

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 GFM40x40x 56.0 mm series as the right table	GFC0412DS-CMA5

Representative Test P/N :GFC0412DS-AM1S	
Equipment: 1. Oven:E24-T0165	On/Off Cycles: Every 500 hours

◎ **L₁₀ Expectancy: 30,000 hours minimum @ fan rated voltage and the temperature of 55°C**
 According to the equation for **Weibull distribution**, $MTTF \cong 7 \times L_{10} = 210,000$ 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,

$$t = 1.036 \times MTTF \times [(B_{r,c}) \div n]^{0.91} \div A_F, \text{ and } A_F = 2^{(T_s - T_u)/10}$$

where, (B_{r,c}) 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 T _s (°C) (Actual Test Temperature)	Unstress Temperature T _u (°C)	Acceleration Factor A _F	Quantity of Test Devices n (pcs)	Poisson Distribution Factor B _{r,c}	Required test time with zero failure t (hours)	Actual test time with zero failure t (hours)	Verified MTTF 40 °C (hours)	Verified L ₁₀ 40 °C (hours)
70	55	2.83	56	2.303	4,216	12,216.0	608,524	86,932

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2011/5/19 2:30 PM	2012/6/23 5:12 AM	<input type="checkbox"/> In process	<input type="checkbox"/> In process (exceed requested)	<input checked="" type="checkbox"/> Termination	12216.0

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' 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.)

- 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.
 3. Noise cannot $> 3\text{dB}$ over the original measure noise.

Temperature for MTTF Estimation (°C)	Acceleration Factor A _F	Estimated MTTF (hours)	Estimated L ₁₀ (hours)
25	22.63	4,868,194	695,456
30	16.00	3,442,333	491,762
40	8.00	1,721,166	245,881
50	4.00	860,583	122,940
55	2.83	608,524	86,932
60	2.00	430,292	61,470
70	1.00	215,146	30,735

Test Result	<input checked="" type="checkbox"/> Accept <input type="checkbox"/> Reject
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QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG11FNL061	5399.00	2013/3/5	Chaoping.Duan	Tim.Yi



DC FAN FUNCTION TEST RECORD FOR LIFE EXPERIMENT

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Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)				
4,216	2011/5/19 2:30 PM	2012/6/23 5:12 AM	56	0	12216.0				
Representative Test P/N :GFC0412DS-AM1S			Current Test Status		<input type="checkbox"/> In process	<input type="checkbox"/> In process (exceed requested)	<input checked="" type="checkbox"/> Termination		
Equipment: 1. Oven:E24-T0165				On/Off Cycles: Every 500 hours					
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 (%)	Initial Test Noise Spec. (dB A)	Final Test Noise Check. (dB A)	Deviation
	1.82Max.	1.82Max.		15390-18810	15390-18810		68.0 Max	68.0 Max	
1	0.95	0.92	-3.8	16989	17060	0.4	63.3	62.8	-0.5
				16576	16455	-0.7			
2	0.93	0.90	-2.5	16913	16989	0.4	64.3	63.6	-0.7
				16589	16666	0.5			
3	0.98	0.91	-7.2	17148	17083	-0.4	63.1	62.6	-0.5
				16547	16586	0.2			
4	0.91	0.94	3.0	17125	17134	0.1	63.2	63.0	-0.2
				16585	16587	0.0			
5	0.95	0.93	-2.4	17134	16902	-1.4	63.7	63.1	-0.6
				16568	16596	0.2			
6	0.96	0.92	-4.0	17030	17126	0.6	63.4	62.5	-0.9
				16511	16304	-1.3			
7	0.93	0.87	-7.0	17093	16616	-2.8	63.1	63.3	0.2
				16418	16420	0.0			
8	0.93	0.91	-2.6	16718	17085	2.2	63.2	62.7	-0.5
				16435	16520	0.5			
9	0.94	0.93	-1.0	16953	16938	-0.1	63.0	63.5	0.5
				16575	16402	-1.0			
10	0.91	0.91	0.3	16863	16870	0.0	63.7	63.0	-0.7
				16537	16545	0.0			
11	0.94	0.92	-2.3	16887	17202	1.9	63.6	62.6	-1.0
				16433	16508	0.5			
12	0.95	0.88	-7.7	16876	16698	-1.1	63.5	63.1	-0.4
				16592	16504	-0.5			
13	1.00	0.94	-5.8	16952	16976	0.1	63.4	62.7	-0.7
				16581	16579	0.0			
14	0.90	0.95	5.6	16824	16965	0.8	63.1	62.9	-0.2
				16479	16565	0.5			
15	0.98	0.93	-4.9	17037	16910	-0.7	63.0	63.4	0.4
				16608	16584	-0.1			
16	0.99	0.96	-3.5	17012	17020	0.0	63.0	62.8	-0.2
				16555	16455	-0.6			
17	0.95	0.92	-3.3	17112	16990	-0.7	63.2	62.3	-0.9
				16588	16402	-1.1			
18	0.96	0.90	-6.4	16983	16777	-1.2	63.0	62.6	-0.4
				16602	16505	-0.6			
19	0.95	1.01	6.1	16970	16824	-0.9	63.6	63.0	-0.6
				16623	16621	0.0			
20	0.94	0.92	-2.5	16945	16980	0.2	63.7	62.5	-1.2
				16438	16410	-0.2			
QE File No.	Time-out for function test or others (hours)		Issued Date	Reported By		Approved By			
DG11FNL061	5399.00		2013/3/5	Chaoping.Duan		Tim.Yi			



DC FAN FUNCTION TEST RECORD FOR LIFE EXPERIMENT

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GFC0412DS-CMA5				

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
4,216	2011/5/19 2:30 PM	2012/6/23 5:12 AM	56	0	12216.0

Representative Test P/N :GFC0412DS-AM1S	Current Test Status	<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-T0165 On/Off Cycles: Every 500 hours

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 (%)	Initial Test Noise Spec. (dB A)	Final Test Noise Check. (dB A)	Deviation
	1.82Max.	1.82Max.		15390-18810 14850-18150	15390-18810 14850-18150		68.0 Max	68.0 Max	
21	0.93	0.93	0.0	17091	16993	-0.6	63.5	62.7	-0.8
				16421	16462	0.2			
22	0.93	0.92	-0.8	16932	17078	0.9	63.1	62.9	-0.2
				16632	16547	-0.5			
23	0.93	0.89	-4.7	16974	17011	0.2	63.3	63.4	0.1
				16462	16549	0.5			
24	0.95	0.90	-5.1	17009	16945	-0.4	63.1	63.1	0.0
				16514	16484	-0.2			
25	0.93	0.91	-2.4	17104	17129	0.1	63.0	62.6	-0.4
				16517	16644	0.8			
26	0.93	0.89	-4.5	16799	16950	0.9	63.0	63.0	0.0
				16558	16581	0.1			
27	0.92	0.92	0.4	16771	17113	2.0	63.1	62.8	-0.3
				16563	16593	0.2			
28	0.94	0.91	-3.2	16909	17022	0.7	63.0	63.3	0.3
				16661	16539	-0.7			
29	0.90	0.93	2.5	17087	17043	-0.3	63.2	63.0	-0.2
				16403	16710	1.9			
30	0.94	0.94	-1.0	16675	17252	3.5	63.2	62.6	-0.6
				16596	16608	0.1			
31	0.93	0.92	-0.8	16673	16901	1.4	63.7	62.9	-0.8
				16504	16553	0.3			
32	0.95	0.88	-7.6	17060	16942	-0.7	63.5	63.3	-0.2
				16721	16524	-1.2			
33	0.91	0.89	-2.3	16874	17022	0.9	63.4	62.7	-0.7
				16475	16421	-0.3			
34	0.92	0.90	-2.7	17001	17017	0.1	63.1	63.1	0.0
				16552	16510	-0.3			
35	0.94	0.90	-4.3	16753	16609	-0.9	63.0	63.5	0.5
				16472	16543	0.4			
36	0.90	0.95	5.4	17226	17100	-0.7	63.1	62.8	-0.3
				16476	16482	0.0			
37	0.92	0.92	-0.1	17089	17170	0.5	63.0	63.0	0.0
				16470	16675	1.2			
38	0.90	0.91	1.0	16537	16994	2.8	63.0	62.6	-0.4
				16489	16558	0.4			
39	0.97	0.87	-9.9	17110	16913	-1.2	63.3	63.1	-0.2
				16588	16516	-0.4			
40	0.99	0.92	-7.6	16797	17004	1.2	63.0	62.5	-0.5
				16666	16644	-0.1			
41	0.92	0.92	0.0	16657	16908	1.5	63.6	62.6	-1.0
				16594	16460	-0.8			

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG11FNL061	5399.00	2013/3/5	Chaoping.Duan	Tim.Yi



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Test Data Between Initial Test and Final Test									
Sample No.	Initial Test Current Spec. (A) 1.82Max.	Final Test Current Spec. (A) 1.82Max.	Deviation (%)	Initial Test Speed Spec. (RPM) 15390-18810 14850-18150	Final Test Speed Spec. (RPM) 15390-18810 14850-18150	Deviation (%)	Initial Test Noise Spec. (dB A) 68.0 Max	Final Test Noise Check. (dB A) 68.0 Max	Deviation 3 dBMax.
42	0.90	0.95	5.2	16975 16525	17036 16529	0.4 0.0	63.3	62.8	1.2
43	0.91	0.94	3.3	17051 16573	17269 16604	1.3 0.2	63.4	63.2	0.9
44	0.97	0.93	-4.0	16834 16455	17206 16475	2.2 0.1	63.3	62.7	-0.6
45	0.92	0.94	2.3	16782 16586	17120 16582	2.0 0.0	63.1	63.4	0.3
46	0.97	0.92	-5.0	17034 16582	17053 16616	0.1 0.2	63.0	62.9	-0.1
47	0.95	0.90	-5.4	17044 16483	17116 16449	0.4 -0.2	63.0	63.1	0.1
48	0.98	0.95	-3.5	16939 16506	16875 16551	-0.4 0.3	63.0	62.7	-0.3
49	0.92	0.94	2.3	16983 16660	17121 16425	0.8 -1.4	63.2	63.3	0.1
50	0.91	0.89	-2.1	16998 16437	16954 16586	-0.3 0.9	63.2	63.0	-0.2
51	0.94	0.91	-3.5	17104 16624	16867 16469	-1.4 -0.9	63.0	62.8	-0.2
52	0.96	0.93	-2.8	16939 16423	17193 16461	1.5 0.2	63.7	62.8	-0.9
53	0.91	0.90	-1.4	17066 16530	16995 16541	-0.4 0.1	63.2	63.1	-0.1
54	0.96	0.90	-6.3	16536 16522	17088 16450	3.3 -0.4	63.3	62.6	-0.7
55	0.95	0.90	-5.3	17078 16473	17030 16615	-0.3 0.9	63.0	63.6	0.6
56	0.94	0.91	-2.9	16644 16616	17029 16663	2.3 0.3	63.3	62.9	-0.4
X-Bar	0.939	0.917	-	16739.9	16768.3	-	63.26	62.94	-
σ	0.025	0.024	-	236.568	261.765	-	0.270	0.311	-
QE File No.		Time-out for function test or others (hours)		Issued Date		Reported By		Approved By	
DG11FNL061		5399.00		2013/3/5		Chaoping.Duan		Tim.Yi	