

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 169X172X50.8mm series as the right table | | | | | |
| Representative Test P/N : THB1748BGARM(S) | | | | | |
| Equipment: 1.Oven: E24-T0161 | | | | On/Off Cycles: Every 500 hours | |

© **L₁₀ Expectancy:** **70,000** hours minimum @ fan rated voltage and the temperature of **40℃**
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 T _s (℃) (Actual Test Temperature) | Unstress Temperature T _u (℃) | 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 | <input type="checkbox"/> In process | <input checked="" type="checkbox"/> In process (exceed requested) | <input type="checkbox"/> 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' 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 (℃) | 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 $\geq 15\%$ 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



DC FAN FUNCTION TEST RECORD FOR LIFE EXPERIMENT

| 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 Φ169X172X50.8mm series as the right table | | | | | | | | | |
|---|---|---|----------------------------|--|--|---|---|---|------------------------------|
| 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 | | <input type="checkbox"/> In process | <input checked="" type="checkbox"/> In process (exceed requested) | <input type="checkbox"/> 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 | | |