



# Mean Time Between Failures

## VLT® 6000 Series

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### **MTBF Methods**

Many customers consider MTBF (Mean Time Between Failures) the same as the expected lifetime for a drive. This is not the case and will often lead to misunderstandings, since the MTBF can be estimated using many different methods: Part Count/Part Stress Prediction, Controlled Endurance Tests, Experiments or Registration of Field Failures.

All above methods have their own justification, but only few methods produce reliable MTBF figures for VLT® drives.

### **Danfoss Drives policy on MTBF**

We at Danfoss Drives Division believe that handing out MTBF figures on request, will only cause confusion amongst the customers, since we realize that many MTBF figures are not accompanied by the conditions under which they were calculated. Many of the MTBF figures will then be almost worthless, since it is difficult to compare different figures the origin of which is unknown.

We believe that our customers should be offered a dialogue about the interpretation of MTBF and its use, so the customer can use the MTBF figures the way they were intended and derived.

Remember that MTBF and expected lifetime is not the same thing!

### **How we calculate**

We base our calculations on the following assumptions:

- We estimate the average operating time per unit to 6,000 hours/year.
- We estimate the average operating conditions as not exceeding specifications.
- All failures seen on the market during the warranty period are used for the calculations of the MTBF figures.
- We only calculate the MTBF with a 60% confidence level.

All of our MTBF figures are calculated based on feedback from our world wide Service Shops. Since all failures, at least within the warranty period, are reported to our database in Graasten, we have a very good basis for calculating the real MTBF based on what our customers are experiencing on the entire world market.

Since we include all failures (software and hardware failures as well as application problems and transportation damage) in our calculation we end up with MTBF figures that relates to reality and not to theoretic calculations.



We know that our MTBF figures are average figures and that probably no customer will see exactly the same MTBF as we state, but we claim that the MTBF figures are based on the best test we can ever make; the installations and operation at our customers' facilities.

The MTBF varies from customer to customer as a function of operating time, load, environment (temperature, vibration, humidity) and applications

**MTBF figures**

The below calculations cover the entire VLT<sup>®</sup> drive including both mechanical and electronic parts and is valid for drives manufactured after January 1<sup>st</sup>, 2000.

**VLT 6002 - 6008      Average MTBF (60% C.L.) = 400,000hours**

**VLT 6011 - 6072      Average MTBF (60% C.L.) = 300,000hours**

**VLT 6075 - 6550      Average MTBF (60% C.L.) = 200,000hours**

If further information or discussion is required, please do not hesitate to contact your Danfoss Drives Representative.