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 THB Φ 169X172X50.8**mm** series as the right table					
Representative Test P/N : THB1748BGARM(S)					
Equipment: 1.Oven: E24-T0161			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)
85	40	22.63	20	2.303	3,138	7,454.0	1,163,897	166,271

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2019/1/8 1:40 PM	2019/7/23 11:54 PM	☐ In process	☑ In process (exceed requested)	☐ Termination	**7454.0**

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	64.00	3,291,997	470,285
30	45.25	2,327,793	332,542
40	22.63	1,163,897	166,271
50	11.31	581,948	83,135
60	5.66	290,974	41,568
70	2.83	145,487	20,784
80	1.41	72,744	10,392
85	1.00	51,437	7,348

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
DG18FNL118	4724.33	2020/5/30	Loly.Wang	Tim.Yi

BGN（dBA）: 15.9 Temp（℃）：24.4

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DC FAN FUNCTION TEST RECORD
FOR LIFE EXPERIMENT

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Required Test Time (hrs)	Date for Test Beginning	Date for Test Termination	Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)
3,138	2019/1/8 1:40 PM	2019/7/23 11:54 PM	20	0	**7454.0**

Representative Test P/N : THB1748BGARM(S)	Current Test Status	☐ In process	☑ In process (exceed requested)	☐ Termination
Equipment: 1.Oven: E24-T0161		On/Off Cycles: Every 500 hours		

Test Data Between Initial Test and Final Test

Sample No.	Initial Test Current Spec. (A) **4.2 Max.**	Final Test Current Spec. (A) **4.2 Max.**	Deviation (%)	Initial Test Speed Spec. (RPM) **7200-8800**	Final Test Speed Spec. (RPM) **7200-8800**	Deviation (%)	Initial Test Noise Spec. (dB A) **79.0Max**	Final Test Noise Spec. (dB A) **79.0Max**	Deviation **3 dBMax.**
1	3. 67	3. 69	0.5	7987	7828	-2.0	75.6	74.6	-1.0
2	3. 60	3. 63	0.7	8047	7866	-2.2	75.7	76.1	0.4
3	3. 72	3. 60	-3.5	7945	7835	-1.4	75.3	74.9	-0.4
4	3. 68	3. 69	0.3	7950	7804	-1.8	74.9	75.3	0.4
5	3. 64	3. 61	-0.8	7957	7807	-1.9	75.6	75.6	0.0
6	3. 60	3. 65	1.5	7975	7824	-1.9	75.1	75.7	0.6
7	3. 63	3. 73	2.8	7997	7838	-2.0	75.2	75.6	0.4
8	3. 66	3. 55	-2.8	7950	7773	-2.2	75.8	74.5	-1.3
9	3. 54	3. 62	2.2	7969	7812	-2.0	75.6	76.2	0.6
10	3. 67	3. 64	-0.7	7955	7800	-1.9	75.5	74.6	-0.9
11	3. 61	3. 62	0.3	7973	7801	-2.2	75.1	76.0	0.9
12	3. 65	3. 65	0.1	7947	7792	-2.0	75.0	75.6	0.6
13	3. 62	3. 77	4.1	7967	7760	-2.6	75.2	77.8	2.6
14	3. 62	3. 57	-1.4	7993	7766	-2.8	75.4	75.2	-0.2
15	3. 62	3. 62	0.0	8018	7822	-2.4	75.0	74.4	-0.6
16	3. 65	3. 62	-0.9	7960	7851	-1.4	75.3	74.8	-0.5
17	3. 67	3. 61	-1.7	8003	7870	-1.7	75.1	75.1	0.0
18	3. 66	3. 64	-0.7	7943	7813	-1.6	74.8	75.4	0.6
19	3. 63	3. 68	1.2	8024	7859	-2.1	75.3	76.1	0.8
20	3. 52	3. 67	4.2	7957	7769	-2.4	74.9	75.9	1.0
X-Bar	3.64	3.64	-	7974.22	7814.56	-	75.29	75.41	-
σ	0.04	0.05	-	28.46	31.14	-	0.29	0.82	-

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG18FNL118	**4724.33**	**2020/5/30**	**Loly.Wang**	**Tim.Yi**