

# Failures analyzing and solution

Tim

## The common failures and classification of GD series inverter

In the routing maintenance, we usually face **many kinds of problem**, we divide these failures as **two types**, internal failures and external failures.



# Catalogue



**Inverter working theory**

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**Ten common methods of the repairments**

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**Internal failures of the inverter**

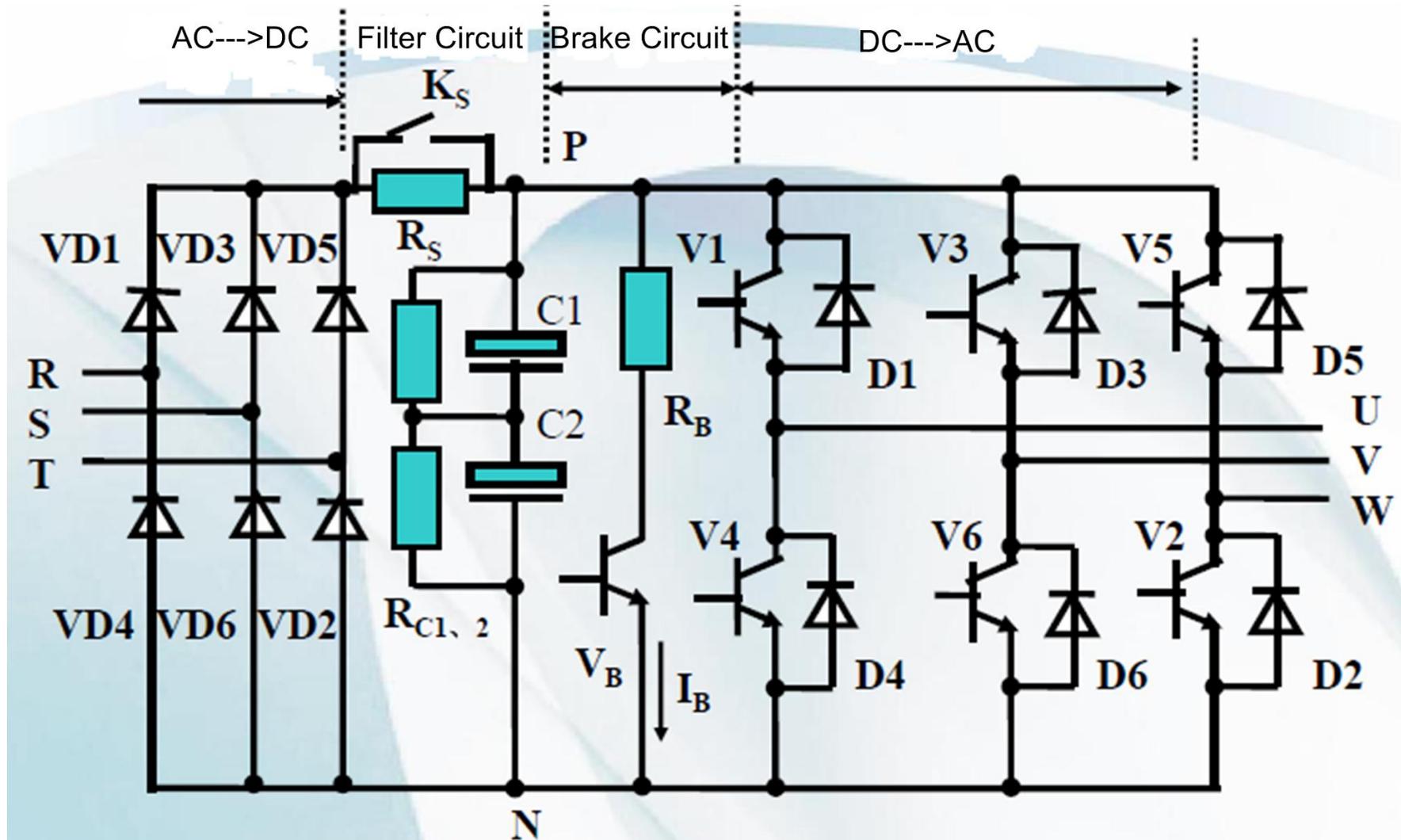
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**External failures of the inverter**

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# Inverter working theory



**Rectifier:** Usually it is consisted of three phase full bridge . The input side was the Grid **AC** power and the outside is the **DC**. We use the DC power to supply for the invert circuit and the control circuit.

**Filter circuit:** Smooth and **improve** the quality of the DC power supply, absorb and **storage** the electric energy. It's consists of many electrolytic capacitors, some inverters also have a DC reactor.

**DC-AC circuit:** This part is for turning the DC power into the AC power with variable voltage variable frequency(VVVF), We usually use the **IGBT** to form invert bridge.

## Ten common methods of the repairments

- 1. Look** Carefully look the fault phenomena and the **fault point** on the PCB board.
- 2. Measure** Measure the questionable components to see if it's broken or whether have **short circuit** or **open circuit** of the solder point
- 3. Test** Test the **wave** of point on the board or test the whole board.
- 4. Listen** listen to the sound of the **relay's** action to check if it's really turned on or turned off, check if the inductance and the **transformer** have **noise**?
- 5. Touch** Touch the IC MOS and transformer to see if they are **over-heated**.
- 6. Disconnect** Disconnect the signal lines or cut off the copper on the PCB board and the pins of the components).
- 7. Short** Short the **control signal** to another point directly.
- 8. Press** Sometimes the fault are caused by the components **loose**, so if you press the components, the fault may disappear.
- 9. Beat** This method is very useful to distinguish whether the **relay** is powered on.
- 10. Discharge** When you **disassemble** the board, you must have the electrolytic **capacitor discharged**.

## Inspection before inverter is powered on

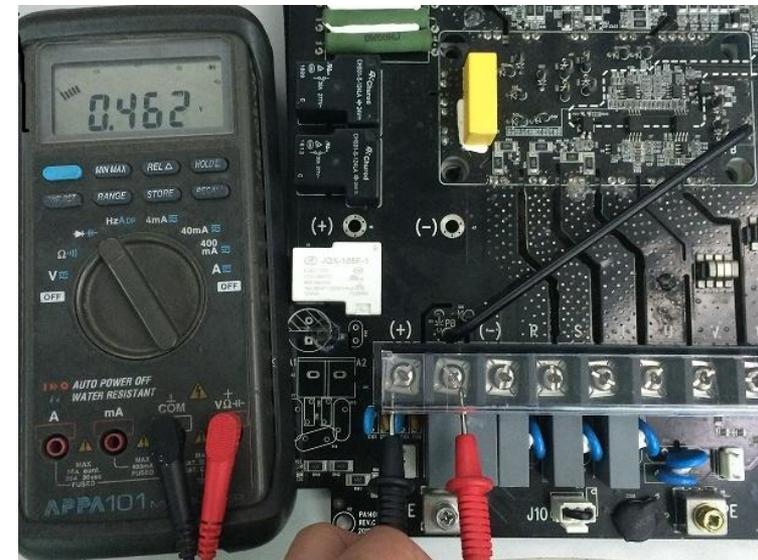
Check if the main circuit is damaged.

Firstly, set the millimeter to Diode position, connect the **black hand** with “+”, then connect the **red hand** with **R、S、T、U、V、W** in order, if all the values is between **0.3--0.5V**, both the rectifier and IGBT upper bridge are good. Contrary, connect the **red hand with “--”**, then connect the **black hand with R、S、T、U、V、W** in order, if all the values is between 0.3--0.5V, both the rectifier and IGBT lower bridge are good.

If the test values **is highly unbalance**, the rectifier or the IGBT must be broken.

And you can't power on in this situation.

If the main circuit is good, you can power on to make further test. As there are many kinds of protective circuit, sometimes it may occurs incorrect fault alarm.



## Part 1: The common internal failures of GD series inverter

- ◆ 1. Rectifier bridge damage
- ◆ 2. IGBTmodule damaged
- ◆ 3. No display when power-on
- ◆ 4. The buttons on the keypad is invalid
- ◆ 5. Current detection fault - ITE
- ◆ 6. Input phase failure - SPI
- ◆ 7. Output phase failure - SPO
- ◆ 8. Over heat failure – OH1 and OH2
- ◆ 9. P-OFF happens while power-on or running

## 1. Rectifier bridge damage

**Failure cause:** Generally, this failure is caused by large fluctuation of **voltage** or internal short-circuit .

**Solution:** the power of **18.5kW** and below, as the rectifier bridge and inverter module are integrated in a power module, the inverter module is very likely damaged when the rectifier bridge is damaged, at the same time the switch power supply circuit and the drive circuit also may be damaged. When repairing such inverter, we suggest disassembling the module firstly, and then check the power supply of drive board is normal or not. If repairing the inverter in site, we suggest replacing the drive board and the module.

For inverters of 18.5kW and above, as the rectifier bridge, the inverter module and the power supply of drive board are separated, we only need to replace the rectifier bridge and the buffer resistance when the rectifier bridge is damaged.



## 2. IGBT module damage

**Failure cause:** Generally, this failure is caused by **shorting of motor winding or cable damaged**. The large fluctuation of grid voltage also may cause damage to inverter module, and at the same time the drive circuit will damage.

**Failure symptom:** The inverter will output fault coder **OUT1, OUT2, OUT3** when IGBT module damaged, corresponding to the phase fault of **U, V** and **W**, sometimes may display output **SPO**.

**Solution:** If repairing the damage inverter in workshop, it is best to replace the module and repair the drive circuit and measure its drive wave at the same time. If repairing the inverter in site, it's best to **replace the IGBT with drive board**. Before measuring the main circuit and checking the motor and the cable, it's best not to power to inverter. Only sure there is no problem can we power to the inverter.

