



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 EFB 172x150x50.8 mm series as the right table	EFB1524SHG	EFB1524VHG	EFB1524HHG	EFB1524HG	EFB1524MG
	EFB1548VHG	EFB1548HHG	EFB1548HG	EFB1548MG	EFB1548LG
	EFB1512HHG	EFB1512HG	EFB1512MG	EFB1512LG	
	EFB1524LG	EFB1524VHG-EP			
	EFB1724SHG	EFB1724VHG	EFB1724HHG	EFB1724HG	EFB1724MG
	EFB1748VHG	EFB1748HHG	EFB1748HG	EFB1748MG	EFB1748LG
	EFB1712HHG	EFB1712HG	EFB1712MG	EFB1712LG	
	EFB1724LG	EFB1712LG	EFB1724SHG-5W15		

Representative Test P/N : EFB1712HHG , EFB1524SHG , EFB1548VHG

Instruments used: 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 \doteq 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 (hours)	Verified L ₁₀ (hours)
80	40	16.00	47	2.303	2,039	2,322.0	557,884	79,698

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2001/3/13 8:00 AM	2001/6/22 1:27 PM	<input type="checkbox"/> In process	<input type="checkbox"/> In process (exceed requested)	<input checked="" type="checkbox"/> Termination	2322.0

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	45.25	1,577,935	225,419
30	32.00	1,115,768	159,395
40	16.00	557,884	79,698
50	8.00	278,942	39,849
60	4.00	139,471	19,924
70	2.00	69,736	9,962
80	1.00	34,868	4,981

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
01FNS018L	390.00	2001/7/4 8:00 AM	<i>Bonnie Cheng</i>	<i>John Sun</i>



DC FAN FUNCTION TEST RECORD FOR LIFE EXPERIMENT

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EFB1548VHG	EFB1548HHG	EFB1548HG	EFB1548MG	EFB1548LG
EFB1512HHG	EFB1512HG	EFB1512MG	EFB1512LG	
EFB1524LG	EFB1524VHG-EP			
EFB1724SHG	EFB1724VHG	EFB1724HHG	EFB1724HG	EFB1724MG
EFB1748VHG	EFB1748HHG	EFB1748HG	EFB1748MG	EFB1748LG
EFB1712HHG	EFB1712HG	EFB1712MG	EFB1712LG	
EFB1724LG	EFB1712LG	EFB1724SHG-5W15		

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
2,039	2001/3/13 8:00 AM	2001/6/22 1:27 PM	47	0	2322.0

Representative Test P/N : EFB1712HHG ,EFB1524SHG , EFB1548VHG	Current Test Status	<input type="checkbox"/> In process	<input type="checkbox"/> In process (exceed requested)	<input checked="" type="checkbox"/> Termination
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Instruments used: 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 : EFB1524SHG									
Sample No.	Initial Test	Final Test	Deviation (%)	Initial Test	Final Test	Deviation (%)	Initial Test	Final Test	Deviation (%)
	Current Spec. (A) 2.10 Max.	Current Spec. (A) 2.10 Max.		Speed Spec. (RPM) 4300 Ref.	Speed Spec. (RPM) 4300-15%		Noise Spec. (dB A) 63.0 Max.	Noise Spec. (dB A) 66.0 Max.	
1	1.47	1.42	-3.4	4319	4348	0.7	61.2	62.1	1.5
2	1.56	1.52	-2.6	4426	4478	1.2	62.5	64.6	3.4
3	1.48	1.46	-1.4	4351	4412	1.4	61.3	63.5	3.6
4	1.58	1.54	-2.5	4392	4478	2.0	62.7	64.2	2.4
5	1.44	1.50	4.2	4315	4225	-2.1	61.5	63.5	3.3
6	1.45	1.41	-2.8	4127	4348	5.4	60.5	62.6	3.5
7	1.47	1.46	-0.7	4357	4348	-0.2	62.4	62.8	0.6
8	1.52	1.50	-1.3	4407	4478	1.6	62.8	63.0	0.3
9	1.48	1.46	-1.4	4345	4412	1.5	61.6	62.7	1.8
10	1.49	1.46	-2.0	4325	4348	0.5	63.1	62.5	-1.0
11	1.51	1.46	-3.3	4371	4412	0.9	63.4	64.2	1.3
12	1.51	1.49	-1.3	4431	4478	1.1	63.0	63.0	0.0
13	1.53	1.50	-2.0	4353	4412	1.4	61.8	63.2	2.3
X-Bar	1.499	1.475	-	4347.615	4398.231	-	62.138	63.223	-
σ	0.041	0.037	-	76.562	74.337	-	0.880	0.746	-

Sample P/N : EFB1548VHG									
Spec.	0.96 Max.	0.96 Max.		4000 Ref.	4000-15%		63.0 Max.	66.0Max.	
1	0.62	0.58	-6.5	4059	4054	-0.1	60.2	61.5	2.2
2	0.58	0.57	-1.7	4037	4054	0.4	60.2	61.8	2.7
3	0.60	0.57	-5.0	4025	4109	2.1	60.0	61.1	1.8
4	0.61	0.58	-4.9	4099	4166	1.6	61.2	61.6	0.7
5	0.61	0.58	-4.9	4061	4054	-0.2	60.7	60.8	0.2
6	0.61	0.58	-4.9	4090	4109	0.5	61.3	61.6	0.5
7	0.60	0.58	-3.3	4053	4166	2.8	60.4	61.8	2.3
8	0.61	0.58	-4.9	4118	4166	1.2	60.4	61.3	1.5
9	0.60	0.60	0.0	4102	4166	1.6	60.0	61.2	2.0
10	0.62	0.58	-6.5	4071	4166	2.3	60.2	61.4	2.0
11	0.62	0.58	-6.5	4077	4166	2.2	60.3	61.8	2.5
12	0.63	0.59	-6.3	4078	4166	2.2	60.4	62.6	3.6
13	0.60	0.57	-5.0	4025	4054	0.7	60.5	61.2	1.2
14	0.60	0.57	-5.0	4043	4054	0.3	60.6	61.6	1.7
X-Bar	0.608	0.579	-	4067.0	4117.9	-	60.5	61.5	-
σ	0.013	0.008	-	29.0	53.2	-	0.4	0.4	-

QE File No.	Time-out for function test or others (hrs)	Issued Date	Reported By	Approved By
01FNS018L	390.00	2001/7/4 8:00 AM	<i>Bonnie Cheng</i>	<i>JOEY SUN</i>



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EFB1512HHG	EFB1512HG	EFB1512MG	EFB1512LG	
EFB1524LG	EFB1524VHG-EP			
EFB1724SHG	EFB1724VHG	EFB1724HHG	EFB1724HG	EFB1724MG
EFB1748VHG	EFB1748HHG	EFB1748HG	EFB1748MG	EFB1748LG
EFB1712HHG	EFB1712HG	EFB1712MG	EFB1712LG	
EFB1724LG	EFB1712LG	EFB1724SHG-5W15		

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
2,039	2001/3/13 8:00 AM	2001/6/22 1:27 PM	47	0	2322.0

Representative Test P/N : EFB1712HHG ,EFB1524SHG , EFB1548VHG	Current Test Status	<input type="checkbox"/> In process	<input type="checkbox"/> In process (exceed requested)	<input checked="" type="checkbox"/> Termination
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Instruments used: 1.Oven: F00-5, E24-T060 2. DC Source: GW GPC-3060D	On/Off Cycles: Every 500 hours
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Test Data Between Initial Test and Final Test

Sample No.	Initial Test	Final Test	Deviation (%)	Initial Test	Final Test	Deviation (%)	Initial Test	Final Test	Deviation (%)
	Current Spec. (A) 3.20 Max.	Current Spec. (A) 3.20 Max.		Speed Spec. (RPM) 3700 Ref.	Speed Spec. (RPM) 3700-15%		Noise Spec. (dB A) 60.5 Max.	Noise Spec. (dB A) 63.5 Max.	
1	2.08	2.09	0.5	3815	3846	0.8	52.7	55.6	5.5
2	2.05	2.05	0.0	3759	3750	-0.2	55.2	55.1	-0.2
3	2.12	2.10	-0.9	3805	3846	1.1	55.6	55.2	-0.7
4	2.18	2.18	0.0	3808	3797	-0.3	55.6	55.5	-0.2
5	2.04	2.00	-2.0	3734	3846	3.0	53.0	55.0	3.8
6	2.04	2.05	0.5	3768	3797	0.8	53.7	55.3	3.0
7	2.18	2.15	-1.4	3832	3846	0.4	53.8	55.5	3.2
8	2.15	2.06	-4.2	3821	3896	2.0	53.6	55.4	3.4
9	2.10	2.05	-2.4	3746	3797	1.4	54.3	55.7	2.6
10	2.03	2.13	4.9	3703	3846	3.9	54.3	55.0	1.3
11	2.06	2.06	0.0	3701	70	-98.1	55.6	54.7	-1.6
12	2.14	2.08	-2.8	3744	3846	2.7	55.2	55.2	0.0
13	2.10	2.02	-3.8	3732	3797	1.7	54.0	54.9	1.7
14	2.22	2.12	-4.5	3630	3750	3.3	54.0	55.0	1.9
15	2.17	2.07	-4.6	3665	3846	4.9	53.9	55.6	3.2
16	2.17	2.07	-4.6	3813	3797	-0.4	55.2	55.4	0.4
17	2.13	2.11	-0.9	3805	3846	1.1	55.3	55.1	-0.4
18	2.11	2.15	1.9	3835	3797	-1.0	55.8	55.7	-0.2
19	2.15	2.20	2.3	3901	3896	-0.1	55.3	55.4	0.2
20	2.14	2.03	-5.1	3760	3797	1.0	53.5	55.0	2.8
X-Bar	2.118	2.089	-	3768.850	3635.450	-	54.480	55.265	-
σ	0.055	0.054	-	64.752	840.169	-	0.958	0.287	-

QE File No.	Time-out for function test or others (hrs)	Issued Date	Reported By	Approved By
01FNS018L	390.00	2001/7/4 8:00 AM	<i>Bonnie Chang</i>	<i>Robert Sun</i>