



# DC FAN LIFE EXPERIMENT REPORT

Available for these models with lower speed and same physical structure. All model may be followed by Rxx or Fxx series suffixes. This test report applies to GFM 80x80x90.0 mm series as the right table	GFM0812DUA02				
	GFM0812DUB7S				

**Representative Test P/N : GFM0812DUA08**

**Equipment: 1.Oven: E24-F0030** On/Off Cycles: Every 500 hours

☉ **L<sub>10</sub> Expectancy:** **70,000** hours minimum @ fan rated voltage and the temperature of 40°C

According to the equation for **Weibull distribution**, **MTTF  $\cong$  7xL10 = 490,000 hours**

And we rely on a zero failure Weibull test strategy and accelerated testing technique, to determine the total test time (t) for verifying the above life estimation by the equations,

$$t = 1.036 \times \text{MTTF} \times [(\text{B}_{r,c}) \div n]^{0.91} \div \text{A}_F, \text{ and } \text{A}_F = 2^{(\text{T}_s - \text{T}_u)/10}$$

where, (B<sub>r,c</sub>) is Poisson distribution factor with the failure number of r equal to 0 and the decimal confidence level of c equal to 0.90(90%).

Stress/Elevated Temperature Ts (°C) (Actual Test Temperature)	Unstress Temperature Tu (°C)	Acceleration Factor A <sub>F</sub>	Quantity of Test Devices n (pcs)	Poisson Distribution Factor B <sub>r,c</sub>	Required test time with zero failure t (hours)	Actual test time with zero failure t (hours)	Verified MTTF 40 °C (hours)	Verified L <sub>10</sub> 40 °C (hours)
70	40	8.00	50	2.303	3,856	4,032.0	512,420	73,203

### Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2014/10/15 3:10 PM	2015/3/25 6:45 AM	<input type="checkbox"/> In process	<input type="checkbox"/> In process (exceed requested)	<input checked="" type="checkbox"/> Termination	4032.0

Herewith , we could assume as right on the basis of above test result. Besides, if the actual test time exceed the required, it comes out that those fans' L<sub>10</sub> 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.

Temperature for MTTF Estimation (°C)	Acceleration Factor A <sub>F</sub>	Estimated MTTF (hours)	Estimated L <sub>10</sub> (hours)
25	22.63	1,449,342	207,049
30	16.00	1,024,840	146,406
40	8.00	512,420	73,203
50	4.00	256,210	36,601
60	2.00	128,105	18,301
70	1.00	64,052	9,150

Fan permission criteria for the measurement after test :

1. Speed can not drop of  $\geq 15\%$  below the original measured rpm.
2. Current cannot increase  $> 15\%$  of original measure current.

<b>Test Result</b>	<input checked="" type="checkbox"/> <b>Accept</b>
	<input type="checkbox"/> <b>Reject</b>

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG14FNL099	0.00	2015/3/31	NaNa.Wang	Tim Yi



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	GFM0812DUB7S				

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
3,856	2014/10/15 3:10 PM	2015/3/25 6:45 AM	50	0	<b>4032.0</b>

Representative Test P/N : GFM0812DUA08	<b>Current Test Status</b>	<input type="checkbox"/>	In process	<input type="checkbox"/>	In process (exceed requested)	<input checked="" type="checkbox"/>	Termination
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Equipment: 1.Oven: E24-F0030	On/Off Cycles: Every 500 hours
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### Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (A)	Final Test Current Spec. (A)	Deviation (%)	Initial Test Speed Spec. (RPM)	Final Test Speed Spec. (RPM)	Deviation (%)
	<b>10.8Max.</b>	<b>10.8Max.</b>		<b>12420-15180</b>	<b>12420-15180</b>	
1	8.47	8.53	0.7	13035	13394	2.8
				12719	12751	0.3
2	8.38	8.53	1.7	13152	13404	1.9
				12679	12749	0.6
3	8.39	8.55	1.8	13141	13425	2.2
				12694	12631	-0.5
4	8.45	8.56	1.3	13100	13374	2.1
				12734	12752	0.1
5	8.44	8.63	2.3	13131	13664	4.1
				12735	12590	-1.1
6	8.43	8.52	1.0	13193	13421	1.7
				12669	12747	0.6
7	8.41	8.55	1.6	13207	13424	1.6
				12673	12615	-0.5
8	8.47	8.53	0.6	13236	13423	1.4
				12713	12738	0.2
9	8.46	8.62	1.9	13247	13563	2.4
				12637	12594	-0.3
10	9.15	8.59	-6.2	13562	13388	-1.3
				13130	12666	-3.5
11	8.49	8.51	0.2	13178	13385	1.6
				12695	12301	-3.1
12	8.44	8.63	2.3	13217	13653	3.3
				12681	12601	-0.6
13	8.60	8.57	-0.4	13259	13389	1.0
				12789	12648	-1.1
14	8.67	8.64	-0.3	13550	13392	-1.2
				12674	12626	-0.4
15	8.73	8.60	-1.5	13495	13600	0.8
				12687	12586	-0.8
16	8.36	8.56	2.4	13102	13395	2.2
				12672	12633	-0.3
17	8.36	8.58	2.6	13107	13550	3.4
				12675	12642	-0.3
18	8.36	8.57	2.6	13171	13468	2.3
				12627	12655	0.2

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3,856	2014/10/15 3:10 PM	2015/3/25 6:45 AM	50	0	<b>4032.0</b>			
Representative Test P/N : GFM0812DUA08			<b>Current Test Status</b>	<input type="checkbox"/> In process	<input type="checkbox"/> In process (exceed requested)	<input checked="" type="checkbox"/> Termination		
Equipment: 1.Oven: E24-F0030				On/Off Cycles: Every 500 hours				
<b>Test Data Between Initial Test and Final Test</b>								
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	<b>10.8Max.</b>	<b>10.8Max.</b>		<b>12420-15180</b>	<b>12420-15180</b>			
19	8.34	8.56	2.7	13199	13550	2.7		
				12637	12637	0.0		
20	8.37	8.53	1.8	12863	13524	5.1		
				12636	12641	0.0		
21	8.42	8.59	2.0	12888	13506	4.8		
				12641	12635	0.0		
22	8.46	8.60	1.7	12849	13431	4.5		
				12559	12635	0.6		
23	8.44	8.54	1.3	12882	13544	5.1		
				12571	12628	0.5		
24	8.46	8.62	1.9	13046	13417	2.8		
				13060	12647	-3.2		
25	8.44	8.54	1.3	13064	13563	3.8		
				12654	12639	-0.1		
26	8.39	8.59	2.5	13051	13447	3.0		
				12623	12644	0.2		
27	8.47	8.54	0.8	12985	13463	3.7		
				12657	12703	0.4		
28	8.25	8.68	5.1	12925	13449	4.1		
				13819	12750	-7.7		
29	8.55	8.54	-0.1	12946	13403	3.5		
				12415	12559	1.2		
30	8.29	8.51	2.7	12949	13485	4.1		
				13805	12693	-8.1		
31	8.32	8.64	3.8	12927	13464	4.2		
				12503	12707	1.6		
32	7.79	8.55	9.9	13136	13360	1.7		
				13278	12585	-5.2		
33	7.60	8.56	12.6	13057	13444	3.0		
				13468	12713	-5.6		
34	8.13	8.66	6.6	13073	13424	2.7		
				12675	12720	0.4		
35	8.23	8.55	3.9	13048	13372	2.5		
				12648	12579	-0.5		
36	9.52	8.54	-10.2	14124	13453	-4.8		
				12670	12703	0.3		
37	8.43	8.52	1.1	12861	13294	3.4		
				12670	12683	0.1		
<b>QE File No.</b>	<b>Time-out for function test or others (hours)</b>		<b>Issued Date</b>		<b>Reported By</b>		<b>Approved By</b>	
DG14FNL099	0.00		2015/3/31		NaNa.Wang		Tim Yi	



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Sample No.	Initial Test Current Spec. (A)	Final Test Current Spec. (A)	Deviation (%)	Initial Test Speed Spec. (RPM)	Final Test Speed Spec. (RPM)	Deviation (%)
	<b>10.8Max.</b>	<b>10.8Max.</b>		12420-15180	12420-15180	
				11880-14520	11880-14520	
38	8.43	8.54	1.3	13086	13374	2.2
				12695	12579	-0.9
39	8.42	8.69	3.2	13027	13445	3.2
				12625	12763	1.1
40	8.30	8.47	2.1	13043	13377	2.6
				12637	12681	0.3
41	8.26	8.49	2.8	12868	13406	4.2
				12519	12552	0.3
42	8.45	8.57	1.4	13043	13299	2.0
				12611	12626	0.1
43	8.38	8.54	2.0	13024	13331	2.4
				12652	12629	-0.2
44	8.41	8.52	1.3	13051	13305	1.9
				12622	12619	0.0
45	8.22	8.45	2.9	12916	13400	3.7
				12628	12607	-0.2
46	8.37	8.48	1.4	13036	13339	2.3
				12646	12617	-0.2
47	8.53	8.46	-0.8	13079	13416	2.6
				13437	12613	-6.1
48	8.25	8.50	3.0	12924	13391	3.6
				12638	12630	-0.1
49	8.30	8.47	2.1	12865	13301	3.4
				13467	12588	-6.5
50	8.35	8.46	1.2	13261	13305	0.3
				13395	12584	-6.1
X-Bar	8.412	8.555	-	12946.2	13037.1	-
$\sigma$	0.263	0.056	-	318.806	404.878	-

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