



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 EFB 40x40x10 mm series as the right table | EFB0412VHA | EFB0412HHA | EFB0412HA | EFB0412MA | EFB0412LA |
| | EFB0405HHA | EFB0405HA | EFB0405MA | EFB0405LA | |
| | | | | | |

Representative Test P/N : EFB0412VHA-F00

Equipment: 1.Oven: F00-5, E24-T060 2. DC Source: GW GPC-3060D On/Off Cycles: Every 500 hours

© **L₁₀ Expectancy: 70,000 hours minimum @ fan rated voltage and the temperature of 40°C**

According to the equation for **Weibull distribution**, **MTTF \cong 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%), 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 (hours) | Verified L ₁₀ (hours) |
|---|--|------------------------------------|----------------------------------|--|--|--|-----------------------|----------------------------------|
| 80 | 40 | 16.00 | 27 | 2.303 | 3,377 | 4,752.0 | 689,430 | 98,490 |

Test Progress:

| Date for Test Beginning | Date for Test Termination (at least) | Current Test Status | | | Current Total Test Time (hours) |
|-------------------------|--------------------------------------|-------------------------------------|--|---|---------------------------------|
| 2001/8/9 8:00 AM | 2002/4/9 3:23 AM | <input type="checkbox"/> In process | <input type="checkbox"/> In process (exceed requested) | <input checked="" type="checkbox"/> Termination | 4752.0 |

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. 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 | 1,950,003 | 278,572 |
| 30 | 32.00 | 1,378,860 | 196,980 |
| 40 | 16.00 | 689,430 | 98,490 |
| 50 | 8.00 | 344,715 | 49,245 |
| 60 | 4.00 | 172,358 | 24,623 |
| 70 | 2.00 | 86,179 | 12,311 |
| 80 | 1.00 | 43,089 | 6,156 |

| QE File No. | Time-out for function test or others (hours) | Issued Date | Reported By | Approved By |
|-------------------|--|--------------------------|---------------------|--------------------|
| 01FNS040-L | 2450.00 | 2002/6/5 10:00 AM | <i>Bonnie Chang</i> | <i>[Signature]</i> |



DC FAN FUNCTION TEST RECORD FOR LIFE EXPERIMENT

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 EFB 40x40x10 mm series as the right table

| | | | | |
|------------|------------|-----------|-----------|-----------|
| EFB0412VHA | EFB0412HHA | EFB0412HA | EFB0412MA | EFB0412LA |
| EFB0405HHA | EFB0405HA | EFB0405MA | EFB0405LA | |
| | | | | |

| Required Test Time (hrs) | Date for Test Beginning | Date for Test Termination | Sample Size (pcs): | Failure (pcs): | Current Total Test Time (hrs) |
|--------------------------|-------------------------|---------------------------|--------------------|----------------|-------------------------------|
| 3,377 | 2001/8/9 8:00 AM | 2002/4/9 3:23 AM | 27 | 0 | 4752.0 |

| | | | | | |
|--|---------------------|--------------------------|---|-------------------------------------|-------------|
| representative Test P/N : EFB0412VHA-F00 | Current Test Status | <input type="checkbox"/> | <input type="checkbox"/> In process (exceed requested) | <input checked="" type="checkbox"/> | 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 P/N : EFB0412VHA-F00

| Sample No. | Initial Test | Final Test | Deviation (%) | Initial Test | Final Test | Deviation (%) | Initial Test | Final Test | Deviation (%) |
|------------|---------------------------------------|---------------------------------------|---------------|---------------------------------------|---------------------------------------|---------------|--|--|---------------|
| | Current Spec. (A) 0.33 Max. | Current Spec. (A) 0.33 Max. | | Speed Spec. (RPM) 8000 Ref. | Speed Spec. (RPM) 6800 Min. | | Noise Spec. (dB A) 41.0 Max. | Noise Spec. (dB A) 44.0 Max. | |
| 1 | 0.17 | 0.16 | -5.9 | 7934 | 8898 | 12.2 | 36.9 | 39.8 | 7.9 |
| 2 | 0.17 | 0.15 | -11.8 | 8116 | 8856 | 9.1 | 37.1 | 39.7 | 7.0 |
| 3 | 0.17 | 0.16 | -5.9 | 8050 | 8897 | 10.5 | 36.8 | 39.8 | 8.2 |
| 4 | 0.16 | 0.16 | 0.0 | 8260 | 8875 | 7.4 | 36.7 | 39.8 | 8.4 |
| 5 | 0.17 | 0.16 | -5.9 | 8112 | 8905 | 9.8 | 36.9 | 39.8 | 7.9 |
| 6 | 0.17 | 0.15 | -11.8 | 8146 | 8845 | 8.6 | 37.3 | 39.7 | 6.4 |
| 7 | 0.17 | 0.15 | -11.8 | 8070 | 8861 | 9.8 | 37.4 | 39.7 | 6.1 |
| 8 | 0.17 | 0.16 | -5.9 | 8050 | 8951 | 11.2 | 37.6 | 39.9 | 6.1 |
| 9 | 0.17 | 0.15 | -11.8 | 8036 | 8905 | 10.8 | 36.9 | 39.8 | 7.9 |
| 10 | 0.17 | 0.16 | -5.9 | 8086 | 8862 | 9.6 | 37.7 | 39.7 | 5.3 |
| 11 | 0.17 | 0.16 | -5.9 | 8060 | 8765 | 8.7 | 37.8 | 39.5 | 4.5 |
| 12 | 0.17 | 0.15 | -11.8 | 8080 | 8788 | 8.8 | 37.5 | 39.5 | 5.3 |
| 13 | 0.16 | 0.15 | -6.3 | 7984 | 8965 | 12.3 | 37.0 | 40.0 | 8.1 |
| 14 | 0.17 | 0.15 | -11.8 | 8035 | 8820 | 9.8 | 37.2 | 39.6 | 6.5 |
| 15 | 0.17 | 0.16 | -5.9 | 8220 | 9015 | 9.7 | 38.0 | 40.1 | 5.5 |
| 16 | 0.17 | 0.16 | -5.9 | 8059 | 7711 | -4.3 | 37.4 | 36.7 | -1.9 |
| 17 | 0.17 | 0.15 | -11.8 | 8218 | 8905 | 8.4 | 37.8 | 39.8 | 5.3 |
| 18 | 0.17 | 0.16 | -5.9 | 8040 | 9008 | 12.0 | 37.5 | 40.1 | 6.9 |
| 19 | 0.17 | 0.16 | -5.9 | 8030 | 8938 | 11.3 | 37.9 | 39.9 | 5.3 |
| 20 | 0.17 | 0.15 | -11.8 | 7950 | 8858 | 11.4 | 37.0 | 39.7 | 7.3 |
| 21 | 0.17 | 0.15 | -11.8 | 8090 | 8889 | 9.9 | 37.6 | 39.8 | 5.9 |
| 22 | 0.17 | 0.15 | -11.8 | 8079 | 8793 | 8.8 | 37.8 | 39.6 | 4.8 |
| 23 | 0.17 | 0.15 | -11.8 | 8022 | 8957 | 11.7 | 37.5 | 40.0 | 6.7 |
| 24 | 0.17 | 0.15 | -11.8 | 8046 | 9003 | 11.9 | 37.2 | 40.1 | 7.8 |
| 25 | 0.17 | 0.16 | -5.9 | 8050 | 9006 | 11.9 | 37.1 | 40.1 | 8.1 |
| 26 | 0.16 | 0.16 | 0.0 | 8083 | 9074 | 12.3 | 37.8 | 40.2 | 6.3 |
| 27 | 0.17 | 0.16 | -5.9 | 7928 | 8904 | 12.3 | 36.9 | 39.8 | 7.9 |
| X-Bar | 0.169 | 0.155 | - | 8068 | 8861 | - | 37.3 | 39.7 | - |
| σ | 0.003 | 0.005 | - | 78.615 | 241.859 | - | 0.383 | 0.630 | - |

| QE File No. | Time-out for function test or others (hrs) | Issued Date | Reported By | Approved By |
|-------------|--|-------------------|---------------------|-------------|
| 01FNS040-L | 2450.00 | 2002/6/5 10:00 AM | <i>Bonnie Chang</i> | <i>John</i> |