

FAN LIFE EXPERIMENT REPORT

Available for these models with lower speed and same physical structure. This test report applies to IceLED LED coolers as the right table	IceLED 450	IceLED Xtra Ultra	
	IceLED 550	IceLED Ultra VS	
	IceLED Xtra 550		
	IceLED Ultra		
Representative Test P/N : IceLED Ultra			
Equipment : 1. Oven : F00-5, E24-T060 2. DC Source : GW GPC-3060D			On/OffCvcles : Every 500 hours

◎ L₁₀ Expectancy: 60,000 hours minimum @ fan rated voltage and the temperature of 40°C

According to the equation for Weibull distribution, $MTTF \doteq 7 \times L_{10} = 420,000$ 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,

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

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 40 °C (hours)	Verified L ₁₀ 40 °C (hours)
80	40	16.00	30	2.303	2,630	2,700.5	431,218	61,603

Test Progress:

Date for Test Beginning	Date for Test Termination (at least)	Current Test Status			Current Total Test Time (hours)
2013-08-02	2013-11-28	☐ In process	☐ In process (exceed requested)	☒ Termination	2700.5

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	1,219,670	174,239
30	32.00	862,437	123,205
40	16.00	431,218	61,603
50	8.00	215,609	30,801
60	4.00	107,805	15,401
70	2.00	53,902	7,700

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				IceLED 550		IceLED Ultra VS			
				IceLED Xtra 550					
				IceLED Ultra					
Required Test Time (hrs)		Date for Test Beginning		Date for Test Termination		Sample Size (pcs):	Failure (pcs):	Current Total Test Time (hrs)	
2,630		2013-08-02		2013-11-28		30	0	2700.5	
Representative Test P/N : IceLED Ultra				Current Test Status		☐ In process	☐ In process (exceed requested)	☒ Termination	
Equipment: 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 No.	Initial Test	Final Test	Deviation (%)	Initial Test	Final Test	Deviation (%)	Initial Test	Final Test	Deviation (%)
	Current (A) 0,23 Max.	Current (A) 0,23 Max.		Speed (RPM) 3,000	Speed (RPM) 2,550		Noise (dB A) 39.4	Noise (dB A) 42.4	
1	0.22	0.20	-10.00	3074	2932	-4.84	37.9	39.0	2.82
2	0.21	0.21	0.00	3122	3012	-3.65	39.3	41.9	6.21
3	0.23	0.22	-4.55	2987	2798	-6.75	38.7	40.7	4.91
4	0.22	0.22	0.00	3051	2916	-4.63	38.3	40.0	4.25
5	0.22	0.20	-10.00	2908	2769	-5.02	36.5	38.4	4.95
6	0.23	0.21	-9.52	3144	3010	-4.45	36.0	38.6	6.74
7	0.21	0.20	-5.00	3098	2922	-6.02	37.1	40.0	7.25
8	0.21	0.21	0.00	2946	2787	-5.71	37.7	40.4	6.68
9	0.22	0.21	-4.76	2920	2708	-7.83	37.2	39.8	6.53
10	0.23	0.21	-9.52	3087	2890	-6.82	37.8	38.9	2.83
11	0.21	0.20	-5.00	3127	3005	-4.06	38.9	41.1	5.35
12	0.21	0.20	-5.00	3102	2949	-5.19	38.0	40.2	5.47
13	0.23	0.22	-4.55	3012	2881	-4.55	36.5	38.5	5.19
14	0.22	0.22	0.00	2937	2766	-6.18	35.9	37.0	2.97
15	0.22	0.21	-4.76	2966	2789	-6.35	36.8	39.2	6.12
16	0.21	0.20	-5.00	3089	2836	-8.92	37.0	38.8	4.64
17	0.21	0.21	0.00	3072	2811	-9.28	37.2	39.4	5.58
18	0.22	0.22	0.00	3136	3013	-4.08	38.1	38.8	1.80
19	0.23	0.20	-15.00	3202	3073	-4.20	39.2	41.9	6.44
20	0.21	0.20	-5.00	3061	2855	-7.22	38.4	40.9	6.11
21	0.22	0.21	-4.76	3083	2980	-3.46	36.9	37.2	0.81
22	0.21	0.21	0.00	2915	2719	-7.21	37.0	39.6	6.57
23	0.23	0.22	-4.55	3123	2989	-4.48	38.9	41.0	5.12
24	0.21	0.20	-5.00	3008	2893	-3.98	37.5	39.5	5.06
25	0.23	0.22	-4.55	3091	2898	-6.66	37.7	38.9	3.08
26	0.22	0.21	-4.76	2917	2791	-4.51	36.6	38.4	4.69
27	0.20	0.20	0.00	3098	3020	-2.58	38.1	39.6	3.79
28	0.23	0.21	-9.52	3112	3003	-3.63	39.0	40.9	4.65
29	0.22	0.22	0.00	3056	2872	-6.41	38.2	40.1	4.74
30	0.22	0.21	-4.76	2896	2698	-7.34	35.9	37.0	2.97
X-Bar	0.219	0.209	-4.459	3044.667	2886.167	-5.492	37.610	39.523	4.841