



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 AFB 40x40x15 mm series as the right table	AFB0412SHB	AFB0412VHB	AFB0412HHB	AFB0412HB	AFB0412MB
	AFB0412LB	AFB0405HHB	AFB0405HB	AFB0405MB	AFB0405LB
	AFB0412LB-P09L	AFB0424LB	AFB0424MB	AFB0424HB	AFB0424HHB
	AFB0424VHB	AFB0424SHB	AFB0412SHB-9U75	AFB0412VHB-TP29	

Representative Test P/N :AFB0412SHB-R00	
Equipment: 1.Oven: F00-5, E24-T060 2. DC Source: GW GPC-3060D	On/Off Cycles: Every 500 hours

◎ **L₁₀ 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_{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%), and

Stress/Elevated Temperature T _s (°C)	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	40	8.00	56	2.303	3,478	4,751.0	669,389	95,627

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2002/12/12 1:00 PM	2003/8/23 4:46 PM	<input type="checkbox"/> In process	<input type="checkbox"/> In process (exceed requested)	<input checked="" type="checkbox"/> Termination	4751.0

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. **Basically , MTBF is equal to MTTF , they use same formula to work out a life data.**)

Fan permission criteria for the measurement after test :

1. For current, the limit is less than spec.(max.).
2. For speed, the allowable decrease is less than 15%.
3. For noise, the limit is less than spec.(max.). + 3 dB

Temperature for MTTF Estimation (°C)	Acceleration Factor A _F	Estimated MTTF (hours)	Estimated L ₁₀ (hours)
25	22.63	1,893,319	270,474
30	16.00	1,338,779	191,254
40	8.00	669,389	95,627
50	4.00	334,695	47,814
60	2.00	167,347	23,907
70	1.00	83,674	11,953

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
02FNL023	2622.00	2003/10/15 6:00 PM	Candy. Lee	JOAN.LIN



DC FAN FUNCTION TEST RECORD FOR LIFE EXPERIMENT

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AFB0412SHB	AFB0412VHB	AFB0412HHB	AFB0412HMB	AFB0412MB
AFB0412LB	AFB0405HHB	AFB0405HB	AFB0405MB	AFB0405LB
AFB0412LB-P09L	AFB0424LB	AFB0424MB	AFB0424HB	AFB0424HHB
AFB0424VHB	AFB0424SHB	AFB0412SHB-9U75	AFB0412VHB-TP29	

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
3,478	2002/12/12 1:00 PM	2003/8/23 4:46 PM	56	0	4751.0

Representative Test P/N :AFB0412SHB-R00	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: F00-5, E24-T060 2. DC Source: GW GPC-3060D On/Off Cycles: Every 500 hours

Test Data Between Initial Test and Final Test

Sample P/N :AFB0412SHB-R00

Sample No.	Initial Test	Final Test	Deviation (%)	Initial Test	Final Test	Deviation (%)	Initial Test	Final Test	Deviation (%)
	Current Spec. (A) 0.35 Max.	Current Spec. (A) 0.35 Max.		Speed Spec. (RPM) 11000 Max.	Speed Spec. (RPM) 11000 Max.		Noise Spec. (dB A) 44.5 Max.	Noise Spec. (dB A) 47.5 Max.	
1	0.23	0.22	-4.3	11238	11792	4.9	44.3	44.7	0.9
2	0.24	0.22	-8.3	11154	11703	4.9	41.7	44.8	7.4
3	0.24	0.22	-8.3	10992	11725	6.7	41.5	44.6	7.5
4	0.25	0.22	-12.0	10830	11952	10.4	41.5	46.3	11.6
5	0.24	0.22	-8.3	11070	11797	6.6	42.9	43.6	1.6
6	0.24	0.22	-8.3	11238	11716	4.3	43.1	47.3	9.7
7	0.26	0.22	-15.4	11028	11850	7.5	42.4	44.1	4.0
8	0.24	0.22	-8.3	10752	11913	10.8	42.1	45.0	6.9
9	0.25	0.22	-12.0	11196	11711	4.6	42.9	43.6	1.6
10	0.24	0.22	-8.3	10992	11657	6.0	42.8	44.1	3.0
11	0.25	0.22	-12.0	11154	12069	8.2	43.1	44.7	3.7
12	0.27	0.22	-18.5	10524	11856	12.7	41.6	46.6	12.0
13	0.26	0.22	-15.4	10752	11600	7.9	41.5	44.0	6.0
14	0.23	0.21	-8.7	11070	11684	5.5	42.6	45.7	7.3
15	0.25	0.22	-12.0	11154	11737	5.2	42.6	44.3	4.0
16	0.24	0.21	-12.5	11070	11593	4.7	43.4	45.0	3.7
17	0.24	0.22	-8.3	10794	11834	9.6	42.4	45.0	6.1
18	0.24	0.22	-8.3	10950	11802	7.8	43.4	45.8	5.5
19	0.23	0.22	-4.3	11364	12030	5.9	43.5	47.1	8.3
20	0.24	0.22	-8.3	11196	11702	4.5	43.2	44.4	2.8
21	0.24	0.22	-8.3	11070	11718	5.9	43.7	47.1	7.8
22	0.25	0.22	-12.0	10992	11915	8.4	43.7	44.4	1.6
23	0.24	0.22	-8.3	11448	11821	3.3	44.0	45.6	3.6
24	0.25	0.22	-12.0	11112	11856	6.7	44.0	45.3	3.0
25	0.24	0.22	-8.3	10992	11814	7.5	43.4	44.0	1.4
26	0.25	0.22	-12.0	10908	11708	7.3	41.9	44.9	7.2
27	0.25	0.22	-12.0	10908	11675	7.0	42.1	45.4	7.8
28	0.25	0.22	-12.0	10794	11781	9.1	43.2	44.7	3.5
29	0.25	0.22	-12.0	11028	11790	6.9	42.8	45.6	6.5
30	0.26	0.22	-15.4	10638	11754	10.5	42.8	46.8	9.3
31	0.24	0.24	0.0	10794	11872	10.0	42.4	46.0	8.5
32	0.25	0.22	-12.0	11070	11938	7.8	44.4	45.1	1.6
33	0.23	0.22	-4.3	10380	11874	14.4	44.0	44.4	0.9
34	0.25	0.23	-8.0	11406	11831	3.7	42.6	45.3	6.3
35	0.25	0.22	-12.0	11112	11906	7.1	42.7	46.8	9.6



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	Current Spec. (A) 0.35 Max.	Current Spec. (A) 0.35 Max.		Speed Spec. (RPM) 11000 Max.	Speed Spec. (RPM) 11000 Max.		Noise Spec. (dB A) 44.5 Max.	Noise Spec. (dB A) 47.5 Max.	
36	0.25	0.22	-12.0	10794	11692	8.3	43.1	45.3	5.1
37	0.25	0.22	-12.0	10908	11663	6.9	42.9	44.7	4.2
38	0.26	0.23	-11.5	10204	11400	11.7	42.9	45.1	5.1
39	0.25	0.22	-12.0	10830	11735	8.4	42.8	46.3	8.2
40	0.24	0.22	-8.3	10872	11797	8.5	43.0	45.4	5.6
41	0.24	0.22	-8.3	11028	11499	4.3	42.8	44.3	3.5
42	0.24	0.22	-8.3	10524	11643	10.6	43.1	45.0	4.4
43	0.25	0.22	-12.0	10830	11738	8.4	41.8	46.2	10.5
44	0.25	0.22	-12.0	11154	11806	5.8	43.4	45.7	5.3
45	0.24	0.22	-8.3	10674	11802	10.6	44.0	44.4	0.9
46	0.24	0.22	-8.3	11196	11808	5.5	44.2	44.0	-0.5
47	0.25	0.23	-8.0	11112	12034	8.3	41.9	45.6	8.8
48	0.25	0.21	-16.0	10416	11594	11.3	43.6	46.0	5.5
49	0.26	0.22	-15.4	10992	11976	9.0	42.4	47.0	10.8
50	0.25	0.22	-12.0	11196	12035	7.5	44.3	46.8	5.6
51	0.26	0.22	-15.4	10992	11960	8.8	42.9	47.4	10.5
52	0.24	0.22	-8.3	11154	11722	5.1	44.4	46.2	4.1
53	0.27	0.22	-18.5	10638	11910	12.0	43.2	46.3	7.2
54	0.27	0.23	-14.8	10488	11417	8.9	41.8	44.3	6.0
55	0.26	0.22	-15.4	10236	11494	12.3	42.6	45.1	5.9
56	0.27	0.22	-18.5	10344	11891	15.0	44.2	46.7	5.7
X-Bar	0.248	0.221	-	10924	11778	-	43.0	45.4	-
σ	0.010	0.004	-	286.251	146.735	-	0.811	1.020	-

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02FNL023	2622.00	2003/10/15 6:00 PM	Candy. Lee	JOAN.LIN