



## 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 THB 120x120x25.4 mm series as the right table | THB1224B-PM00 |  |  |                                |  |
| <b>Representative Test P/N : THB1224B</b>   |               |  |  |                                |  |
| <b>Equipment: 1.Oven: E24-T0165</b>   |               |  |  | On/Off Cycles: Every 500 hours |  |

◎ **L<sub>10</sub> 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<sub>r,c</sub>) 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 <sub>s</sub> (°C)<br>(Actual Test Temperature) | Unstress Temperature T <sub>u</sub> (°C) | Acceleration Factor A <sub>F</sub> | Quantity of Test Devices n (pcs) | Poisson Distribution Factor B <sub>r,c</sub> | Required test time with zero failure t (hours) | Actual test time with zero failure t (hours) | Verified MTTF 40 °C (hours) | Verified L <sub>10</sub> 40 °C (hours) |
|--|--|------------------------------------|----------------------------------|--|--|--|-----------------------------|--|
| 70   | 40                                       | 8.00                               | 56                               | 2.303  | 3,478  | 20,478.0                                     | 2,885,236                   | 412,177                                |

**Test Progress:**

| Date for Test Beginning | Date for Test Termination (at least) | Current Test Status                 |   |                                      | Current Total Test Time (hours) |
|-------------------------|--------------------------------------|-------------------------------------|---|--------------------------------------|---------------------------------|
| 2010/5/6 11:30 AM       | 2013/5/11 12:16 AM                   | <input type="checkbox"/> In process | <input checked="" type="checkbox"/> In process (exceed requested) | <input type="checkbox"/> Termination | 20478.0                         |

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<sub>10</sub> 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 >3dB over the original measure noise.

| Temperature for MTTF Estimation (°C) | Acceleration Factor A <sub>F</sub> | Estimated MTTF (hours) | Estimated L <sub>10</sub> (hours) |
|--------------------------------------|------------------------------------|------------------------|-----------------------------------|
| 25                                   | 22.63                              | 8,160,681              | 1,165,812                         |
| 30                                   | 16.00                              | 5,770,473              | 824,353                           |
| 40                                   | 8.00                               | 2,885,236              | 412,177                           |
| 50                                   | 4.00                               | 1,442,618              | 206,088                           |
| 60                                   | 2.00                               | 721,309                | 103,044                           |
| 70                                   | 1.00                               | 360,655                | 51,522                            |

**Test Result**

- Accept**  
 **Reject**

| QE File No. | Time-out for function test or others (hours) | Issued Date | Reported By | Approved By |
|-------------|--|-------------|-------------|-------------|
| DG10FNL052  | 22935.00                                     | 2014/7/26   | NaNa.Wang   | Tim.Yi      |

BGN (dBA) : 16.3

Temp (°C) : 23.6



## DC FAN FUNCTION TEST RECORD FOR LIFE EXPERIMENT

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 applies to THB 120x120x25.4 mm series as the right table

|                                 |                                |                                  |                           |                       |                                      |
|---------------------------------|--------------------------------|----------------------------------|---------------------------|-----------------------|--------------------------------------|
| <b>Required Test Time (hrs)</b> | <b>Date for Test Beginning</b> | <b>Date for Test Termination</b> | <b>Sample Size (pcs):</b> | <b>Failure (pcs):</b> | <b>Current Total Test Time (hrs)</b> |
| 3,478                           | 2010/5/6 11:30 AM              | 2013/5/11 12:16 AM               | 56                        | 0                     | <b>20478.0</b>                       |

|                                    |                            |                                     |   |                                      |
|------------------------------------|----------------------------|-------------------------------------|---|--------------------------------------|
| Representative Test P/N : THB1224B | <b>Current Test Status</b> | <input type="checkbox"/> In process | <input checked="" type="checkbox"/> In process (exceed requested) | <input type="checkbox"/> Termination |
|------------------------------------|----------------------------|-------------------------------------|---|--------------------------------------|

Equipment: 1.Oven: E24-T0165 On/Off Cycles: Every 500 hours

### Test Data Between Initial Test and Final Test

| Sample No. | Initial Test Current Spec. | Final Test Current Spec.   | Deviation (%) | Initial Test Speed Spec.    | Final Test Speed Spec.      | Deviation (%) | Initial Test Noise Spec.    | Final Test Noise Spec.      | Deviation |
|------------|----------------------------|----------------------------|---------------|-----------------------------|-----------------------------|---------------|-----------------------------|-----------------------------|-----------|
|            | ( mA )<br><b>1140 Max.</b> | ( mA )<br><b>1140 Max.</b> |               | ( RPM )<br><b>7470-9130</b> | ( RPM )<br><b>7470-9130</b> |               | ( dB A )<br><b>69.0 Max</b> | ( dB A )<br><b>69.0 Max</b> |           |
| 1          | 912                        | 914                        | 0.2           | 8261                        | 8426                        | 2.0           | 63.6                        | 64.3                        | 0.7       |
| 2          | 900                        | 902                        | 0.2           | 8079                        | 8422                        | 4.2           | 64.4                        | 63.8                        | -0.6      |
| 3          | 888                        | 879                        | -1.0          | 8164                        | 8293                        | 1.6           | 64.3                        | 64.4                        | 0.1       |
| 4          | 937                        | 883                        | -5.8          | 8269                        | 8361                        | 1.1           | 63.7                        | 64.3                        | 0.6       |
| 5          | 933                        | 897                        | -3.9          | 8185                        | 8368                        | 2.2           | 64.2                        | 66.0                        | 1.8       |
| 6          | 950                        | 883                        | -7.1          | 8184                        | 8361                        | 2.2           | 64.3                        | 63.6                        | -0.7      |
| 7          | 878                        | 905                        | 3.1           | 8067                        | 8386                        | 4.0           | 64.2                        | 64.2                        | 0.0       |
| 8          | 952                        | 905                        | -4.9          | 8227                        | 8386                        | 1.9           | 63.9                        | 64.6                        | 0.7       |
| 9          | 855                        | 849                        | -0.7          | 7948                        | 8238                        | 3.6           | 64.2                        | 64.8                        | 0.6       |
| 10         | 884                        | 898                        | 1.6           | 8227                        | 8358                        | 1.6           | 64.1                        | 63.7                        | -0.4      |
| 11         | 891                        | 879                        | -1.3          | 8076                        | 8280                        | 2.5           | 64.3                        | 65.0                        | 0.7       |
| 12         | 931                        | 918                        | -1.4          | 8258                        | 8444                        | 2.3           | 63.8                        | 63.9                        | 0.1       |
| 13         | 926                        | 921                        | -0.5          | 8307                        | 8454                        | 1.8           | 64.0                        | 65.2                        | 1.2       |
| 14         | 898                        | 858                        | -4.5          | 7972                        | 8266                        | 3.7           | 63.9                        | 64.1                        | 0.2       |
| 15         | 920                        | 896                        | -2.6          | 8244                        | 8413                        | 2.0           | 63.8                        | 65.3                        | 1.5       |
| 16         | 943                        | 905                        | -4.0          | 8230                        | 8338                        | 1.3           | 63.7                        | 65.5                        | 1.8       |
| 17         | 888                        | 855                        | -3.7          | 8167                        | 8307                        | 1.7           | 63.6                        | 64.4                        | 0.8       |
| 18         | 942                        | 917                        | -2.7          | 8227                        | 8411                        | 2.2           | 63.8                        | 64.6                        | 0.8       |
| 19         | 928                        | 849                        | -8.5          | 8281                        | 8238                        | -0.5          | 63.7                        | 63.7                        | 0.0       |
| 20         | 921                        | 1019                       | 10.6          | 8236                        | 8326                        | 1.1           | 63.7                        | 64.8                        | 1.1       |
| 21         | 935                        | 897                        | -4.1          | 8212                        | 8355                        | 1.7           | 63.8                        | 65.0                        | 1.2       |
| 22         | 928                        | 909                        | -2.0          | 8170                        | 8364                        | 2.4           | 63.9                        | 63.8                        | -0.1      |
| 23         | 936                        | 898                        | -4.1          | 8318                        | 8358                        | 0.5           | 63.9                        | 65.6                        | 1.7       |
| 24         | 920                        | 920                        | 0.0           | 8273                        | 8397                        | 1.5           | 64.0                        | 65.8                        | 1.8       |
| 25         | 909                        | 871                        | -4.2          | 8067                        | 8267                        | 2.5           | 64.1                        | 64.0                        | -0.1      |
| 26         | 908                        | 890                        | -2.0          | 8226                        | 8323                        | 1.2           | 64.2                        | 63.7                        | -0.5      |
| 27         | 931                        | 891                        | -4.3          | 8116                        | 8297                        | 2.2           | 64.0                        | 64.6                        | 0.6       |
| 28         | 896                        | 896                        | 0.0           | 8138                        | 8342                        | 2.5           | 64.2                        | 64.8                        | 0.6       |
| 29         | 884                        | 879                        | -0.6          | 8087                        | 8280                        | 2.4           | 64.1                        | 63.7                        | -0.4      |
| 30         | 884                        | 902                        | 2.0           | 8128                        | 8355                        | 2.8           | 64.3                        | 64.0                        | -0.3      |
| 31         | 915                        | 874                        | -4.5          | 8227                        | 8338                        | 1.3           | 64.4                        | 64.2                        | -0.2      |
| 32         | 885                        | 874                        | -1.2          | 8105                        | 8299                        | 2.4           | 63.6                        | 63.8                        | 0.2       |
| 33         | 958                        | 918                        | -4.2          | 8258                        | 8444                        | 2.3           | 64.2                        | 64.1                        | -0.1      |
| 34         | 926                        | 911                        | -1.6          | 8279                        | 8435                        | 1.9           | 63.7                        | 63.9                        | 0.2       |
| 35         | 931                        | 924                        | -0.8          | 8285                        | 8377                        | 1.1           | 63.8                        | 64.5                        | 0.7       |

|                    |   |                    |                    |                    |
|--------------------|---|--------------------|--------------------|--------------------|
| <b>QE File No.</b> | <b>Time-out for function test or others (hours)</b> | <b>Issued Date</b> | <b>Reported By</b> | <b>Approved By</b> |
| DG10FNL052         | 22935.00  | 2014/7/26          | NaNa.Wang          | Tim.Yi             |



## DC FAN FUNCTION TEST RECORD FOR LIFE EXPERIMENT

|   |               |  |  |  |  |
|---|---------------|--|--|--|--|
| Available for these models with lower speed and same physical structure.<br>All model may be followed by Rxx or Fxx series suffixes. This test report<br>applies to THB 120x120x25.4 mm series as the right table | THB1224B-PM00 |  |  |  |  |
|---|---------------|--|--|--|--|

| Required Test Time (hrs) | Date for Test Beginning | Date for Test Termination | Sample Size (pcs): | Failure (pcs): | Current Total Test Time (hrs) |
|--------------------------|-------------------------|---------------------------|--------------------|----------------|-------------------------------|
| 3,478                    | 2010/5/6 11:30 AM       | 2013/5/11 12:16 AM        | 56                 | 0              | <b>20478.0</b>                |

|                                    |                            |                                     |  |                                      |
|------------------------------------|----------------------------|-------------------------------------|--|--------------------------------------|
| Representative Test P/N : THB1224B | <b>Current Test Status</b> | <input type="checkbox"/> In process | <input checked="" type="checkbox"/> In process<br>(exceed requested) | <input type="checkbox"/> Termination |
|------------------------------------|----------------------------|-------------------------------------|--|--------------------------------------|

|                              |                                |
|------------------------------|--------------------------------|
| Equipment: 1.Oven: E24-T0165 | On/Off Cycles: Every 500 hours |
|------------------------------|--------------------------------|

### Test Data Between Initial Test and Final Test

| Sample No. | Initial Test Current Spec. | Final Test Current Spec.   | Deviation (%) | Initial Test Speed Spec.    | Final Test Speed Spec.      | Deviation (%) | Initial Test Noise Spec.    | Final Test Noise Spec.      | Deviation |
|------------|----------------------------|----------------------------|---------------|-----------------------------|-----------------------------|---------------|-----------------------------|-----------------------------|-----------|
|            | ( mA )<br><b>1140 Max.</b> | ( mA )<br><b>1140 Max.</b> |               | ( RPM )<br><b>7470-9130</b> | ( RPM )<br><b>7470-9130</b> |               | ( dB A )<br><b>69.0 Max</b> | ( dB A )<br><b>69.0 Max</b> |           |
| 36         | 888                        | 862                        | -2.9          | 7903                        | 8274                        | 4.7           | 63.9                        | 63.6                        | -0.3      |
| 37         | 891                        | 956                        | 7.3           | 8213                        | 8453                        | 2.9           | 64.0                        | 64.9                        | 0.9       |
| 38         | 898                        | 892                        | -0.7          | 8233                        | 8351                        | 1.4           | 64.3                        | 63.8                        | -0.5      |
| 39         | 871                        | 860                        | -1.3          | 7876                        | 8307                        | 5.5           | 64.1                        | 65.1                        | 1.0       |
| 40         | 920                        | 901                        | -2.1          | 8135                        | 8307                        | 2.1           | 64.2                        | 64.0                        | -0.2      |
| 41         | 903                        | 921                        | 2.0           | 8050                        | 8454                        | 5.0           | 64.3                        | 64.2                        | -0.1      |
| 42         | 992                        | 871                        | -12.2         | 8501                        | 8267                        | -2.8          | 64.4                        | 65.4                        | 1.0       |
| 43         | 922                        | 889                        | -3.6          | 8060                        | 8349                        | 3.6           | 64.4                        | 64.3                        | -0.1      |
| 44         | 900                        | 891                        | -1.0          | 8115                        | 8297                        | 2.2           | 63.6                        | 64.5                        | 0.9       |
| 45         | 891                        | 897                        | 0.7           | 8114                        | 8323                        | 2.6           | 64.3                        | 63.6                        | -0.7      |
| 46         | 907                        | 911                        | 0.4           | 8225                        | 8431                        | 2.5           | 64.2                        | 64.7                        | 0.5       |
| 47         | 919                        | 893                        | -2.8          | 8110                        | 8420                        | 3.8           | 64.1                        | 64.9                        | 0.8       |
| 48         | 860                        | 863                        | 0.3           | 8078                        | 8296                        | 2.7           | 64.0                        | 65.1                        | 1.1       |
| 49         | 934                        | 896                        | -4.1          | 8174                        | 8342                        | 2.1           | 64.4                        | 63.9                        | -0.5      |
| 50         | 911                        | 932                        | 2.3           | 8173                        | 8424                        | 3.1           | 63.9                        | 65.7                        | 1.8       |
| 51         | 881                        | 865                        | -1.8          | 7931                        | 8221                        | 3.7           | 63.8                        | 64.2                        | 0.4       |
| 52         | 893                        | 904                        | 1.2           | 8184                        | 8413                        | 2.8           | 63.8                        | 64.4                        | 0.6       |
| 53         | 957                        | 902                        | -5.7          | 8243                        | 8355                        | 1.4           | 64.0                        | 63.8                        | -0.2      |
| 54         | 892                        | 890                        | -0.2          | 7998                        | 8268                        | 3.4           | 63.8                        | 64.7                        | 0.9       |
| 55         | 914                        | 908                        | -0.7          | 8234                        | 8394                        | 1.9           | 63.7                        | 64.9                        | 1.2       |
| 56         | 886                        | 890                        | 0.5           | 8325                        | 8323                        | 0.0           | 63.9                        | 64.2                        | 0.3       |
| X-Bar      | 911.7                      | 896.1                      | -             | 8167.4                      | 8349.6                      | -             | 64.01                       | 64.46                       | -         |
| $\sigma$   | 26.596                     | 27.397                     | -             | 115.977                     | 62.244                      | -             | 0.247                       | 0.628                       | -         |

| QE File No.       | Time-out for function test or others (hrs) | Issued Date      | Reported By      | Approved By   |
|-------------------|--|------------------|------------------|---------------|
| <b>DG10FNL052</b> | <b>22935.00</b>                            | <b>2014/7/26</b> | <b>NaNa.Wang</b> | <b>Tim.Yi</b> |