

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 PFR 92x92x38.0 mm series as the right table	PFR0912XHE				

Representative Test P/N : PFR0912XHE-SP00

Equipment: 1.Oven: E24-T0166

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 $\hat{=}$ 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%).

Stress/Elevated Temperature Ts (°C)	Unstress Temperature Tu (°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)
60	40	4.00	56	2.303	6,956	3,360.0	236,703	33,815

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2010/9/9 3:00 PM	2011/9/25 3:33 AM	☒ In process	☐ In process (exceed requested)	☐ Termination	3360.0

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.

Temperature for MTTF Estimation (°C)	Acceleration Factor A _F	Estimated MTTF (hours)	Estimated L ₁₀ (hours)
25	11.31	669,496	95,642
30	8.00	473,405	67,629
40	4.00	236,703	33,815
50	2.00	118,351	16,907
60	1.00	59,176	8,454

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.

Test Result	☒ Accept
	☐ Reject

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG10FNL127	2177.00	2011/5/4	Nan Yang	Long Zhao



DC FAN FUNCTION TEST RECORD FOR LIFE EXPERIMENT

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PFR0912XHE				

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
6,956	2010/9/9 3:00 PM	2011/9/25 3:33 AM	56	0	3360.0
Representative Test P/N : PFR0912XHE-SP00			Current Test Status	☒ In process	☐ In process (exceed requested) ☐ Termination
Equipment: 1.Oven: E24-T0166				On/Off Cycles: Every 500 hours	

Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (A) 4.50 Max.	Final Test Current Spec. (A) 4.50 Max.	Deviation (%)	Initial Test Speed Spec. (RPM) 10350-12650	Final Test Speed Spec. (RPM) 10350-12650	Deviation (%)	Initial Test Noise Spec. (dB A) 73.6 Max	Final Test Noise Spec. (dB A) 73.6 Max	Deviation 3 dBMax.
1	3.80	3.65	-3.8	11335	11569	2.1	68.6	69.0	0.4
2	3.75	3.58	-4.5	11372	11715	3.0	68.9	68.3	-0.6
3	3.86	3.75	-2.8	11389	11742	3.1	69.3	68.8	-0.5
4	3.97	3.85	-2.9	11585	11528	-0.5	68.9	68.5	-0.4
5	3.82	3.56	-6.7	11307	11461	1.4	69.4	68.7	-0.7
6	3.81	3.69	-3.0	11370	11783	3.6	69.0	69.0	0.0
7	3.84	3.75	-2.4	11367	11566	1.8	69.4	69.2	-0.2
8	3.66	3.72	1.6	11283	11389	0.9	69.1	69.1	0.0
9	3.68	3.69	0.3	11211	11283	0.6	68.9	69.5	0.6
10	3.76	3.56	-5.3	11330	11399	0.6	68.7	68.2	-0.5
11	3.79	3.69	-2.6	11296	11322	0.2	69.1	69.9	0.8
12	3.79	3.65	-3.7	11399	11364	-0.3	69.3	69.2	-0.1
13	3.80	3.69	-2.8	11377	11290	-0.8	69.3	69.0	-0.3
14	3.73	3.76	0.9	11355	11295	-0.5	68.6	69.2	0.6
15	3.84	3.69	-3.8	11397	11210	-1.6	68.8	69.5	0.7
16	3.76	3.72	-1.0	11321	11273	-0.4	69.3	69.2	-0.1
17	3.77	3.71	-1.6	11370	11323	-0.4	69.7	69.3	-0.4
18	3.76	3.72	-1.1	11322	11201	-1.1	68.9	69.1	0.2
19	3.89	3.69	-5.2	11423	11448	0.2	69.3	69.2	-0.1
20	3.75	3.72	-0.7	11303	11719	3.7	69.2	69.0	-0.2
21	4.01	3.69	-8.1	11536	11823	2.5	69.0	68.5	-0.5
22	3.79	3.46	-8.7	11364	11617	2.2	68.3	68.7	0.4
23	3.80	3.69	-2.8	11338	11747	3.6	68.6	68.3	-0.3
24	3.62	3.75	3.5	11247	11660	3.7	69.1	68.5	-0.6
25	3.66	3.62	-1.2	11197	11547	3.1	68.8	69.0	0.2
26	3.71	3.62	-2.5	11290	11699	3.6	69.3	68.3	-1.0
27	3.77	3.69	-2.2	11335	11565	2.0	68.9	68.2	-0.7
28	4.06	3.77	-7.1	11581	11454	-1.1	69.2	68.3	-0.9
29	3.87	3.85	-0.6	11459	11476	0.1	68.9	69.2	0.3
30	3.71	3.62	-2.5	11245	11526	2.5	69.1	68.3	-0.8
31	3.71	3.72	0.3	11295	11524	2.0	68.8	68.2	-0.6
32	3.74	3.75	0.2	11276	11399	1.1	69.3	69.0	-0.3
33	3.68	3.69	0.3	11266	11290	0.2	68.9	68.2	-0.7
34	3.88	3.77	-2.8	11441	11323	-1.0	69.6	68.3	-1.3
35	3.71	3.85	3.8	11381	11719	3.0	69.4	68.3	-1.1

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG10FNL127	2177.00	2011/5/4	Nan Yang	Long Zhao



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PFR0912XHE				

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
6,956	2010/9/9 3:00 PM	2011/9/25 3:33 AM	56	0	3360.0

Representative Test P/N : PFR0912XHE-SP00	Current Test Status	☒ In process	☐ In process (exceed requested)	☐ Termination
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Equipment: 1.Oven: E24-T0166	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) 4.50 Max.	Final Test Current Spec. (A) 4.50 Max.	Deviation (%)	Initial Test Speed Spec. (RPM) 10350-12650	Final Test Speed Spec. (RPM) 10350-12650	Deviation (%)	Initial Test Noise Spec. (dB A) 73.6 Max	Final Test Noise Spec. (dB A) 73.6 Max	Deviation 3 dBMax.
36	3.65	3.58	-2.0	11237	11417	1.6	69.0	69.3	0.3
37	3.74	3.72	-0.5	11305	11648	3.0	68.8	69.5	0.7
38	3.65	3.69	1.1	11210	11625	3.7	69.4	69.1	-0.3
39	3.60	3.72	3.3	11238	11394	1.4	69.3	69.2	-0.1
40	3.70	3.69	-0.3	11273	11681	3.6	69.0	69.3	0.3
41	3.97	3.72	-6.2	11533	11660	1.1	68.9	68.5	-0.4
42	3.67	3.72	1.5	11218	11279	0.5	69.1	68.8	-0.3
43	3.73	3.75	0.7	11323	11931	5.4	69.3	68.6	-0.7
44	3.69	3.68	-0.3	11231	11675	4.0	68.6	69.2	0.6
45	3.67	3.65	-0.6	11239	11594	3.2	69.1	69.0	-0.1
46	3.67	3.69	0.7	11202	11354	1.4	68.9	69.6	0.7
47	3.91	3.78	-3.2	11407	11389	-0.2	68.9	69.3	0.4
48	3.63	3.72	2.4	11181	11266	0.8	68.8	69.2	0.4
49	3.65	3.72	1.9	11201	11482	2.5	69.1	68.1	-1.0
50	3.92	3.82	-2.5	11318	11347	0.3	69.2	69.0	-0.2
51	3.73	3.70	-0.8	11380	11249	-1.2	69.0	68.2	-0.8
52	3.78	3.82	1.0	11305	11576	2.4	68.7	68.3	-0.4
53	3.83	3.80	-0.7	11448	11275	-1.5	69.4	68.5	-0.9
54	3.61	3.65	1.1	11163	11279	1.0	69.2	68.6	-0.6
55	3.76	3.78	0.4	11299	11389	0.8	68.8	68.4	-0.4
56	3.58	3.62	1.2	11147	11482	3.0	68.9	68.2	-0.7
X-Bar	3.762	3.704	-	11325.4	11486.4	-	69.04	68.82	-
σ	0.104	0.075	-	99.194	179.304	-	0.278	0.461	-

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