Fundamental Troubleshooting Manual for VFD

1. Purpose

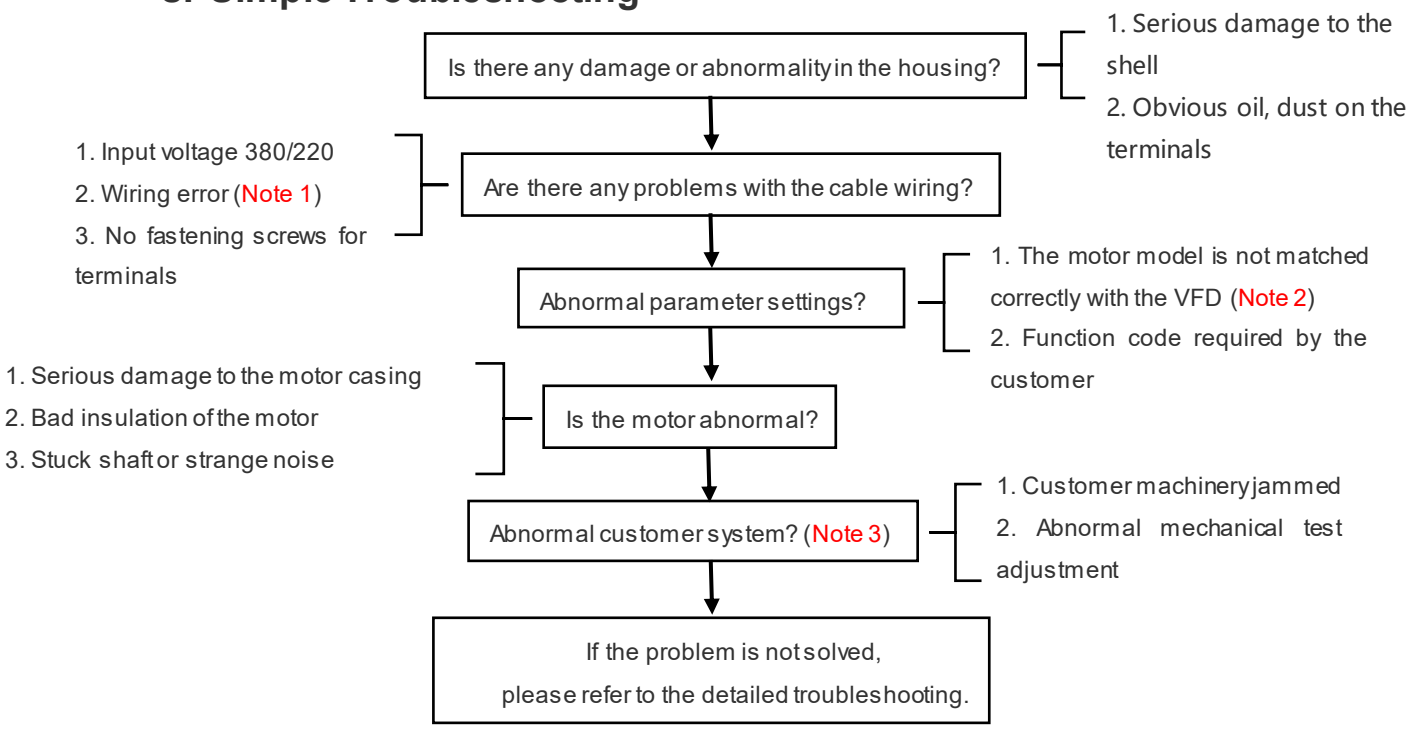
This test guide is applicable to service personnel in the field troubleshooting/ judgment of machine faults, accurately locate the problem, avoid direct replacement of the machine. This avoids the problem of being unable to reproduce the problem caused by changing the machine directly and prolonging the processing progress of the problem.

This guide is only the basic detection of the VFD and some of the more frequent failure detection and judgment methods.

2. Tools Needed

Multimeter, VFD, asynchronous motor and other supporting equipment.

3. Simple Troubleshooting



Note 1: Wiring Error

1. Is the RST power cord correct?
2. Is the UVW motor wire correct?
3. Is the external control wire wired correctly?

Note 2:

Check whether the motor model matches the nameplate power of the VFD. Is the selection correct?

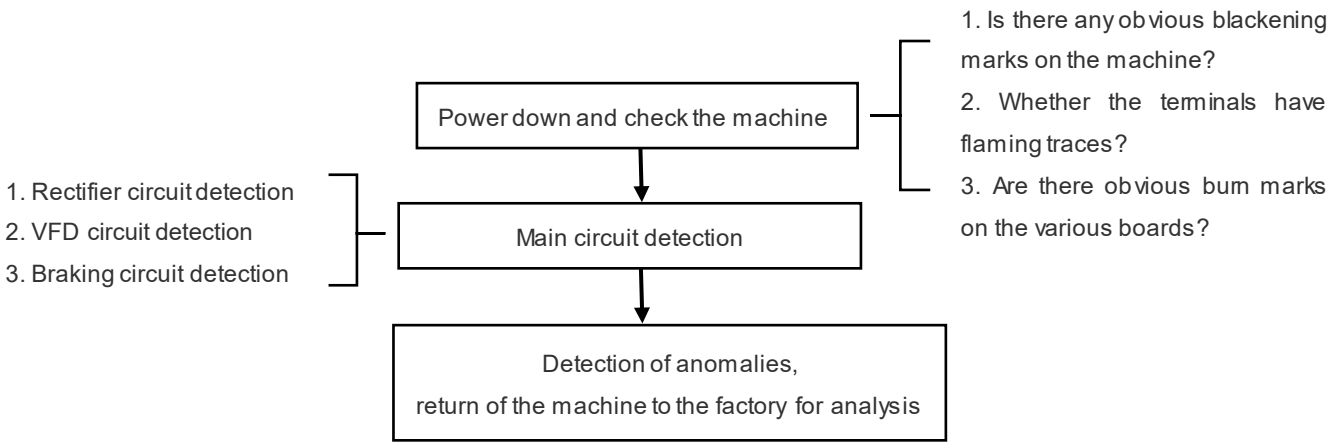
Note 3:

Measure whether the motor insulation is good, and whether the insulation to ground is good?

4. Detailed Troubleshooting

1. Hardware Troubleshooting

1) Driver Board Troubleshooting



Rectifier Circuits

a. Use the diode gear of the multimeter, the red pen points to the three-phase input terminals (R, S, T), and the black pen points to "+", and the diode gear of the multimeter points to "+", and the red pen points to the three-phase input terminals (R, S, T). Measure the rectifier part of the three-phase bridge is normal, the multimeter display at 0.6V or so is normal, short-circuit or open-circuit indicates damage, such as Figure 1.

Figure. 1 Schematic Diagram of Three-Phase Upper Bridge Measurement in Rectifier Section

b. Use the diode gear of the multimeter, the red pen points “-”, the black pen points to the three-phase input terminals (R, S, T). Measure the rectifier part of the three-phase under the bridge is normal, the multimeter display at 0.4V or so is normal, short-circuit or open-circuit damage, such as Figure 2.

Figure. 2 Schematic Diagram of Three-Phase Lower Bridge Measurement in Rectifier Section

VFD Circuit

a. Use the diode gear of the multimeter, the red pen points to the three-phase output terminals (U, V, W), the black pen points to “+”, and then measure whether the VFD part of the three-phase upper bridge is normal, short circuit or open circuit means normal. Measure the inverter part of the three-phase upper bridge is normal, the multimeter display in the 0.4V or so is normal, short circuit or open circuit indicates damage, such as Figure 3.

Figure. 3 Schematic Diagram of Three-Phase Upper Bridge Measurement in the Inverter Section

b. Use the multimeter diode gear, red pen “-”, black pen were point three-phase input terminals (U, V, W), measure the rectifier part of the three-phase under the bridge is normal, the multimeter displays at 0.4V or so is normal, short circuit or open circuit indicates damage, such as Figure 4.

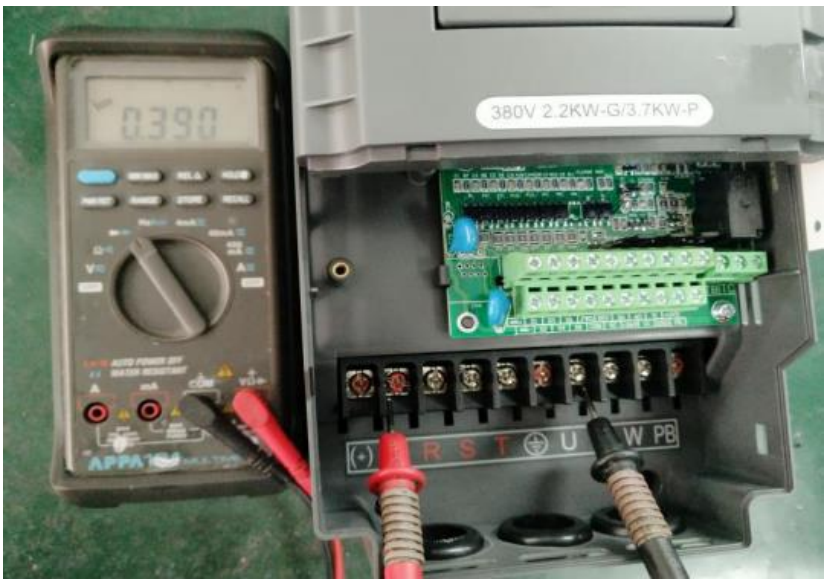


Figure. 4 Schematic diagram of Three-Phase Lower Bridge Measurement in the Inverter Section

Brake Circuit

a. Use the multimeter DC gear, red pen point +, black pen point PB, set P9.12 = 340, run the VFD, the multimeter shows in 540V, no voltage indicates that the brake is not open or damaged, such as Figure 5.

Figure. 5 Schematic Diagram of Braking Circuit Measurement

b. External buffer resistor directly at both ends of the resistance file to measure the resistance value, the resistance value of tens of ohms for normal.

Drive Circuit

Static Voltage Measurement:

a. Power on the upper bridge arm and lower bridge arm drive static voltage measurements, generally between -7.5V ~ -8V, (multimeter playing in the DC gear) such as Figure 6.

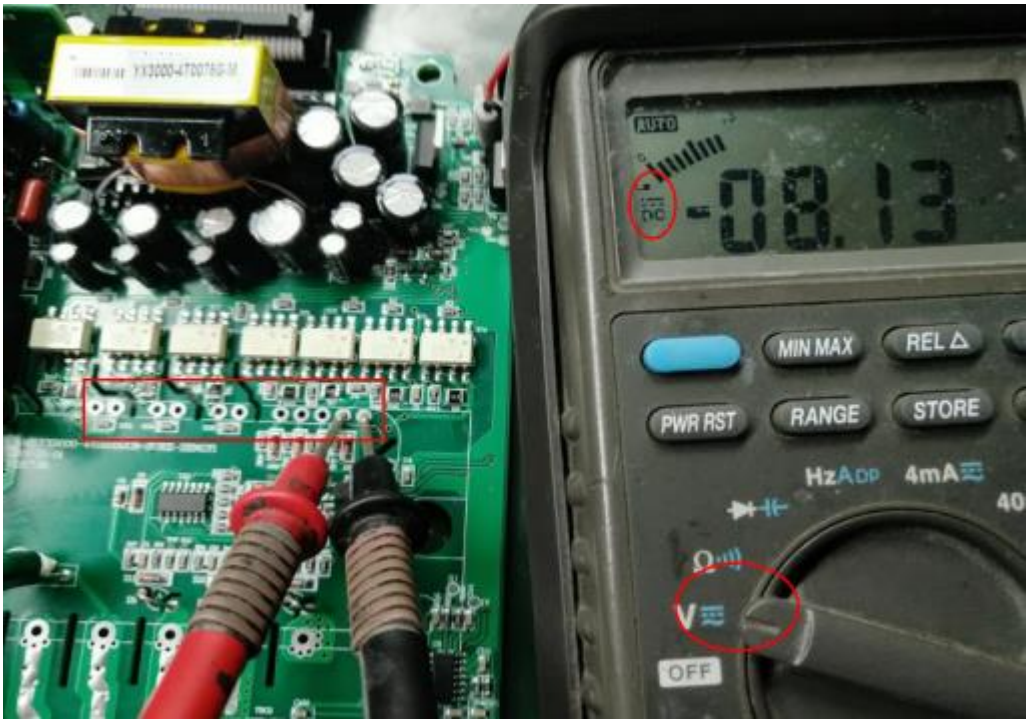


Figure. 6 Multimeter Set to DC

b. 1HZ operation, and then separately measure the drive of the upper bridge arm and the lower bridge arm voltage, generally in the 13V or so, (using a multimeter AC gear measurement) such as Figure 7.

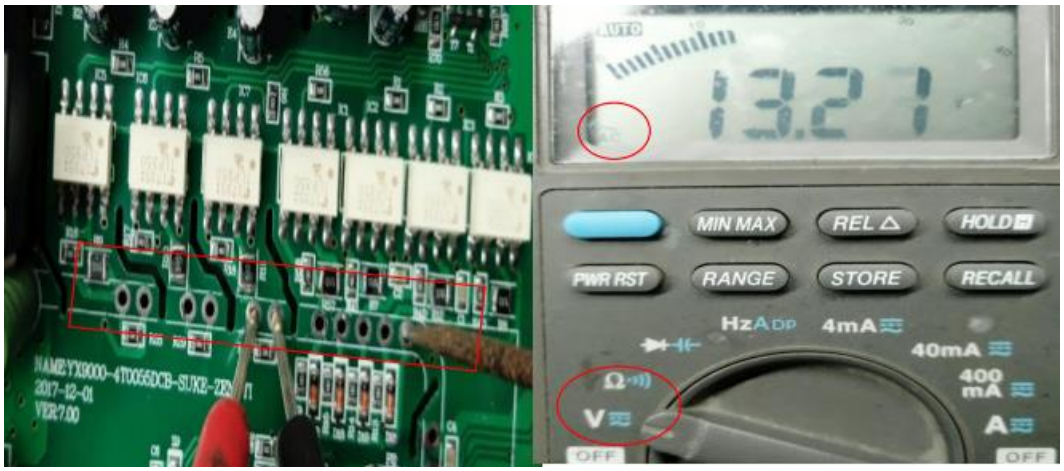


Figure. 7 Driving Voltage of the Driver for 1Hz Operation Measurement

c. If the conditions are such that 1HZ operation is possible, the drive waveforms of the drivers can be measured separately with an oscilloscope, such as Figure 8.

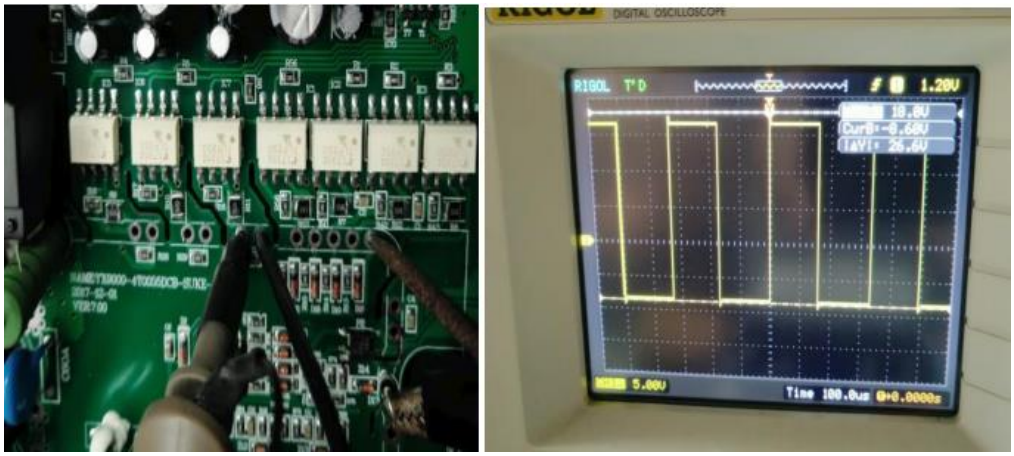


Figure. 8 Oscilloscope Measurement of the Driving Waveform, the Waveform is a Sinusoidal Waveform

2. Common Troubleshooting

1) No display on power-up keypad

Exhaustion Process:

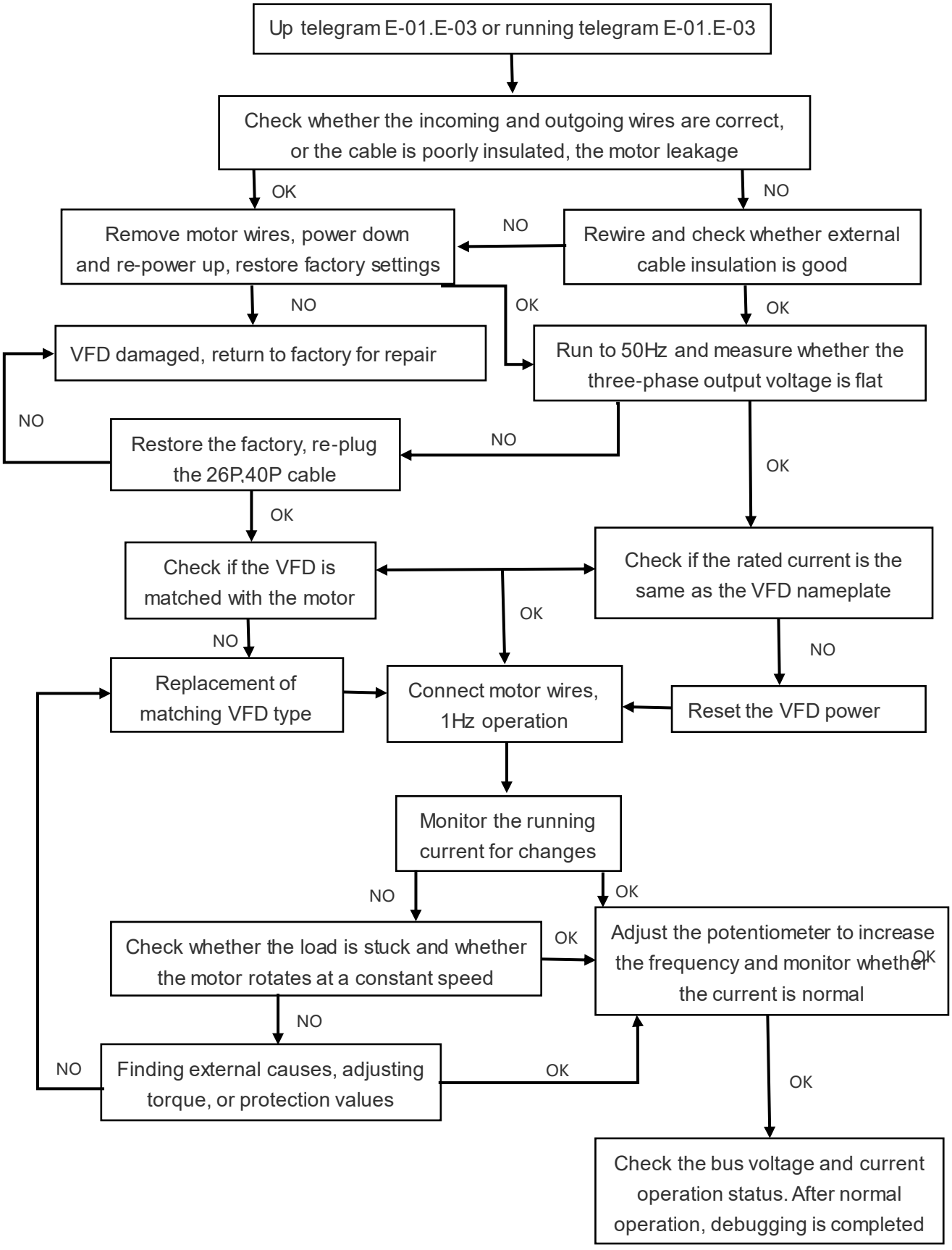
1. First, confirm whether the voltage at the RST terminal is normal (measured with a multimeter in AC mode), and check the terminal wiring for short circuits (control board 10V, 24V power supply, etc.).
2. Check that the keypad leads are correct, if not, re-plug the keypad leads or replace the keypad.
3. Measure the control board terminal 10V, 24V whether there is voltage, if not, then to measure the voltage between GND and +5V is 5V, such as Figure 9. **If still can not solve the problem, the VFD needs to be returned to the factory for repair and analysis!**

Figure. 9 Multimeter DC Gear, Black Pen on GND, Red Pen On +5V

Up telegram E-01.E-03 or running telegram E-01.E-03

2) Common Failure Analysis

A. E-01.E-03



Troubleshooting Measures

1. Firstly, check if the power and motor wires are wired correctly, ensure good insulation of external devices, and verify the motor direction.

2. Remove the motor wires, cut off the power and power on again, set P3.01=10/ Pd.01=1 to restore factory settings. Reconnect the 26P and 40P ribbon cables, run at 50Hz, and measure whether the three-phase outputs of U, V and W are balanced.

3. Run at low frequency, check the current of b-03/ b0.04, observe the operation and load of the motor.

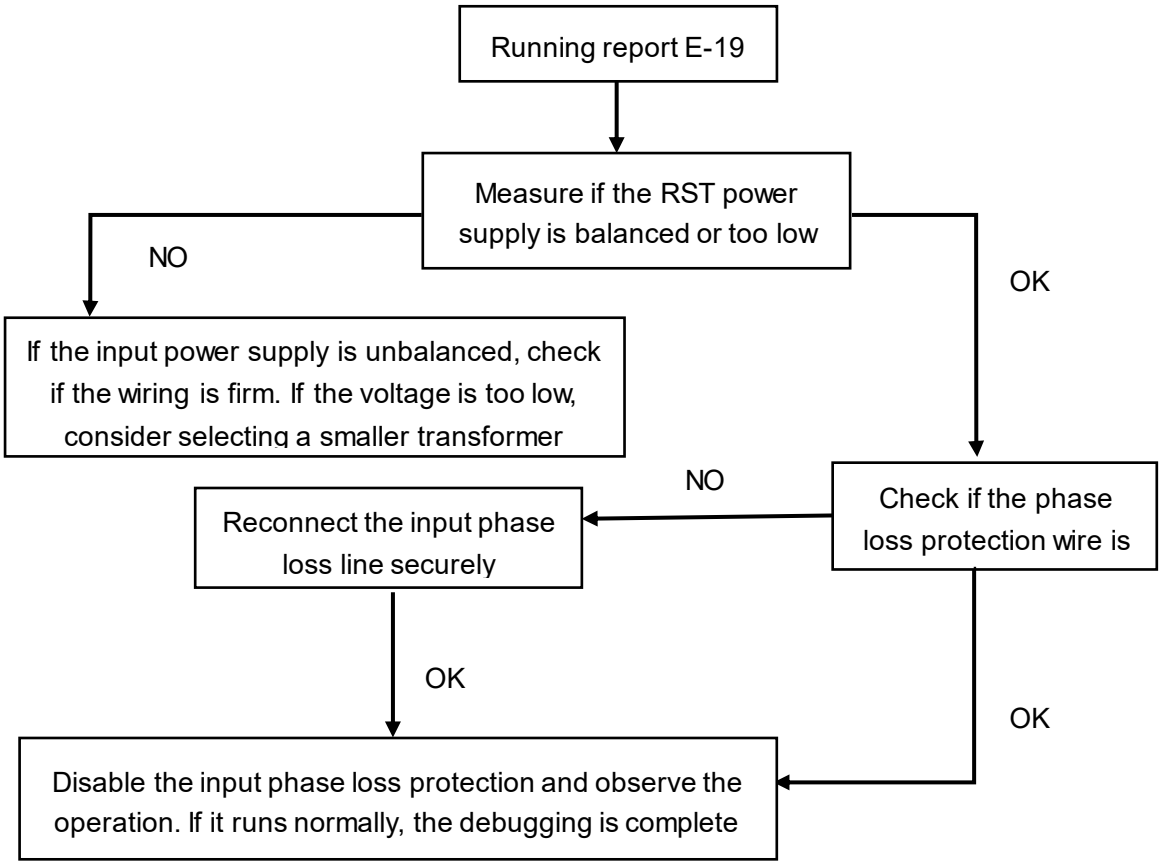
4. According to the actual load situation, adjust the parameters P0.09.P0.07.P5.04.P9.13 or P0.17, P0.18, and P0.22 of the old version of GK3000 machine to match the load. YX9000/ V9 machine adjusts whether the motor parameters of P0.00=0, P5.00, P5.01, P0.00=1, P8 group are correct, re-self-learning, and then adjust P8.10, etc.

5. If occasional interruptions occur during operation, search for external interference sources and eliminate them.

If the above measures fail to resolve the issue, the VFD needs to be replaced with a different model or returned to the factory for inspection.

B. E-19

Analysis Approach



Troubleshooting Measures

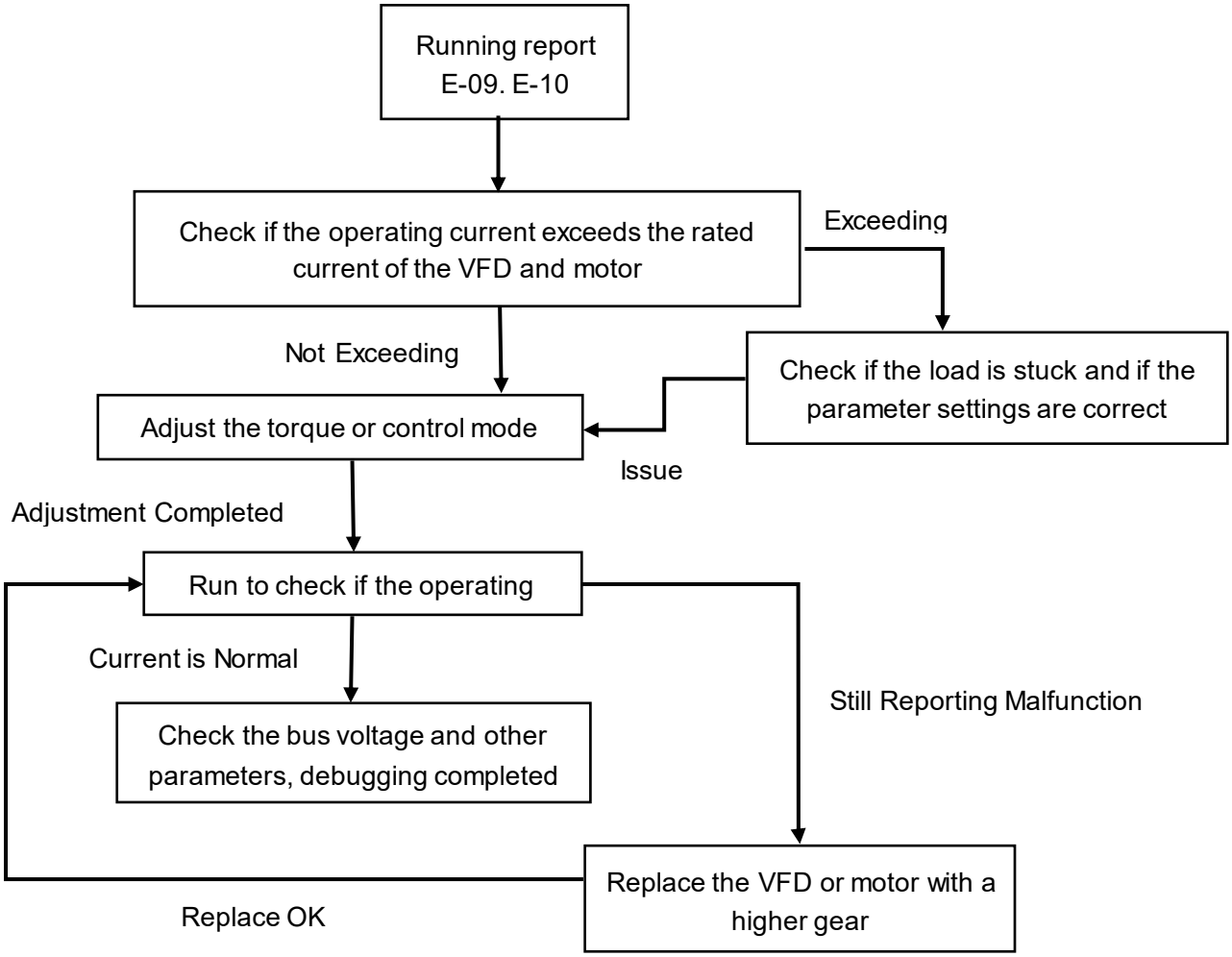
1. Firstly, measure whether the input power supply is normal. If it is normal, check whether the phase loss protection circuit of the input power supply is normal;

2. Set P5.11=0/ PA.12=10.

The above measures have not been resolved, and the VFD needs to be returned to the factory for repair.

C. E-09. E-10

Analysis Approach



Troubleshooting Measures

1. Check if the operating current of b-03/ b0.04 exceeds the rated current.

2. Recheck if there is any external load jamming or insufficient lubrication of the equipment bearings.

3. Verify if the motor is running in the correct direction.

4. For the old version of GK3000 machines, adjust parameters such as P0.09, P0.07, P5.04, P9.13, or P0.17, P0.18, P0.22, etc. For the new version of GK3000 machines, adjust P0.00=0, P5.00, P5.01, P0.00=1, ensure the P8 group motor parameters are correct, perform relearning, and then adjust parameters such as P8.10.

If the issue persists after taking the above measures, consider upgrading to a higher-rated VFD or replacing the motor.

4) Reporting Undervoltage and Overvoltage Faults

Troubleshooting Measures

1. First, confirm whether the input power supply is correct. For instance, if a 380V power supply is connected to a 220V source.

2. If the system reports POFF undervoltage fault and E-07 overvoltage fault, measure the voltage at both ends of the P+ and P- busbars to see if they are normal (around DC300V for 220V systems and around DC540V for 380V systems). If they are normal, then the busbar detection circuit may be faulty and needs recalibration. As shown in figure 10, 0-5V corresponds to 0-1000V in the software, so if the CVD voltage is around 2.6V, then the busbar voltage should be around 540V.

3. Due to the non-uniform direction of precise fine-tuning, it is necessary to monitor the changes in GND and CVD voltages for adjustment.

4. If the voltage between b-04/ b0.02 and CVD and GND is normal, it indicates that the bus detection circuit is damaged and needs to be returned to the factory for repair.

Note 5: If the motor is damaged, it will also report E-04.E-06.E-07. Special attention should be paid to this. At this time, the motor wire should be removed before running the VFD. If it is not reported, it means that the motor is damaged.

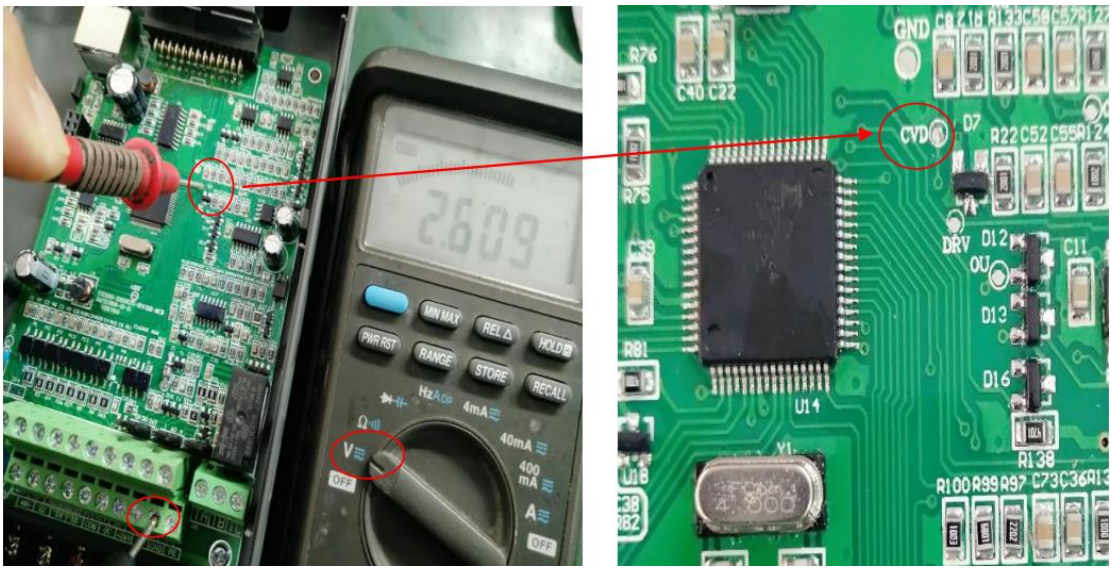


Figure. 10 Black Probe Placed on the GND Terminal of the Control Board, and Red Probe Placed on the CVD Point

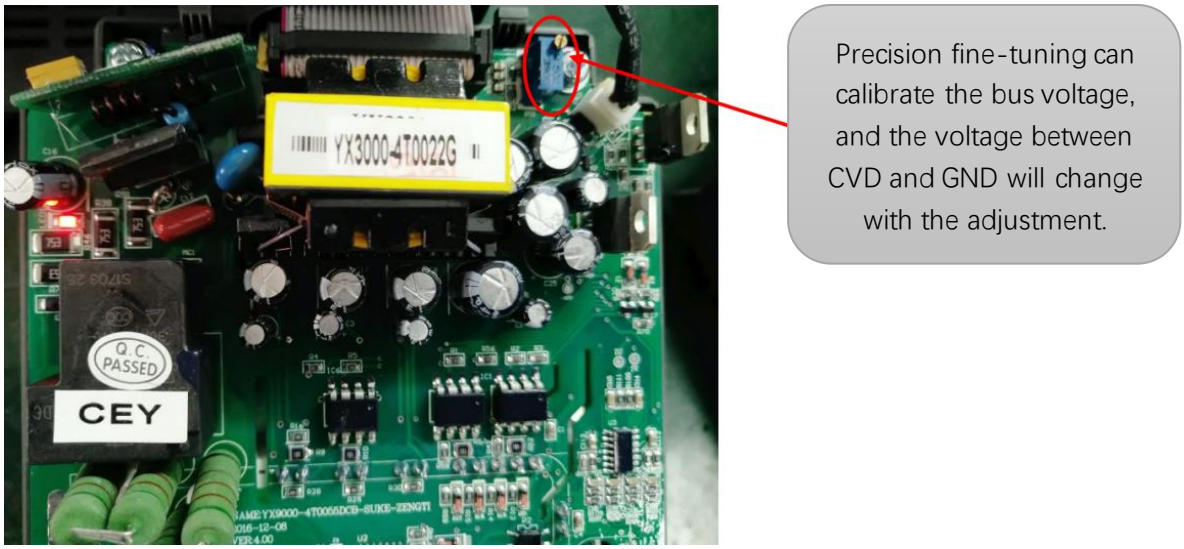


Figure. 11 Precise Adjustment can Calibrate the Bus Voltage of b-04

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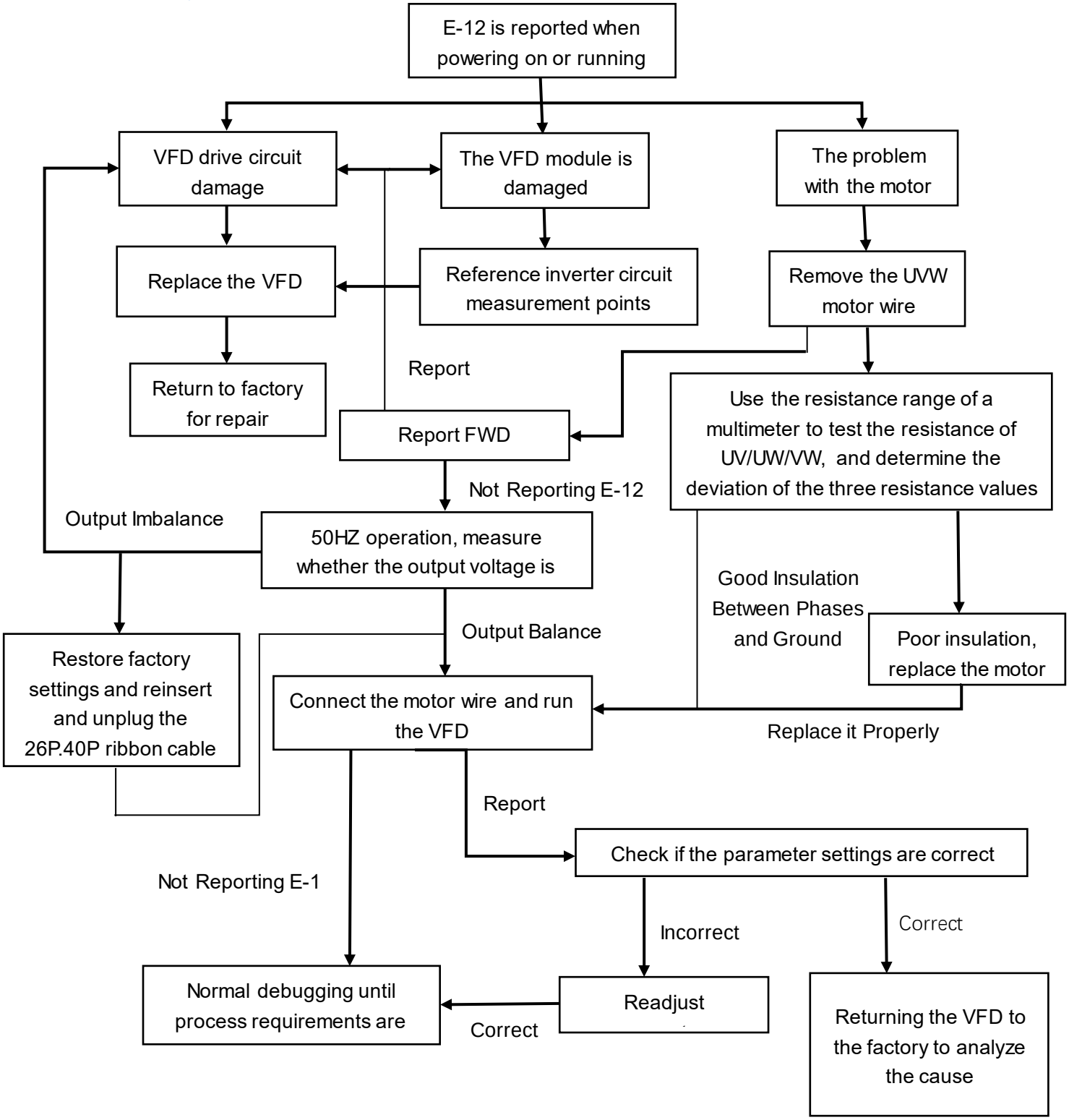
E-12

Analysis Approach



Troubleshooting Measures

1. If E-12 is reported upon power-up, confirm whether the wiring is correct first, restore the factory settings, then power off and on again.

2. If E-12 is reported during operation, first remove the UVW motor wire, and then run to measure whether the output voltage is balanced.

3. Measure the three-phase insulation and ground insulation of the UVW motor.

4. Motor lead wire breakage and poor insulation or motor burnout;

5. Check if the parameters of the VFD are set reasonably.

6. The old version of GK3000 reported E-12 as module inverter protection, while the new version of GK3000 reported this fault as output phase loss or significant current fluctuations.

If the above measures are not resolved, the VFD needs to be returned.

E-04.E-05.E-06.E-07 Fault Reported

Troubleshooting Measures

1. If E-04 fault is reported during operation, first ensure that the motor has come to a complete stop and check if the load is still in motion. Then, examine if the acceleration and deceleration times are too short and if the V/ F curve is set reasonably.

2. If E-05 overvoltage fault is reported, first confirm if the deceleration time is too short and if the load inertia is too high. If the load inertia is excessive, adding a braking resistor may be necessary. If the braking resistor is already added and E-05 persists, then adjust parameters P2.05, P2.06, P2.07, and P2.08 accordingly. Specific adjustments should be based on the on-site conditions, with suggested values (P2.05=2, P2.06=0.3, P2.07=0.1, P2.08=10).

3. If E-06 or E-07 overvoltage faults are reported, first confirm whether the input power supply is normal, and then check whether the b- bus voltage matches the actual bus voltage between P+ and P-. If not, refer to the analysis process for under voltage and overvoltage faults.

Note 6: Motor damage can also result in E-04, E-06, and E-07 faults. This should be given special attention. In such cases, disconnect the motor wires and run the variable frequency drive again. If the faults disappear, it indicates motor damage.

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E-11 Fault Reported

Troubleshooting Measures

1. When the VFD is powered on and running, an E-11 fault is reported. First, confirm whether the 26P or 40P ribbon cable is firmly inserted. If not, unplug and tighten the ribbon cable, check if there are any foreign objects on the 26P or 40P pins. If there are any, clean them thoroughly and reinsert the ribbon cable. Then, make sure that the VFD hears the sound of the main circuit contactor or relay closing during the power on process. If there is no sound of closing, for machines with 45kW and above, check whether the contactor signal wire on the SHORT terminal of the drive board is tightly inserted. If not, reinsert it or check if there is insulation oil on the SHORT terminal. If there is, clean it and then tighten the contactor signal wire.

2. For 75kW and 160kW machines, confirm whether the driver board has 24V first.

3. For machines above 185kW, check whether the transformer and power supply voltage are normal, and then confirm the signal

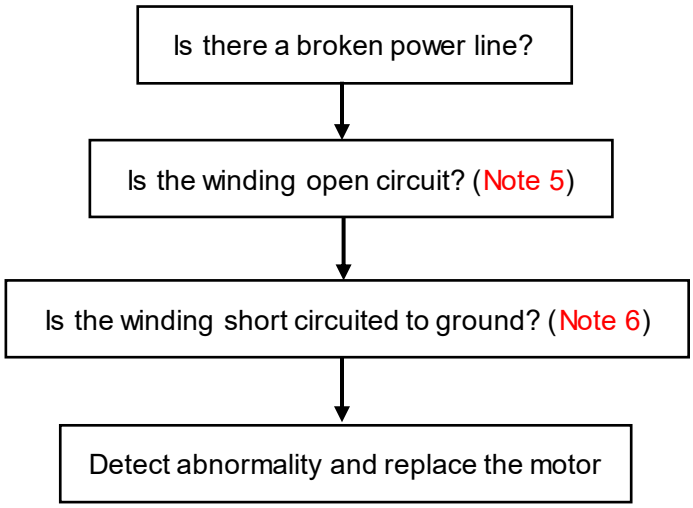
3. When reporting E-06 or E-07 overvoltage faults, first confirm whether the input power supply is normal, and then check whether the b-04 bus voltage matches the actual bus voltage between P+ and P-. If not, follow the analysis process for undervoltage and overvoltage faults for troubleshooting.

Note 6: Motor damage can also result in E-04, E-06, and E-07 faults. This should be given special attention. In such cases, disconnect the motor wires and run the VFD drive again. If the faults disappear, it indicates motor damage.

3. Motor Troubleshooting

1) **Motor Winding Detection**

Analysis Approach



Note 5: Method for detecting short circuit between three phases of motor with multimeter.

Use the resistance setting of the multimeter to detect the UV, UW, and VW phases (red, white, and black) respectively to check whether there is an open circuit. The phase-to-phase resistance of the motor is generally only a few ohms to more than ten ohms, and the deviation of the three groups of phase-to-phase resistances should be less than 10% is shown in figure 12.

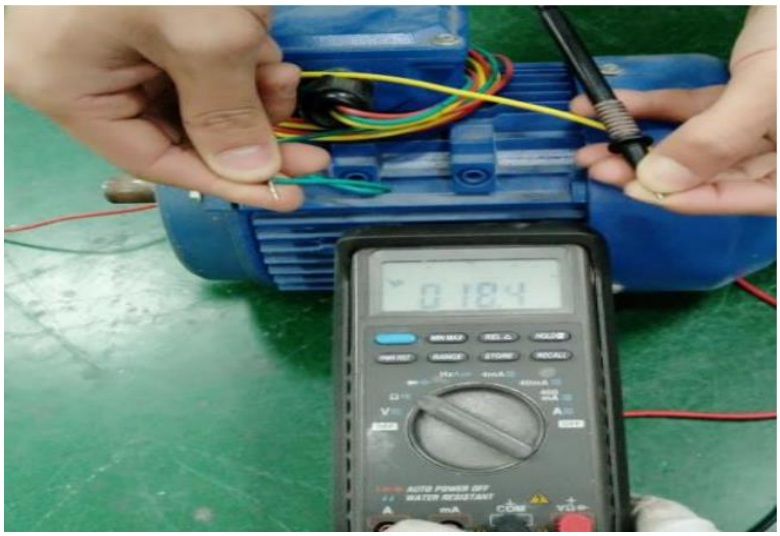


Figure. 12 Check if the winding is Open Circuit

Note 6: The method of using a multimeter to detect whether there is a short circuit between the three-phase and the casing

Use a multimeter to test whether there is a short circuit between the U, V, and W wires and the motor casing using the resistance range. Normally, the resistance values of the three phases of the motor to ground are all infinite, as shown in figure 13.

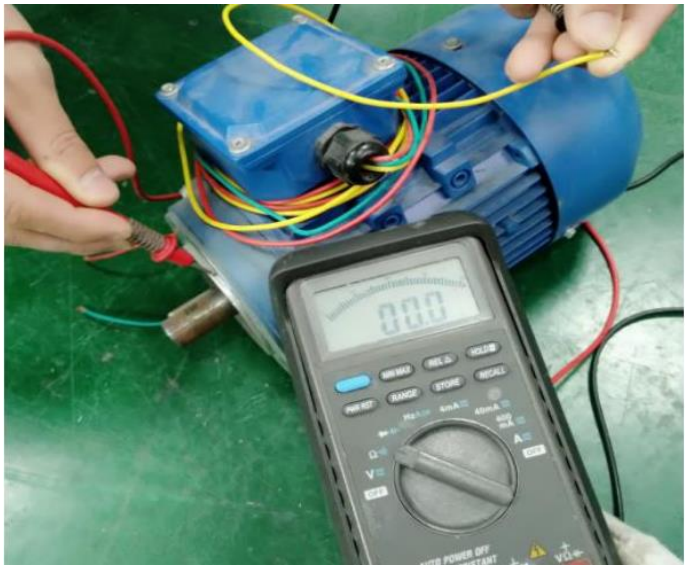


Figure 13: Short Circuit Detection Between UVW Line and Casing