

# SOFASCO INC.

## MTTF REPORT

<b>MODEL NO:</b> DF30098V24				
<b>BEARING</b>	<b>VOLTAGE(V)</b>	<b>CURRENT(A)</b>	<b>SPEED(RPM)</b>	<b>TEST VOLTAGE(V)</b>
BALL BEARING	24	0.18	3200	24
<b>TESTED QTY/PCS</b>	<b>TEST HRS/EA</b>		<b>TOTAL HRS</b>	<b>TEST TEMPERATURE/ °C</b>
60	1800		108000	70

1. According to the equation of product accumulation failure rate,

$$\odot 10\% = 1 - e^{-\lambda t} \quad \odot t \rightarrow L_{10} \quad \odot L_{10} = 0.10536/\lambda \quad \odot \text{MTTF} = 1/\lambda$$

$$\odot \text{MTTF}/L_{10} = (1/\lambda)/(0.10536/\lambda) \approx 9.5 \quad \text{So we get the result, } \text{MTTF} \approx 9.5 * L_{10}$$

2. According to the equation for **Arrhenius Model**

$$A_F = e^{\Delta H/KT} = e^{\{(\Delta H/K) \times [(1/T_u) - (1/T_s)]\}}$$

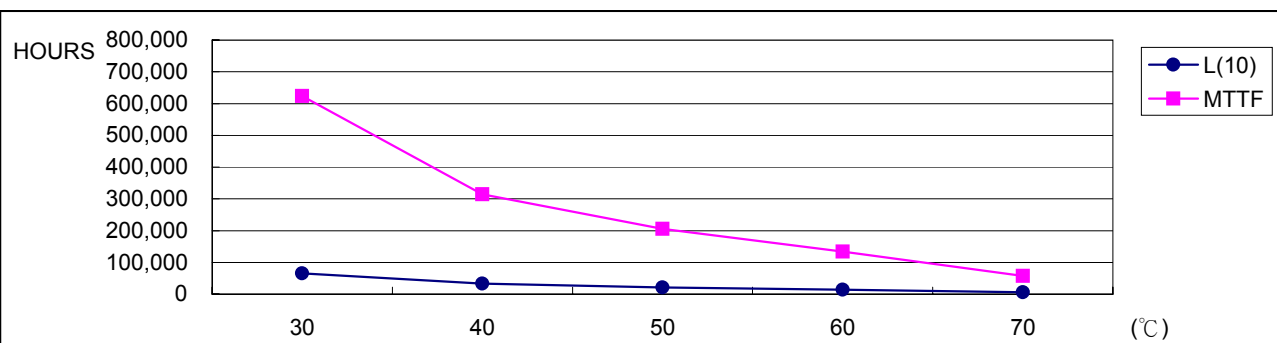
where,  $A_F$  is acceleration factor,  $e$  is natural logarithm (2.713),  $\Delta H$  is activation energy,

$K$  is Boltzmann's constant ( $8.623 \times 10^{-5}$  eV/°K),  $T$  is absolute temperature (°K),

$T_u$  is unstress temperature (°K),  $T_s$  is stress temperature (°K), and the confidence level is equal to 0.90 (90%)

Herewith, we could assume as right on the basis of above test result. Besides, if the actual test time exceeded the required, it comes out that those fans L10 expectancy and MTTF are greater than the warrant. (MTTF: means Mean Time To Failures, it should be used in a non-repairable system setting. Now we show the MTTF in our life report, that's because we will not repair the failed fans during life experiment. MTBF: means Mean Time Between failures, it should be used in a repairable system setting. Basically, MTBF is equal to MTTF, they use same formula to work out a life data.)

Temperature For MTTF Estimation (°C)	Acceleration Factor $A_F$	Estimated MTTF(hours)	Estimated $L_{10}$ (hours)
<b>30</b>	<b>10.78</b>	<b>623,569</b>	<b>65,639</b>
<b>40</b>	<b>5.43</b>	<b>314,098</b>	<b>33,063</b>
<b>50</b>	<b>3.55</b>	<b>205,350</b>	<b>21,616</b>
<b>60</b>	<b>2.32</b>	<b>134,200</b>	<b>14,126</b>
<b>70</b>	<b>1</b>	<b>57,845</b>	<b>6,089</b>



<b>APPROVED BY</b>	<b>ISSUED DATE</b>	<b>CHECKED BY</b>	<b>PREPARED BY</b>
MICHAEL WANG	2008.12.04	LILY TSAI	LUCY KUO