Danfoss Drive Preventive Maintenance Instruction

1. PM Checklist

Check box	Preventative Maintenance Step
☐	Vacuum dust and dirt from heat sink fins
☐	Clean or replace as conditions require intake air filters (125 Hp constant torque models, 150 Hp variable torque models and larger have filters located behind the intake louver panels)
☐	Check ventilation fans for proper operation and clean as needed.
☐	Confirm VFD's ventilation clearances have not been obstructed
☐	Check electrical connections and re-torque as needed. If possible, perform an IR thermal scan of the VFD's power input and power output.
☐	Check line voltage
☐	Check motor & output phase balance
☐	Inspect DC buss capacitors (older drives)
☐	Record the VFD's parameter settings using MCT-10
☐	Confirm the VFD doors and covers are in place and properly closed

2. Clean the drive's interior.
    a. Dirt coating drive circuit boards and other components can interfere with proper cooling and even provide a path for electricity to short out along unintended paths. This can cause erratic operation and possibly damage to drive components.
    b. Corroded electrical connections can cause excess heat build-up, short circuits, erratic drive operation, and even component damage.
    c. This should be done after the installation of the drives is complete and before power is applied to the drive. The main point here is to ensure that no metal filings or other installation-related dirt are inside the drive or its option enclosure.
    d. If the drive is installed in an area where a lot of construction work will be performed, it is best to keep the drive covered while it is not in operation. Of course, if it is being used, the drive must be uncovered so that cooling air can be freely supplied to it. After the construction is complete it will be important to clean the interior of the drive. Low pressure, clean, dry air or similar commercial products can be used to clean dirt off of circuit boards. While a vacuum cleaner ca be used to collect falling dirt, it is important to ensure that circuit boards are not damaged by the use of a powerful vacuum cleaner on the boards. Inspect drive connectors for dirt or corrosion.
    e. In a normal environment, the drive's interior should be inspected annually and cleaned, if necessary. In dirty environments, more frequent inspection is required. The level of dirt found inside the drive can be used to dictate the frequency of inspections and cleanings that is required.

3. Clean air filters (if any).
    a. Many VLT drives have no air filters. However, some sizes and enclosure styles do use air filters in conjunction with their fan cooling systems. For these drives it is important to periodically inspect and clean or replace the filter element.

b. Because the loading of the air filters can vary dramatically from one installation to another, it is important to initially check the air filters frequently to establish the required inspection interval.

4. Check the tightness of connections.
    a. Loose power connections can cause extra heating and/or arcing. The heating reduces efficiency and can actually melt down connectors. The arcing can cause intermittent currents and electrical noise. These can disrupt the operation of the drive.
    b. Loose or corroded ground connections can cause electrical noise problems. All of the VLT drives have some degree of electrical noise filtering. Some of this electrical noise is sunk to earth ground. Without a reliable ground connection the noise filters cannot operate as designed. In addition, a poor ground connection can become a safety issue.
    c. Loose control wires can cause intermittent operation of equipment. Loose or missing shielding for signal wires can cause erratic operation of the drive. In a extreme case this can even cause the drive to trip off.
    d. The preventive maintenance procedure would involve first turning off power to the drive and waiting until the DC bus capacitors have discharged to a safe level. Then all of the accessible connections should be inspection for corrosion and checked for tightness. It should not be necessary to disassemble the drive to perform this operation.
    e. This should be performed once the drive is installed and at least annually afterward. If the drive is subjected to vibration or wide temperature variations, it should be checked more frequently.
5. Check cooling fans.
    a. Cooling fans are used to remove heat from the drive. Proper operation of the cooling fans helps ensure long drive life by keeping the drive's components cool. The cooling system should be inspected at least annually, more frequently when the drive is exposed to extreme conditions.
    b. Inspect the heat sinks, air inlets, and air outlets to ensure that there is an open path for air flow.
    c. The cooling fans in many VLT drives will turn themselves off when the drive's temperature is low enough to not require forced ventilation. To check for proper fan operation if the fans are not running, remove power from the drive. When power is reapplied the fans should start and run for a few seconds.
    d. Listen for unusual noises from the fans when they are running.
    e. The VLT drives use a heat sink temperature sensor to help indicate if there is a problem with the cooling system. If the drive issues a HEAT SINK OVERTEMP. warning or alarm, check the cooling system carefully.
6. Check bus capacitors for voltage balance and/or physical damage.
    a. The large DC bus capacitors in the drives are subject to deterioration over an extended period of time. It generally takes a significant number of years before any problems occur, although high ambient temperatures and other factors can accelerate this process.
    b. Problems with the DC bus capacitors generally first show up as a large "AC ripple voltage" being superimposed on the DC bus. The VLT 6000 continually monitors for excessive DC bus ripple, so it will generally provide an early warning of bus capacitor problems. If the drive gives a MAINS PHASE LOSS warning or alarm and a check of the input AC power line shows it to be balanced under loaded conditions, the DC bus capacitors should be checked carefully.
    c. On drives with an input power line voltage of 380 V AC or larger, the DC bus capacitors are connected as two banks that are in series with each other. With power applied to the drive, the voltage across the positive half should be within 10% of the voltage across the negative half.

d. With power removed from the drive, a physical inspection of the capacitors should not show any deformation of the cases of the capacitors or liquid leaking from them.

e. Low voltage capacitor testers are of no use in checking DC bus capacitors. The main concern is to ensure that the capacitors don't have excessive leakage current when the DC bus voltage is applied to it. This cannot be tested at a low voltage.

f. If one capacitor on the DC bus is found to be weak or damaged, it is important to replace the entire capacitor bank. A capacitor with an excessive amount of leakage current places excessive stress on other capacitors in the bank.

g. If it is convenient to access the two halves of the DC bus capacitors, the inspection technique given in "c" and "d" can be performed annually. Otherwise, it is best to simply let the drive's internal monitoring circuitry described in "b" provide an indication of possible problems.