at the back side of the Cabinet. Once Zeolite desiccant material is refreshed thru heating, it seals off the back side vents and opens to the interior side for dehumidification to set level as programmed.

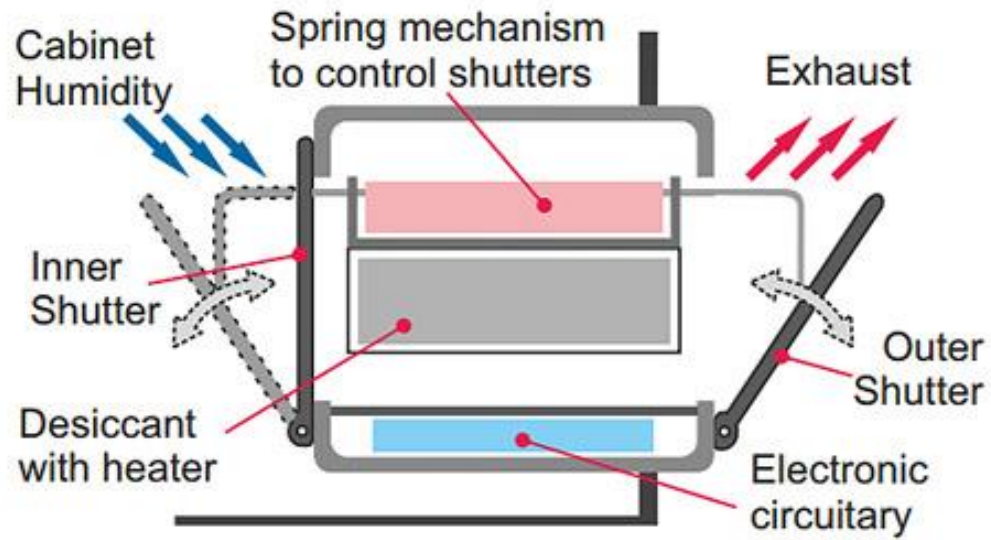
The de-humidification level inside is continuously compared to the preset level till it achieves the desired RH level. Zeolite material Re-heating of the Zeolite desiccant material starts only when the humidity inside the cabinet exceeds the absorption capacity of Zeolite drying material. Normally the re-generation of the Zeolite desiccant material thru just 8 minutes heating, suffices for many weeks of de-humidification process.

### **Absorption Stage:**

Valves are opened inward and closed outward in order to absorb moisture in the desiccators from the Cabinet and stored items/ components placed inside and maintains the set humidity with repeated process.

### **Exhaustion Stage:**

Valves are closed inward and opened outward in order to exhaust moisture from saturated desiccators to atmosphere outside the dehumidifying dry cabinet.



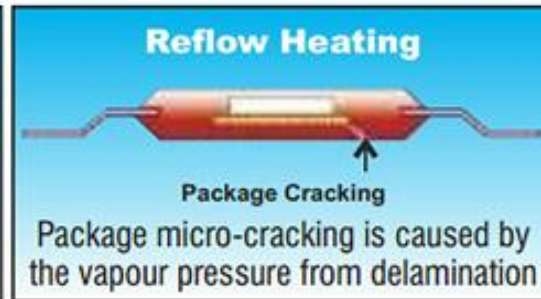
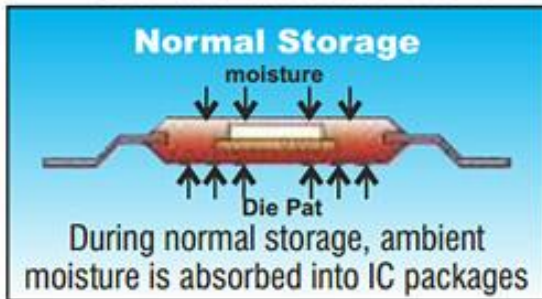
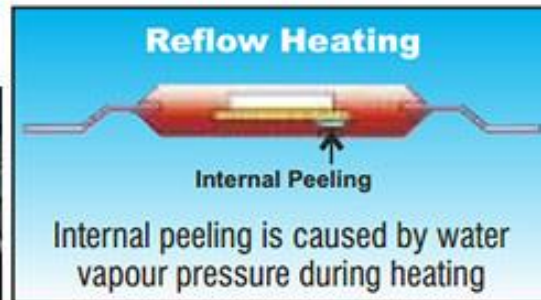
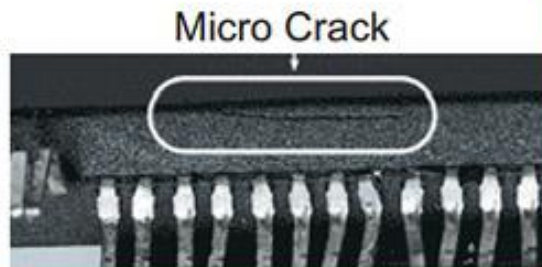
5~50% RH, 320L  
Dry Storage Cabinet  
Model: IDSC-320

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**ESD Safe**

Wrist Strap Terminal  
for ESD Safe working



5~50% RH, 510L  
Dry Storage Cabinet  
Model: IDSC-510

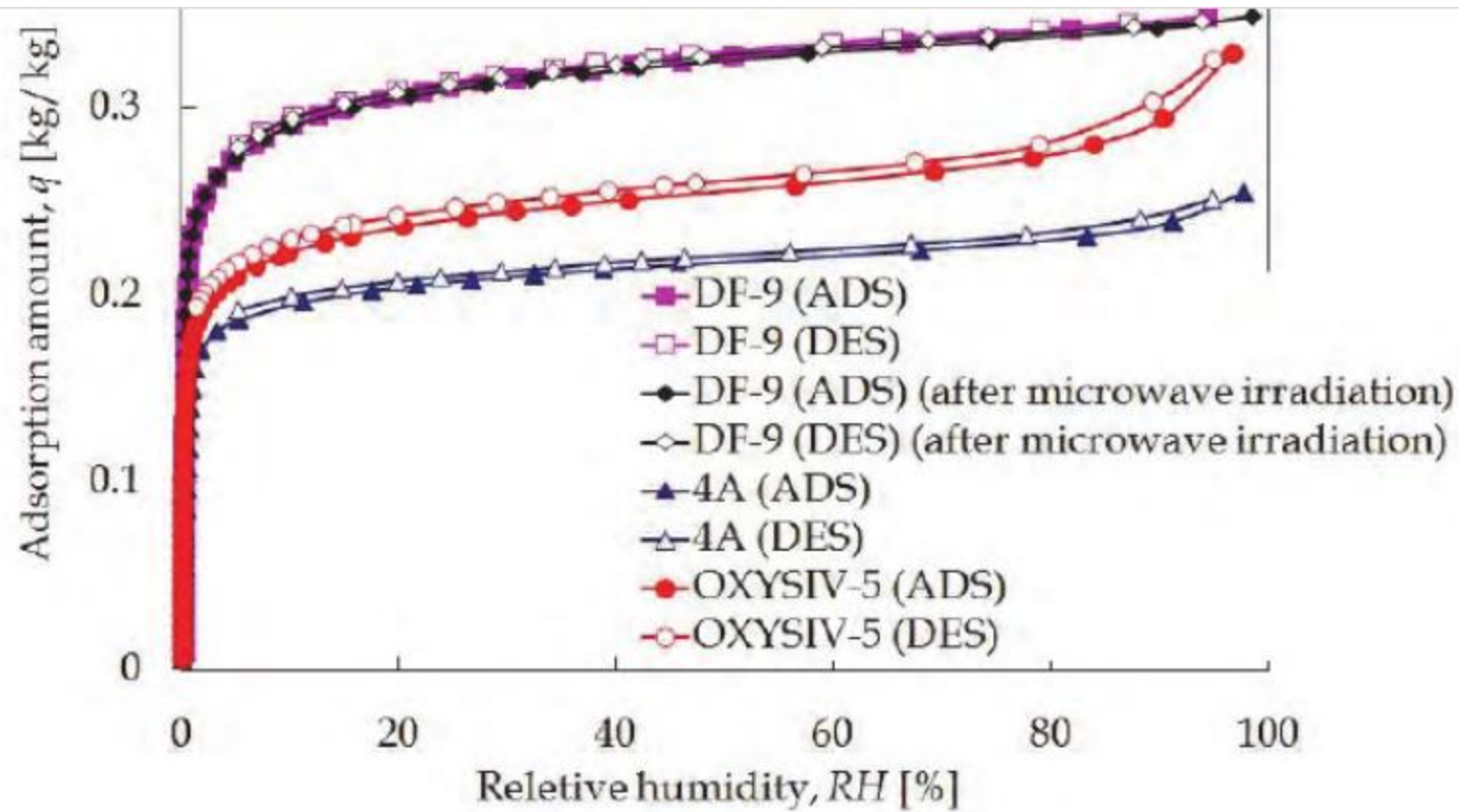


5~50% RH, 240L  
Dry Storage Cabinet  
Model: IDSC-240



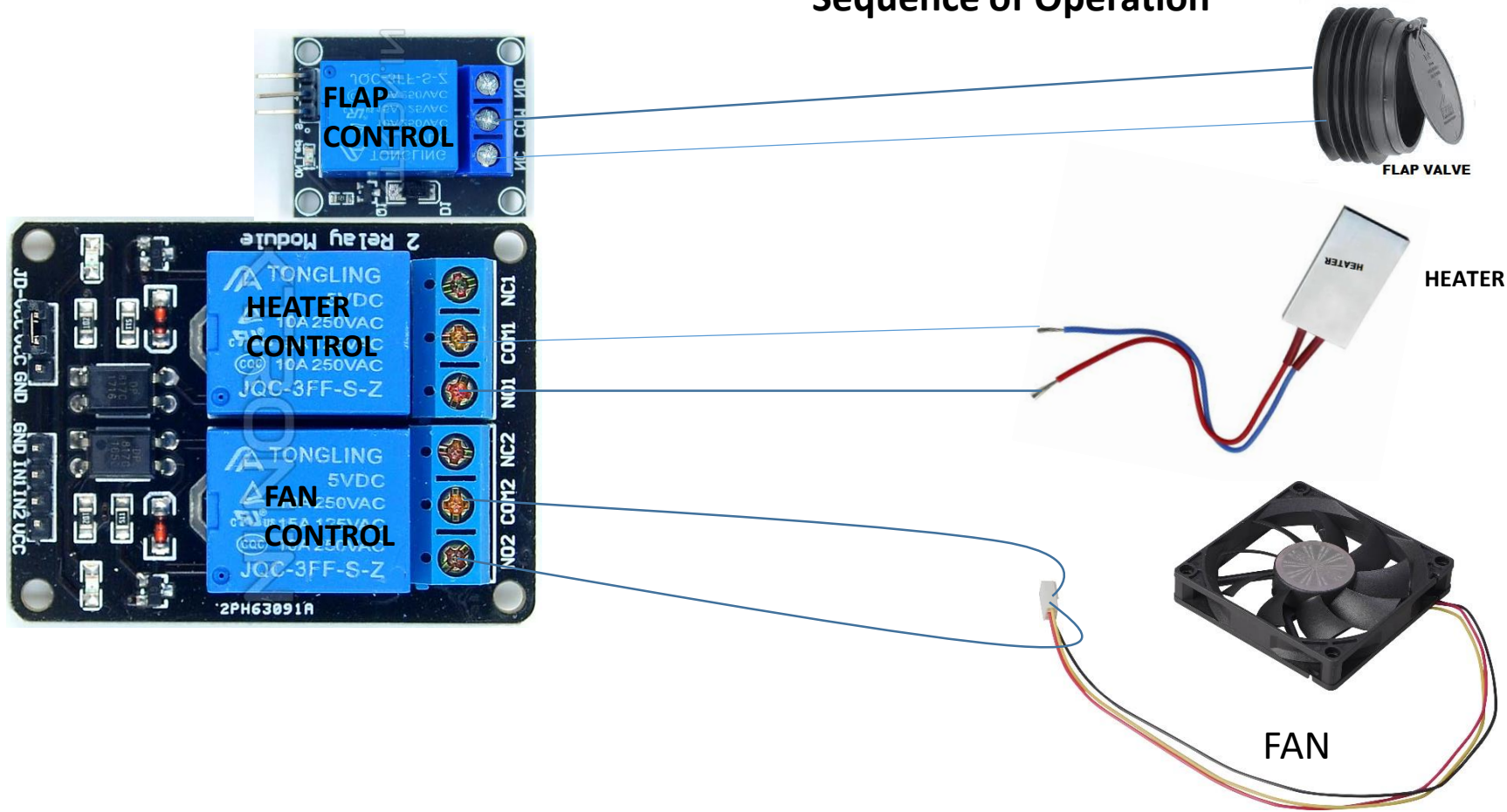
## DF-9 – Water Vapour

Maximum RH of Zeolite to keep around 75%.



Adsorption and desorption isotherms of water-vapor on zeolites at 30°C The adsorption amount of water-vapor on 4A and OXYSIV-5 rise sharply in the range of the relative humidity,  $RH$ , below 5%, and then increased gradually. For 4A, the adsorption amount of water-vapor below 5% of  $RH$  accounts for 75% of the total adsorption amount. In addition, the adsorption amount of 4A is smaller than that of OXYSIV-5. For DF-9, the adsorption amount of water-vapor rise sharply in the range of the relative humidity,  $RH$ , below 10%, and then increased gradually almost similar to that of OXYIVE-5. The adsorption amount of water-vapor below 10% of  $RH$  accounts for 84% of the total adsorption amount which is 1.3 times larger than that of OXYSIV-5. In addition, the water- vapor adsorption and desorption of 4A and DF-9 showed desorption hysteresis, which is smaller than that of OXYSIV-5. on, visual check and measurement of water-vapor adsorption and desorption isotherms was carried out after the microwave irradiation experiment. As a result, the damage and the transformation of the zeolites by microwave irradiation were not observed. Moreover,

## Sequence of Operation



### Humidity Control ON

FAN ON	HEATER OFF	FLAP CLOSE	HUMIDITY REDUCES BUT VAPOR ABSORBED BY ZEOLITE GET SATURATED
HUMIDITY CONTROL OFF & VAPOUR ABSORBED BY ZEOLITE TO BE REMOVED			
FAN OFF	HEATER ON	FLAP OPEN	VAPOR DEPOSITED IN ZEOLITE TO BE REMOVED THROUGH FLAP & MAKE IT OUT OF CABINET.

Initial Starting Phase (30 minutes) :-

Zeolite maximum RH to keep around = 75%.

When RH below 75% →

1. Fan ON 2. Heater OFF 3. Flap closed

When RH above 75% →

1. Fan Off 2. Heater ON 3. Flap Open

After 30 Minutes :-

Take set value of RH

When RH below  $(RH + 15\%RH)$

1. Fan ON 2. Heater OFF 3. Flap closed

When RH below  $(RH - 15\%RH)$

1. Fan Off 2. Heater ON 3. Flap Open



