DELTA ELECTRONICS, INC.

DC FAN LIFE EXPERIMENT REPORT

Available for these models with lower speed and same physical structure. All model may be followed byRxx orFxx series suffixes. This test report applies to **FFB 40x40x28.0 mm** series as the right table	FFB0412EN-00B86	FFB0412EN-00AN2	FFB0412EN-00BDM	FFB0412EN-00Y5W	FFB0412EN-00BZ3	FFB0412EN-00BZE
	FFB0412EN-00Y2E	FFB0412EN-00AXF	FFB0412EN-00B34	FFB0412EN-00BVK	FFB0412EN-00BVH	FFB0412EN-00C33
		FFB0412EN-00ARR	FFB0412EN-00BMS	FFB0412EN-00BHM	FFB0412EN-00BZD	FFB0412EN-00BFK
		FFB0412VN-00ANQ	FFB0412EN-00Y2B	FFB0412EN-00Y0X	FFB0412EN-00YFP(S)	FFB0412SN-00ARQ

Representative Test P/N : FFB0412EN-00A7E

Equipment: 1.Oven: E24-T0171 | On/Off Cycles: Every 500 hours

◎ **L_{10} Expectancy: 70,000 hours minimum @ fan rated voltage and the temperature of 40℃**

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,

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

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 (℃) (Actual Test Temperature)	Unstress Temperature Tu (℃)	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 ℃ (hours)	Verified L_{10} 40 ℃ (hours)
80	40	16.00	55	2.303	1,768	17,739.0	4,917,359	702,480

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
		☐ In process	☑ In process (exceed requested)	☐ Termination	
2015/1/6 7:00 PM	2015/3/21 10:38 AM				17739.0

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' L_{10} 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 (℃)	Acceleration Factor A_F	Estimated MTTF (hours)	Estimated L_{10} (hours)
25	45.25	13,908,392	1,986,913
30	32.00	9,834,718	1,404,960
40	16.00	4,917,359	702,480
50	8.00	2,458,680	351,240
60	4.00	1,229,340	175,620
70	2.00	614,670	87,810
80	1.00	307,335	43,905

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.

Test Result	☑ Accept ☐ Reject

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG14FNL180	7008.80	2017/11/2	Loly.Wang	Tim.Yi

BGN（dBA）:16.6 Temp（℃）：23.5

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	FFB0412EN-00Y2E	FFB0412EN-00AXF	FFB0412EN-00B34	FFB0412EN-00BVK	FFB0412EN-00BVH	FFB0412EN-00C33
		FFB0412EN-00ARR	FFB0412EN-00BMS	FFB0412EN-00BHM	FFB0412EN-00BZD	FFB0412EN-00BFK
		FFB0412VN-00ANQ	FFB0412EN-00Y2B	FFB0412EN-00Y0X	FFB0412EN-00YFP(S)	FFB0412SN-00ARQ

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
1,768	2015/1/6 7:00 PM	2015/3/21 10:38 AM	55	0	**17739.0**

Representative Test P/N : FFB0412EN-00A7E	Current Test Status	☐ In process	☑ In process (exceed requested)	☐ Termination
Equipment: 1.Oven: E24-T0171		On/Off Cycles: Every 500 hours		

Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (A) **2.1 Max.**	Final Test Current Spec. (A) **2.1 Max.**	Deviation (%)	Initial Test Speed Spec. (RPM) **22500-27500**	Final Test Speed Spec. (RPM) **22500-27500**	Deviation (%)	Initial Test Noise Spec. (dB A) **68.0Max**	Final Test Noise Spec. (dB A) **68.0Max**	Deviation **3 dBMax.**
1	1. 25	1. 32	5.3	24579	24543	-0.1	62.2	63.8	1.6
2	1. 24	1. 35	8.5	24326	24863	2.2	62.3	65.6	3.3
3	1. 32	1. 27	-4.1	24876	24932	0.2	61.8	62.8	1.0
4	1. 19	1. 27	6.8	23800	24819	4.3	61.4	62.8	1.4
5	1. 29	1. 36	5.9	24622	24908	1.2	61.8	62.8	1.0
6	1. 24	1. 28	3.2	24407	24736	1.3	61.6	61.1	-0.5
7	1. 22	1. 23	0.3	23917	24113	0.8	61.5	64.8	3.3
8	1. 29	1. 26	-1.9	24729	24781	0.2	61.7	62.5	0.8
9	1. 24	1. 42	15.0	24402	25080	2.8	62.0	62.3	0.3
10	1. 28	1. 24	-2.7	24596	25117	2.1	62.2	62.4	0.2
11	1. 20	1. 33	11.1	24039	24860	3.4	61.4	62.2	0.8
12	1. 26	1. 34	6.7	24153	25028	3.6	61.6	63.5	1.9
13	1. 17	1. 23	5.1	23871	24354	2.0	61.8	62.2	0.4
14	1. 20	1. 29	6.7	23951	24965	4.2	62.1	65.1	3.0
15	1. 39	1. 37	-1.4	25036	24942	-0.4	61.9	62.1	0.2
16	1. 29	1. 31	1.4	24678	24886	0.8	62.3	61.8	-0.5
17	1. 28	1. 37	7.3	24319	24801	2.0	61.5	62.6	1.1
18	1. 32	1. 39	5.5	24734	24838	0.4	61.7	64.8	3.1
19	1. 22	1. 23	0.7	24324	24728	1.7	62.1	63.0	0.9
20	1. 30	1. 24	-4.4	24617	24496	-0.5	61.9	62.9	1.0
21	1. 29	1. 27	-1.9	24700	24708	0.0	62.3	62.5	0.2
22	1. 28	1. 27	-0.8	24538	25043	2.1	61.5	62.0	0.5
23	1. 26	1. 33	5.5	24425	25000	2.4	62.1	63.2	1.1
24	1. 27	1. 30	2.0	24618	24902	1.2	61.7	62.8	1.1
25	1. 32	1. 34	1.2	24278	25059	3.2	62.3	62.3	0.0
26	1. 29	1. 30	0.4	24768	24155	-2.5	61.5	63.2	1.7
27	1. 33	1. 28	-3.3	24668	25035	1.5	61.7	62.8	1.1
28	1. 29	1. 26	-2.2	24703	24538	-0.7	62.1	63.6	1.5
29	1. 27	1. 21	-4.6	24511	24365	-0.6	61.5	62.0	0.5
30	1. 31	1. 27	-3.4	24743	24089	-2.6	61.7	62.1	0.4
31	1. 23	1. 30	5.6	23982	24968	4.1	62.0	63.0	1.0
32	1. 25	1. 28	2.2	24599	24462	-0.6	62.1	62.0	-0.1

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG14FNL180	**7008.80**	**2017/11/2**	**Loly.Wang**	**Tim.Yi**

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		FFB0412EN-00ARR	FFB0412EN-00BMS	FFB0412EN-00BHM	FFB0412EN-00BZD	FFB0412EN-00BFK
		FFB0412VN-00ANQ	FFB0412EN-00Y2B	FFB0412EN-00Y0X	FFB0412EN-00YFP(S)	FFB0412SN-00ARQ

Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
1,768	2015/1/6 7:00 PM	2015/3/21 10:38 AM	55	0	**17739.0**

Representative Test P/N : FFB0412EN-00A7E	**Current Test Status**	☐ In process	☑ In process (exceed requested)	☐ Termination
Equipment: 1.Oven: E24-T0171		On/Off Cycles: Every 500 hours		

Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (A) **2.1 Max.**	Final Test Current Spec. (A) **2.1 Max.**	Deviation (%)	Initial Test Speed Spec. (RPM) **22500-27500**	Final Test Speed Spec. (RPM) **22500-27500**	Deviation (%)	Initial Test Noise Spec. (dB A) **68.0Max**	Final Test Noise Spec. (dB A) **68.0Max**	Deviation **3 dBMax.**
33	1. 23	1. 34	8.4	24080	25035	4.0	61.9	64.2	2.3
34	1. 21	1. 33	9.7	24454	25209	3.1	61.4	62.8	1.4
35	1. 23	1. 32	7.9	24331	24997	2.7	61.6	62.7	1.1
36	1. 27	1. 30	2.5	24253	24175	-0.3	61.8	63.3	1.5
37	1. 19	1. 29	8.6	23870	24700	3.5	62.1	63.4	1.3
38	1. 29	1. 33	2.9	24965	24849	-0.5	61.9	64.5	2.6
39	1. 26	1. 33	4.8	24177	24332	0.6	62.3	68.3	6.0
40	1. 22	1. 30	7.0	24451	24946	2.0	61.5	62.2	0.7
41	1. 25	1. 26	1.0	24477	24851	1.5	62.0	64.9	2.9
42	1. 25	1. 35	7.7	24651	24460	-0.8	61.8	66.0	4.2
43	1. 26	1. 33	5.5	24467	24758	1.2	62.2	62.9	0.7
44	1. 33	1. 23	-7.8	24962	24150	-3.3	61.4	62.7	1.3
45	1. 25	1. 22	-2.4	24406	24689	1.2	61.6	65.4	3.8
46	1. 29	1. 23	-4.8	24799	24547	-1.0	62.0	62.2	0.2
47	1. 32	1. 26	-4.7	24472	24703	0.9	61.8	61.5	-0.3
48	1. 32	1. 25	-5.1	24773	24554	-0.9	62.2	61.9	-0.3
49	1. 34	1. 25	-7.3	24877	24754	-0.5	61.4	61.9	0.5
50	1. 23	1. 34	9.0	24303	24751	1.8	62.0	61.3	-0.7
51	1. 34	1. 23	-8.3	24865	24890	0.1	61.6	64.0	2.4
52	1. 28	1. 34	4.9	24615	24734	0.5	62.2	62.7	0.5
53	1. 28	1. 32	2.6	24734	25012	1.1	61.0	62.5	1.5
54	1. 33	1. 28	-3.5	24766	24962	0.8	61.8	61.9	0.1
55	1. 28	1. 28	0.4	24513	24402	-0.5	61.6	61.4	-0.2
X-Bar	1.27	1.29	-	24486.7	24737.7	-	61.83	63.04	-
σ	0.045	0.048	-	304.755	283.881	-	0.306	1.338	-

QE File No.	Time-out for function test or others (hrs)	Issued Date	Reported By	Approved By
DG14FNL180	**7008.80**	**2017/11/2**	**Loly.Wang**	**Tim.Yi**