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MANUFACTURER'S DECLARATION

Danfoss A/S

Danfoss Drives

MTBF (Mean Time Between Failures)

Product category: Frequency Converter

Type designation(s): VLT® HVAC Basic Drive FC-101 Series

**Danfoss Drives
policy on MTBF**

We at Danfoss Drives believe that handing out MTBF figures on request, will only cause confusion among 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 figures where the origins are 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!

MTBF figures:

The below calculations cover the entire VLT® HVAC Basic Drive FC-101 series including both mechanical and electronic parts and is valid for drives manufactured after April 2017.

VLT® HVAC Basic Drive series FC-101 (FC-101PK25-FC-101P90K) T2, T4, T6

Average MTBF_(60%C.L.) = 1.000.000 hours

<p>Date: 2018.11.26 Place of issue: Graasten</p>	<p>Issued by  Signature: Name: Lars Jensen Title: Quality Engineer</p>	<p>Date: 2018.11.26 Place of issue: Graasten</p>	<p>Approved by  Signature: Name: Ole Jensen Sondergard Title: Director Market Quality Management</p>
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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.

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.
- 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 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 tests we can 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.