



# 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 <b>GFC60x60x76.0 mm</b> series as the right table	GFC0812DW-BD71	GFC0812DW-SM00A02	FA121A08-E02	GFC0812DW-DJ23B2X	GFC0848DWB74
	GFC0812DW-CK2G	GFC0812DW-CN	FA121A08-F11	GFC0812DW-SM00BZH	
	GFC0848DW-DH51	GFC0848DWA01	FA121A08-F1	GFC0848DW-CL60	
	GFC0812DW-DJ23	GFC0812DW-SM00ATG	GFC0812DW-DJ23B0Q	GFC0812DW-SM00A5L	

**Representative Test P/N : GFC0848DW-BK13**

**Equipment: 1.Oven: E24-F0056** 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 ≐ 7×L10 =** **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,

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

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	56	2.303	3,478	9,478.0	1,335,397	190,771

**Test Progress:**

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2012/2/6 3:00 PM	2013/8/14 11:46 PM	<input type="checkbox"/> In process	<input type="checkbox"/> In process (exceed requested)	<input checked="" type="checkbox"/> Termination	<b>9478.0</b>

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	3,777,074	539,582
30	16.00	2,670,795	381,542
40	8.00	1,335,397	190,771
50	4.00	667,699	95,386
60	2.00	333,849	47,693
70	1.00	166,925	23,846

- Fan permission criteria for the measurement after test :
1. Speed can not drop of ≥ 15% below the original measured rpm.
  2. Current cannot increase > 15% of original measure current.
  3. Noise cannot >3dB over the original measure noise.

<b>Test Result</b>	<input checked="" type="checkbox"/> <b>Accept</b> <input type="checkbox"/> <b>Reject</b>
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QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG12FNL006	9851.00	2014/4/22	Chaoping.Duan	Tim.Yi



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	GFC0812DW-CK2G	GFC0812DW-CN	FA121A08-F11	GFC0812DW-SM00BZH	
	GFC0848DW-DH51	GFC0848DWA01	FA121A08-F1	GFC0848DW-CL60	
	GFC0812DW-DJ23	GFC0812DW-SM00ATG	GFC0812DW-DJ23B0Q	GFC0812DW-SM00A5L	

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
3,478	2012/2/6 3:00 PM	2013/8/14 11:46 PM	56	0	<b>9478.0</b>

Representative Test P/N :GFC0848DW-BK13	<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-F0056 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 Spec. (dB A)	Deviation
	<b>1.87 Max.</b>	<b>1.87 Max.</b>		<b>11250-13750 9900-12100</b>	<b>11250-13750 10170-12430</b>		<b>76.5 Typ</b>	<b>76.5 Typ</b>	
1	1.59	1.62	2.1	12503	12534	0.2	78.2	79.2	1.0
2	1.61	1.59	-0.9	11123	11162	0.4	78.6	79.3	0.7
				12630	12649	0.2			
3	1.68	1.60	-5.1	11119	11156	0.3	78.5	79.9	1.4
				12604	12655	0.4			
4	1.68	1.79	6.6	11138	11190	0.5	78.4	79.6	1.2
				12635	12453	-1.4			
5	1.68	1.76	5.1	11116	11153	0.3	78.1	79.4	1.3
				12648	12554	-0.7			
6	1.67	1.60	-4.0	11123	11145	0.2	78.5	79.8	1.3
				12649	12614	-0.3			
7	1.65	1.62	-1.6	11131	11154	0.2	78.7	79.5	0.8
				12644	12637	-0.1			
8	1.64	1.62	-1.2	11136	11097	-0.4	78.2	79.8	1.6
				12619	12617	0.0			
9	1.68	1.63	-2.9	11167	11163	0.0	78.0	79.2	1.2
				12641	12634	-0.1			
10	1.68	1.62	-3.8	11164	11155	-0.1	77.8	79.4	1.6
				12623	12633	0.1			
11	1.67	1.62	-3.3	11132	11196	0.6	78.4	79.6	1.2
				12589	12651	0.5			
12	1.61	1.61	-0.4	11111	11125	0.1	78.1	79.8	1.7
				12606	12627	0.2			
13	1.63	1.62	-0.7	11065	11160	0.9	77.6	79.2	1.6
				12511	12589	0.6			
14	1.65	1.51	-8.7	11093	11146	0.5	78.4	79.4	1.0
				12606	12565	-0.3			
15	1.65	1.59	-3.6	11105	11120	0.1	78.2	79.6	1.4
				12551	12594	0.3			
16	1.63	1.61	-1.3	11102	11141	0.4	78.5	79.8	1.3
				12616	12607	-0.1			
17	1.60	1.59	-0.8	11178	11156	-0.2	77.5	79.2	1.7
				12510	12553	0.3			
18	1.64	1.60	-2.4	11141	11167	0.2	77.4	79.4	2.0
				12536	12591	0.4			
				11129	11098	-0.3			

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG12FNL006	9851.00	2014/4/22	Chaoping.Duan	Tim.Yi



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GFC0812DW-CK2G	GFC0812DW-CN	FA121A08-F11	GFC0812DW-SM00BZH	
GFC0848DW-DH51	GFC0848DWA01	FA121A08-F1	GFC0848DW-CL60	
GFC0812DW-DJ23	GFC0812DW-SM00ATG	GFC0812DW-DJ23B0Q	GFC0812DW-SM00A5L	

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
3,478	2012/2/6 3:00 PM	2013/8/14 11:46 PM	56	0	<b>9478.0</b>

Representative Test P/N :GFC0848DW-BK13	<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-F0056 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 Spec. (dB A)	Deviation
	<b>1.87 Max.</b>	<b>1.87 Max.</b>		11250-13750 9900-12100	11250-13750 10170-12430		<b>76.5 Typ</b>	<b>76.5 Typ</b>	
19	1.59	1.56	-1.6	12624	12585	-0.3	77.3	79.6	2.3
				11139	11141	0.0			
20	1.60	1.60	-0.1	12672	12625	-0.4	77.5	79.8	2.3
				11221	11138	-0.7			
21	1.59	1.67	5.2	12596	12627	0.2	77.7	79.2	1.5
				11129	11155	0.2			
22	1.62	1.64	1.4	12614	12683	0.5	77.6	79.4	1.8
				11148	11158	0.1			
23	1.62	1.61	-0.6	12627	12556	-0.6	78.1	79.6	1.5
				11162	11144	-0.2			
24	1.64	1.63	-0.7	12645	12607	-0.3	77.1	79.8	2.7
				11143	11137	-0.1			
25	1.63	1.61	-1.5	12535	12624	0.7	78.2	79.2	1.0
				11155	11159	0.0			
26	1.64	1.59	-2.9	12617	12551	-0.5	77.2	79.6	2.4
				11148	11117	-0.3			
27	1.60	1.61	0.5	12641	12643	0.0	78.5	79.8	1.3
				11071	11159	0.8			
28	1.60	1.63	2.1	12586	12574	-0.1	78.2	79.5	1.3
				11152	11173	0.2			
29	1.64	1.60	-2.6	12620	12698	0.6	78.1	79.7	1.6
				11162	11067	-0.9			
30	1.60	1.60	0.2	12640	12658	0.1	78.1	79.2	1.1
				11119	11148	0.3			
31	1.61	1.60	-0.4	12552	12603	0.4	78.6	79.4	0.8
				11131	11122	-0.1			
32	1.60	1.60	0.2	12556	12578	0.2	78.2	79.6	1.4
				11150	11156	0.1			
33	1.60	1.61	0.4	12584	12619	0.3	77.1	79.3	2.2
				11164	11148	-0.1			
34	1.61	1.63	1.4	12511	12660	1.2	78.3	79.7	1.4
				11130	11164	0.3			
35	1.60	1.62	1.4	12550	12672	1.0	77.3	79.9	2.6
				11104	11154	0.5			
36	1.61	1.61	-0.3	12593	12673	0.6	78.1	79.3	1.2
				11080	11141	0.6			
37	1.59	1.63	2.6	12645	12663	0.1	77.2	79.5	2.3
				11105	11112	0.1			

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	GFC0848DW-DH51	GFC0848DWA01	FA121A08-F1	GFC0848DW-CL60	
	GFC0812DW-DJ23	GFC0812DW-SM00ATG	GFC0812DW-DJ23B0Q	GFC0812DW-SM00ASL	

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
3,478	2012/2/6 3:00 PM	2013/8/14 11:46 PM	56	0	<b>9478.0</b>

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Equipment: 1.Oven: E24-F0056 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 Spec. ( dB A )	Deviation
	<b>1.87 Max.</b>	<b>1.87 Max.</b>		<b>11250-13750 9900-12100</b>	<b>11250-13750 10170-12430</b>		<b>76.5 Typ</b>	<b>76.5 Typ</b>	
38	1.59	1.62	2.1	12517	12660	1.1	78.3	79.5	1.2
				11130	11151	0.2			
39	1.59	1.59	0.1	12574	12655	0.6	78.1	79.7	1.6
				11141	11141	0.0			
40	1.60	1.63	2.1	12564	12657	0.7	77.4	79.9	2.5
				11082	11169	0.8			
41	1.62	1.62	-0.1	12568	12637	0.5	77.6	79.3	1.7
				11157	11106	-0.5			
42	1.59	1.61	1.4	12512	12157	-2.8	77.5	79.5	2.0
				11160	10936	-2.0			
43	1.59	1.60	0.4	12567	12552	-0.1	77.9	79.7	1.8
				11170	11126	-0.4			
44	1.61	1.61	0.2	12611	12563	-0.4	78.1	79.9	1.8
				11121	11131	0.1			
45	1.60	1.60	-0.1	12569	12618	0.4	78.2	79.3	1.1
				11130	11176	0.4			
46	1.60	1.50	-6.1	12555	12620	0.5	78.3	79.5	1.2
				11127	11163	0.3			
47	1.59	1.52	-4.6	12568	12561	-0.1	77.1	79.7	2.6
				11142	11131	-0.1			
48	1.59	1.52	-4.6	12389	12493	0.8	77.2	79.3	2.1
				11139	11090	-0.4			
49	1.59	1.61	1.0	12537	12583	0.4	77.7	79.5	1.8
				11076	10981	-0.9			
50	1.63	1.62	-0.7	12638	12615	-0.2	77.9	79.0	1.1
				11145	10980	-1.5			
51	1.61	1.58	-1.7	12585	12605	0.2	77.1	79.9	2.8
				11174	11178	0.0			
52	1.62	1.59	-2.0	12582	12676	0.7	77.2	79.7	2.5
				11172	11177	0.0			
53	1.63	1.60	-2.1	12583	12419	-1.3	77.3	79.6	2.3
				11158	11169	0.1			
54	1.60	1.56	-2.4	12637	12644	0.1	77.4	79.5	2.1
				11093	11125	0.3			
55	1.60	1.61	0.4	12609	12593	-0.1	77.5	79.8	2.3
				11140	11127	-0.1			
56	1.59	1.54	-3.1	12580	12597	0.1	77.9	79.4	1.5
				11103	11139	0.3			
X-Bar	1.619	1.607	-	11860.0	11867.3	-	77.88	79.53	-
$\sigma$	0.029	0.046	-	731.495	738.286	-	0.478	0.232	-

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