

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 GFB 40x40x56.0 mm series as the right table					
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Representative Test P/N : GFB0412ES-EEY9					
Equipment: 1.Oven: E24-T0167			On/Off Cycles: Every 500 hours		

© L₁₀ Expectancy: **30,000** hours minimum @ fan rated voltage and the temperature of 55℃
 According to the equation for **Weibull distribution**, **MTTF $\doteq$ 7×L₁₀ = 210,000 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 (℃) (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 55 ℃ (hours)	Verified L ₁₀ 55 ℃ (hours)
80	55	5.66	56	2.303	2,108	360.0	35,866	5,124

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2019/7/22 8:30 AM	2019/10/26 7:51 PM	☒ In process	☐ In process (exceed requested)	☐ Termination	360.0

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.

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.

Temperature for MTTF Estimation (℃)	Acceleration Factor A _F	Estimated MTTF (hours)	Estimated L ₁₀ (hours)
25	45.25	286,927	40,990
30	32.00	202,888	28,984
40	16.00	101,444	14,492
50	8.00	50,722	7,246
55	5.66	35,866	5,124
60	4.00	25,361	3,623
70	2.00	12,680	1,811
80	1.00	6,340	906
Test Result		☒ Accept	☐ Reject

QE File No.	Time-out for function test or others (hours)	Issued Date	Reported By	Approved By
DG19FNL039	207.50	2019/8/15	Loly.Wang	Tim Yi



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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)				
2,108	2019/7/22 8:30 AM	2019/10/26 7:51 PM	56	0	360.0				
Representative Test P/N : GFB0412ES-EEY9		Current Test Status		☒ In process	☐ In process (exceed requested) ☐ Termination				
Equipment: 1.Oven: E24-T0167				On/Off Cycles: Every 500 hours					
Test Data Between Initial Test and Final Test									
Sample No.	Initial Test Current Spec. (A) 3.90 Max.	Final Test Current Spec. (A) 3.90 Max.	Deviation (%)	Initial Test Speed Spec. (RPM) 26550-32450 23850-29150	Final Test Speed Spec. (RPM) 26550-32450 23850-29150	Deviation (%)	Initial Test Noise Spec. (dB A) 77.0 Max	Final Test Noise Spec. (dB A) 77.0 Max	Deviation 3 dBMax.
1	3. 21	3. 31	3.1	29669	29666	0.0	77.0	76.3	-0.7
2	3. 35	3. 13	-6.6	26785	26581	-0.8	77.1	75.7	-1.4
3	3. 28	3. 19	-2.9	29728	29537	-0.6	77.4	75.2	-2.2
4	3. 27	3. 09	-5.6	26799	26559	-0.9	77.3	75.3	-2.0
5	3. 24	3. 19	-1.8	29765	29596	-0.6	78.0	76.3	-1.7
6	3. 31	3. 15	-5.0	26845	26700	-0.5	78.4	75.9	-2.5
7	3. 22	3. 17	-1.5	29714	29543	-0.6	78.2	75.9	-2.3
8	3. 19	3. 12	-2.1	26697	26588	-0.4	77.0	74.3	-2.7
9	3. 30	3. 15	-4.5	29682	29600	-0.3	78.8	76.7	-2.1
10	3. 19	3. 18	-0.5	26779	26711	-0.3	77.3	75.4	-1.9
11	3. 25	3. 16	-2.8	29870	29530	-1.1	77.4	75.6	-1.8
12	3. 24	3. 16	-2.4	26826	26682	-0.5	77.4	75.5	-1.9
13	3. 12	3. 10	-0.7	29733	29671	-0.2	77.2	74.9	-2.3
14	3. 25	3. 18	-2.4	26744	26715	-0.1	77.5	75.0	-2.5
15	3. 23	3. 11	-3.9	29649	29612	-0.1	77.6	75.2	-2.4
16	3. 26	3. 19	-2.2	26633	26615	-0.1	77.5	75.6	-1.9
17	3. 25	3. 16	-2.8	30000	29543	-1.5	77.6	75.4	-2.2
18	3. 33	3. 13	-6.1	26803	26665	-0.5	76.5	74.7	-1.8
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2,108		2019/7/22 8:30 AM		2019/10/26 7:51 PM		56		0		360.0	
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19	3. 24	3. 10	-4.4	29674 26673	29541 26688	-0.4 0.1	78.1	75.7	-2.4		
20	3. 21	3. 17	-1.1	29692 26658	29685 26673	0.0 0.1	77.3	75.0	-2.3		
21	3. 19	3. 16	-0.7	29699 26771	29564 26503	-0.5 -1.0	77.5	75.4	-2.1		
22	3. 25	3. 13	-3.6	29609 26669	29428 26617	-0.6 -0.2	77.9	75.3	-2.6		
23	3. 13	3. 14	0.2	29655 26797	29656 26551	0.0 -0.9	77.4	75.0	-2.4		
24	3. 21	3. 23	0.6	29693 26724	29853 26673	0.5 -0.2	77.7	75.0	-2.7		
25	3. 26	3. 19	-2.1	29567 26867	29784 26680	0.7 -0.7	78.0	75.6	-2.4		
26	3. 31	3. 15	-4.8	29872 26566	29501 26573	-1.2 0.0	77.5	75.5	-2.0		
27	3. 23	3. 21	-0.6	29754 26672	29778 26842	0.1 0.6	77.4	74.6	-2.8		
28	3. 25	3. 19	-2.1	29578 26707	29602 26609	0.1 -0.4	78.1	76.0	-2.1		
29	3. 24	3. 17	-2.3	29773 26841	29601 26658	-0.6 -0.7	77.2	75.2	-2.0		
30	3. 23	3. 19	-1.3	29768 26553	29505 26747	-0.9 0.7	77.7	76.0	-1.7		
31	3. 18	3. 20	0.4	29607 26780	29523 26692	-0.3 -0.3	77.1	75.2	-1.9		
32	3. 30	3. 18	-3.8	29761 26711	29580 26661	-0.6 -0.2	78.4	75.7	-2.7		
33	3. 20	3. 15	-1.5	29634 26850	29553 26662	-0.3 -0.7	77.5	75.4	-2.1		
34	3. 26	3. 16	-2.9	29712 26813	29654 26561	-0.2 -0.9	77.3	75.3	-2.0		
35	3. 28	3. 22	-1.8	29691 26875	29646 26636	-0.2 -0.9	77.2	75.1	-2.1		
36	3. 26	3. 20	-1.8	29734 26707	29678 26707	-0.2 0.0	78.0	75.2	-2.8		
37	3. 22	3. 15	-2.1	29666 26670	29660 26562	0.0 -0.4	77.8	75.3	-2.5		
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38	3. 26	3. 12	-4.1	29833	29651	-0.6	77.8	75.4	-2.4
				26781	26500	-1.0			
39	3. 28	3. 18	-3.0	29829	29653	-0.6	78.5	76.1	-2.4
				26672	26646	-0.1			
40	3. 26	3. 18	-2.5	29514	29545	0.1	77.8	75.7	-2.1
				26591	26558	-0.1			
41	3. 21	3. 21	0.2	29859	29703	-0.5	77.4	75.4	-2.0
				26680	26644	-0.1			
42	3. 25	3. 17	-2.5	29735	29619	-0.4	77.2	74.9	-2.3
				26777	26621	-0.6			
43	3. 31	3. 22	-2.8	29830	29557	-0.9	77.3	75.4	-1.9
				26830	26627	-0.8			
44	3. 28	3. 13	-4.6	29870	29573	-1.0	77.7	75.6	-2.1
				26772	26625	-0.5			
45	3. 25	3. 16	-2.7	29668	29616	-0.2	77.5	75.1	-2.4
				26773	26704	-0.3			
46	3. 30	3. 15	-4.5	29813	29681	-0.4	77.4	75.4	-2.0
				26933	26671	-1.0			
47	3. 24	3. 18	-1.8	29682	29598	-0.3	77.1	75.5	-1.6
				26727	26768	0.2			
48	3. 19	3. 12	-2.1	29633	29559	-0.2	78.4	74.9	-3.5
				26765	26657	-0.4			
49	3. 30	3. 15	-4.4	29716	29657	-0.2	77.2	75.5	-1.7
				26573	26492	-0.3			
50	3. 20	3. 17	-0.8	29623	29628	0.0	76.9	74.4	-2.5
				26650	26551	-0.4			
51	3. 26	3. 15	-3.4	29786	29572	-0.7	77.0	75.6	-1.4
				26591	26655	0.2			
52	3. 23	3. 20	-1.1	29768	29780	0.0	77.6	75.5	-2.1
				26817	26739	-0.3			
53	3. 27	3. 21	-1.8	29796	29649	-0.5	76.9	75.1	-1.8
				26833	26661	-0.6			
54	3. 26	3. 18	-2.5	29767	29734	-0.1	77.3	75.4	-1.9
				26625	26650	0.1			
55	3. 26	3. 14	-3.6	29733	29666	-0.2	77.5	75.2	-2.3
				26688	26559	-0.5			
56	3. 31	3. 10	-6.4	29815	29542	-0.9	77.1	75.1	-2.0
				26645	26539	-0.4			
X-Bar	3.247	3.165	-	28237.8	0	-	77.53	75.39	-
σ	0.045	0.038	-	1504.543	0	-	0.457	0.447	-
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