# CUS800M

# RELIABILITY DATA

# INDEX



※ Test results are typical data. Nevertheless the following results are considered to be reference data because all units have nearly the same characteristics.

# 1. Calculated Values of MTBF

**Parts stress reliability prediction MTBF**

**MODEL：CUS800M-12**

**Calculating Method**

Calculated based on parts stress reliability prediction of Telcordia (*1).
Individual failure rate $\lambda_{SS}$ is calculated by the electric stress and temperature rise of the each part.

*1: Telcordia document "Reliability Prediction Procedure for Electronic Equipment"
(Document number SR-332,Issue3)

＜Formula＞

$$MTBF = \frac{1}{\lambda_{equip}} = \frac{1}{\pi_E \sum_{i=1}^{m} (N_i \cdot \lambda_{ssi})} \times 10^9 \quad \text{(Hours)}$$

$$\lambda_{ssi} = \lambda_{Gi} \cdot \pi_{Qi} \cdot \pi_{Si} \cdot \pi_{Ti}$$

$\lambda_{equip}$ : Total equipment failure rate (FITs = Failures in$10^9$ hours)

$\lambda_{Gi}$ : Generic failure rate for the ith part

$\pi_{Qi}$ : Quality factor for the ith part

$\pi_{Si}$ : Stress factor for the ith part

$\pi_{Ti}$ : Temperature factor for the ith part

$m$ : Number of different part types

$N_i$ : Quantity of ith part type

$\pi_E$ : Equipment environmental factor

**MTBF Values**

Conditions

- Input voltage ： 115VAC
- Output voltage & current ： 12VDC, 56.7A
- Standby voltage & current ： 5VDC, 2A
- Environmental factor ： GB (Ground, Benign)
- Mounting method ： Standard mounting A

SR-332,Issue3

MTBF(Ta=25℃) ≒ 755,365 (Hours)

MTBF(Ta=30℃) ≒ 632,086 (Hours)

MTBF(Ta=40℃) ≒ 425,854 (Hours)

# 1. Calculated Values of MTBF

**Parts stress reliability prediction MTBF**

**MODEL：CUS800M-24**

**Calculating Method**

Calculated based on parts stress reliability prediction of Telcordia (*1).
Individual failure rate $\lambda_{SS}$ is calculated by the electric stress and temperature rise of the each part.

*1: Telcordia document “Reliability Prediction Procedure for Electronic Equipment”
(Document number SR-332,Issue3)

＜Formula＞

$$MTBF = \frac{1}{\lambda_{equip}} = \frac{1}{\pi_E \sum_{i=1}^{m} (N_i \cdot \lambda_{ssi})} \times 10^9 \quad \text{(Hours)}$$

$$\lambda_{ssi} = \lambda_{Gi} \cdot \pi_{Qi} \cdot \pi_{Si} \cdot \pi_{Ti}$$

$\lambda_{equip}$ : Total equipment failure rate (FITs = Failures in$10^9$ hours)

$\lambda_{Gi}$ : Generic failure rate for the ith part

$\pi_{Qi}$ : Quality factor for the ith part

$\pi_{Si}$ : Stress factor for the ith part

$\pi_{Ti}$ : Temperature factor for the ith part

$m$ : Number of different part types

$N_i$ : Quantity of ith part type

$\pi_E$ : Equipment environmental factor

**MTBF Values**

Conditions

- Input voltage ： 115VAC
- Output voltage & current ： 24VDC, 33.4A
- Standby voltage & current ： 5VDC, 2A
- Environmental factor ： GB (Ground, Benign)
- Mounting method ： Standard mounting A

SR-332,Issue3

MTBF(Ta=25℃) ≒ 805,502 (Hours)

MTBF(Ta=30℃) ≒ 674,511 (Hours)

MTBF(Ta=40℃) ≒ 452,227 (Hours)

## 2. Components Derating

**MODEL : CUS800M-12**

### (1) Calculating Method

(a) Measuring method

| | | | |
|---|---|---|---|
| ・Mounting method | : Standard mounting A | ・Input voltage | : 115, 230VAC |
| ・Output voltage & current | : 12V, 56.7A | ・Ambient temperature | : 40°C |
| ・Standby voltage & current | : 5V, 2A | | |

(b) Semiconductors

Compared with maximum junction temperature and actual one which is calculated based on case temperature, power dissipation and thermal impedance.

(c) IC, Resistors, Capacitors, etc.

Ambient temperature, operating condition, power dissipation and so on are within derating criteria.

(d) Calculating method of thermal impedance

$$\theta j - c = \frac{Tj(max) - Tc}{Pch(max)} \qquad \theta j - a = \frac{Tj(max) - Ta}{Pch(max)} \qquad \theta j - l = \frac{Tj(max) - Tl}{Pch(max)}$$

| | |
|---|---|
| Tc | : Case Temperature at Start Point of Derating;25℃ in General |
| Ta | : Ambient Temperature at Start Point of Derating;25℃ in General |
| Tl | : Lead Temperature at Start Point of Derating;25℃ in General |
| Pch(max) | : Maximum Channel Dissipation |
| Tj(max) (Tch(max)) | : Maximum Junction (channel) Temperature |
| θj-c (θch-c) | : Thermal Impedance between Junction (channel) and Case |
| θj-a | : Thermal Impedance between Junction and air |
| θj-l | : Thermal Impedance between Junction and Lead |

**(2) Component Derating List**

| Location No. | Measurement condition<br>Vin = 115VAC Iout = 56.7A Istb = 2A Ta = 40°C |
|---|---|
| BD1<br>D25XB80-7000<br>SHINDENGEN | Tch (max) = 150 °C θch-c = 1.0 °C/W<br>Pch= 9.1 W ΔTc = 40 °C Tc = 80 °C<br>Tch = Tc + ((θch-c) × Pch) = 89.1 °C<br>D.F. = 59.4 % |
| SCR1<br>TN1605H-6FP<br>STMICRO | Tch (max) = 150 °C θch-c = 4.5 °C/W<br>Pch = 3.06 W ΔTc = 34.5 °C Tc = 74.5 °C<br>Tch = Tc + ((θch-c) × Pch ) = 88.3 °C<br>D.F. = 58.8 % |
| D1<br>TRS10A65F,S1Q<br>TOSHIBA | Tch (max) = 175 °C θch-c = 3.78 °C/W<br>Pch= 2.3 W ΔTc = 44.0 °C Tc = 84 °C<br>Tch = Tc + ((θch-c) × Pch ) = 92.7 °C<br>D.F. = 53.0 % |
| Q1<br>TK39N60W,S1VF<br>TOSHIBA | Tj (max) = 150 °C θj-c = 0.463 °C/W<br>Pd = 6.8 W ΔTc = 36.5 °C Tc = 76.5 °C<br>Tj = Tc + ((θj-c) × Pd ) = 79.6 °C<br>D.F. = 53.1 % |
| Q103,Q104<br>IPT60R090CFD7<br>INFINEON | Tj (max) = 150 °C θj-c = 0.78 °C/W<br>Pd = 3.3 W ΔTc = 37.8 °C Tc = 77.8 °C<br>Tj = Tc + ((θj-c) × Pd ) = 80.4 °C<br>D.F. = 53.6 % |
| D61<br>SB360-E3/73<br>VISHAY | Tj (max) = 150 °C θj-l = 10 °C/W<br>Pd = 0.9 W ΔTl = 59.2 °C Tl = 99.2 °C<br>Tj = Tl + ((θj-l) × Pd ) = 108.2 °C<br>D.F. = 72.1 % |
| Q301,Q303<br>TPH1R306PL,L1Q<br>TOSHIBA | Tj (max) = 175 °C θj-c = 0.88 °C/W<br>Pd = 3.6 W ΔTc = 71.7 °C Tc = 111.7 °C<br>Tj = Tc + ((θj-c) × Pd ) = 114.9 °C<br>D.F. = 65.6 % |

Terminology Used

Vin : Input Voltage
Iout : Output Current
Istb : Output current of standby
Ta : Ambient temperature

**(2) Component Derating List**

| Location No. | Measurement condition<br>Vin = 230VAC Iout = 56.7A Istb = 2A Ta = 40°C |
|---|---|
| BD1<br>D25XB80-7000<br>SHINDENGEN | Tch (max) = 150 °C θch-c = 1.0 °C/W<br>Pch= 4.45 W ΔTc = 20.9 °C Tc = 60.9 °C<br>Tch = Tc + ((θch-c) × Pch) = 65.4 °C<br>D.F. = 43.6 % |
| SCR1<br>TN1605H-6FP<br>STMICRO | Tch (max) = 150 °C θch-c = 4.5 °C/W<br>Pch = 3.0 W ΔTc = 20.9 °C Tc = 60.9 °C<br>Tch = Tc + ((θch-c) × Pch ) = 74.4 °C<br>D.F. = 49.6 % |
| D1<br>TRS10A65F,S1Q<br>TOSHIBA | Tch (max) = 175 °C θch-c = 3.78 °C/W<br>Pch= 1.5 W ΔTc = 27.3 °C Tc = 67.3 °C<br>Tch = Tc + ((θch-c) × Pch ) = 73.0 °C<br>D.F. = 41.7 % |
| Q1<br>TK39N60W,S1VF<br>TOSHIBA | Tj (max) = 150 °C θj-c = 0.463 °C/W<br>Pd = 3.2 W ΔTc = 19.8 °C Tc = 59.8 °C<br>Tj = Tc + ((θj-c) × Pd ) = 61.3 °C<br>D.F. = 40.9 % |
| Q103,Q104<br>IPT60R090CFD7<br>INFINEON | Tj (max) = 150 °C θj-c = 0.78 °C/W<br>Pd = 3.3 W ΔTc = 31.6 °C Tc = 71.6 °C<br>Tj = Tc + ((θj-c) × Pd ) = 74.2 °C<br>D.F. = 49.4 % |
| D61<br>SB360-E3/73<br>VISHAY | Tj (max) = 150 °C θj-l = 10 °C/W<br>Pd = 0.9 W ΔTl = 54.4 °C Tl = 94.4 °C<br>Tj = Tl + ((θj-l) × Pd ) = 103.4°C<br>D.F. = 68.9 % |
| Q301,Q303<br>TPH1R306PL,L1Q<br>TOSHIBA | Tj (max) = 175 °C θj-c = 0.88 °C/W<br>Pd = 3.6 W ΔTc = 64.1 °C Tc = 104.1 °C<br>Tj = Tc + ((θj-c) × Pd ) = 107.3 °C<br>D.F. = 61.3 % |

Terminology Used

Vin : Input Voltage  
Iout : Output Current  
Istb : Output current of standby  
Ta : Ambient temperature

## 2. Components Derating

**MODEL : CUS800M-24**

### (1) Calculating Method

(a) Measuring method

| | | | |
|---|---|---|---|
| ・Mounting method | : Standard mounting A | ・Input voltage | : 115, 230VAC |
| ・Output voltage & current | : 24V, 33.4A | ・Ambient temperature | : 40°C |
| ・Standby voltage & current | : 5V, 2A | | |

(b) Semiconductors

Compared with maximum junction temperature and actual one which is calculated based on case temperature, power dissipation and thermal impedance.

(c) IC, Resistors, Capacitors, etc.

Ambient temperature, operating condition, power dissipation and so on are within derating criteria.

(d) Calculating method of thermal impedance

$$\theta j-c = \frac{Tj(max) - Tc}{Pch(max)} \qquad \theta j-a = \frac{Tj(max) - Ta}{Pch(max)} \qquad \theta j-l = \frac{Tj(max) - Tl}{Pch(max)}$$

| | |
|---|---|
| Tc | : Case Temperature at Start Point of Derating；25℃ in General |
| Ta | : Ambient Temperature at Start Point of Derating；25℃ in General |
| Tl | : Lead Temperature at Start Point of Derating；25℃ in General |
| Pch(max) | : Maximum Channel Dissipation |
| Tj(max) (Tch(max)) | : Maximum Junction (channel) Temperature |
| θj-c (θch-c) | : Thermal Impedance between Junction (channel) and Case |
| θj-a | : Thermal Impedance between Junction and air |
| θj-l | : Thermal Impedance between Junction and Lead |

## (2) Component Derating List

| Location No. | Measurement condition<br>Vin = 115VAC Iout = 33.4A Istb = 2A Ta = 40°C |
| --- | --- |
| BD1<br>D25XB80-7000<br>SHINDENGEN | Tch (max) = 150 °C θch-c = 1.0 °C/W<br>Pch= 12 W ΔTc = 47.2 °C Tc = 87.2 °C<br>Tch = Tc + ((θch-c) × Pch) = 99.2 °C<br>D.F. = 66.1 % |
| SCR1<br>TN1605H-6FP<br>STMICRO | Tch (max) = 150 °C θch-c = 4.5 °C/W<br>Pch = 3.27 W ΔTc = 48 °C Tc = 88 °C<br>Tch = Tc + ((θch-c) × Pch ) = 102.7 °C<br>D.F. = 68.5 % |
| D1<br>TRS10A65F,S1Q<br>TOSHIBA | Tch (max) = 175 °C θch-c = 3.78 °C/W<br>Pch= 2.7 W ΔTc = 52.1 °C Tc = 92.1 °C<br>Tch = Tc + ((θch-c) × Pch ) = 102.3 °C<br>D.F. = 58.5 % |
| Q1<br>TK39N60W,S1VF<br>TOSHIBA | Tj (max) = 150 °C θj-c = 0.463 °C/W<br>Pd = 8.4 W ΔTc = 47.4 °C Tc = 87.4 °C<br>Tj = Tc + ((θj-c) × Pd ) = 91.3 °C<br>D.F. = 60.9 % |
| Q103,Q104<br>IPT60R090CFD7<br>INFINEON | Tj (max) = 150 °C θj-c = 0.78 °C/W<br>Pd = 3.67 W ΔTc = 58.4 °C Tc = 98.4 °C<br>Tj = Tc + ((θj-c) × Pd ) = 101.3 °C<br>D.F. = 67.5 % |
| D61<br>SB360-E3/73<br>VISHAY | Tj (max) = 150 °C θj-l = 10 °C/W<br>Pd = 0.9 W ΔTl = 56.7 °C Tl = 96.7 °C<br>Tj = Tl + ((θj-l) × Pd ) = 105.7 °C<br>D.F. = 70.5 % |
| Q301,Q303<br>TPH2R408QM,LQ(M1<br>TOSHIBA | Tj (max) = 175 °C θj-c = 0.71 °C/W<br>Pd = 2.27W ΔTc = 65.9 °C Tc = 105.9 °C<br>Tj = Tc + ((θj-c) × Pd ) = 107.5 °C<br>D.F. = 61.4 % |

Terminology Used

Vin : Input Voltage

Iout : Output Current

Istb : Output current of standby

Ta : Ambient temperature

**(2) Component Derating List**

| Location No. | Measurement condition<br>Vin = 230VAC   Iout = 33.4A   Istb = 2A   Ta = 40°C |
|---|---|
| BD1<br>D25XB80-7000<br>SHINDENGEN | Tch (max) = 150 °C   θch-c = 1.0 °C/W<br>Pch= 6 W   ΔTc = 24 °C   Tc = 64 °C<br>Tch = Tc + ((θch-c) × Pch) = 70 °C<br>D.F. = 46.7 % |
| SCR1<br>TN1605H-6FP<br>STMICRO | Tch (max) = 150 °C   θch-c = 4.5 °C/W<br>Pch = 3.2 W   ΔTc = 29 °C   Tc = 69 °C<br>Tch = Tc + ((θch-c) × Pch ) = 83.4 °C<br>D.F. = 55.6 % |
| D1<br>TRS10A65F,S1Q<br>TOSHIBA | Tch (max) = 175 °C   θch-c = 3.78 °C/W<br>Pch= 1.6 W   ΔTc = 30.9 °C   Tc = 70.9 °C<br>Tch = Tc + ((θch-c) × Pch ) = 76.9 °C<br>D.F. = 44.0 % |
| Q1<br>TK39N60W,S1VF<br>TOSHIBA | Tj (max) = 150 °C   θj-c = 0.463 °C/W<br>Pd = 5.6 W   ΔTc = 24.7 °C   Tc = 64.7 °C<br>Tj = Tc + ((θj-c) × Pd ) = 67.3 °C<br>D.F. = 44.9 % |
| Q103,Q104<br>IPT60R090CFD7<br>INFINEON | Tj (max) = 150 °C   θj-c = 0.78 °C/W<br>Pd = 3.67 W   ΔTc = 49.6 °C   Tc = 89.6 °C<br>Tj = Tc + ((θj-c) × Pd ) = 92.5 °C<br>D.F. = 61.6 % |
| D61<br>SB360-E3/73<br>VISHAY | Tj (max) = 150 °C   θj-l = 10 °C/W<br>Pd = 0.9 W   ΔTl = 47.2 °C   Tl = 87.2 °C<br>Tj = Tl + ((θj-l) × Pd ) = 96.2 °C<br>D.F. = 64.1 % |
| Q301,Q303<br>TPH2R408QM,LQ(M1<br>TOSHIBA | Tj (max) = 175 °C   θj-c = 0.71 °C/W<br>Pd = 2.27 W   ΔTc = 57.1 °C   Tc = 97.1 °C<br>Tj = Tc + ((θj-c) × Pd ) = 98.7 °C<br>D.F. = 56.4 % |

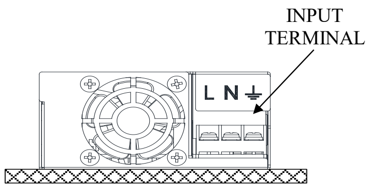
Terminology Used

Vin : Input Voltage
Iout : Output Current
Istb : Output current of standby
Ta : Ambient temperature

## 3. Main Components Temperature Rise △T List

**MODEL : CUS800M-12**

### (1) Measuring Conditions

| Mounting Method<br>(Standard Mounting : A) | Mounting A<br>(STANDARD MOUNTING)<br> | |
|---|---|---|
| Input Voltage | 115VAC | 230VAC |
| Output Voltage | 12V | |
| Output Current | 56.7A | |
| Standby Current | 2A | |
| Ambient Temperature | 40°C | |



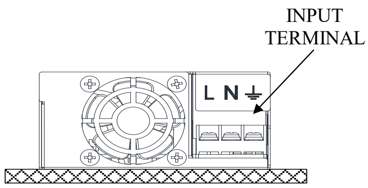
### (2) Measuring Results

| | | ΔT Temperature Rise (°C) | |
|---|---|---|---|
| Input Voltage | | 115VAC | 230VAC |
| Location No. | Part name | Mounting A | |
| BD1 | Diode Bridge | 40 | 20.9 |
| C51A | E.CAP. | 42.8 | 36.2 |
| C51C | E.CAP. | 42.1 | 35.2 |
| C52A | E.CAP. | 40.5 | 34.4 |
| C52B | E.CAP. | 49.2 | 42.9 |
| C8B | E.CAP. | 15.3 | 9.4 |
| C8C | E.CAP. | 18.7 | 12.7 |
| D1 | SBD | 44 | 27.3 |
| L3 | CHOKE COIL | 30.4 | 18.6 |
| Q1 | MOS FET | 36.5 | 19.8 |
| Q103 | MOS FET | 37.8 | 31.6 |
| Q104 | MOS FET | 36.9 | 31.5 |
| Q301 | MOS FET | 71.7 | 64.1 |
| Q303 | MOS FET | 66.4 | 59.1 |
| SCR1 | Thyristor | 34.5 | 20.9 |
| T1 | TRANS | 73.8 | 66.5 |
| TH101 | Thermistor(PTC) | 34.7 | 29.2 |
| TH2 | Thermistor(PTC) | 35.2 | 20.5 |
| TH301 | Thermistor(PTC) | 66.1 | 59.1 |

## 3. Main Components Temperature Rise △T List

**MODEL : CUS800M-24**

### (1) Measuring Conditions

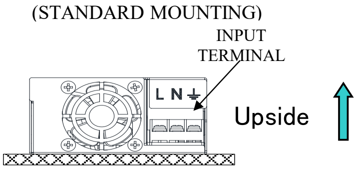
| Mounting Method<br>(Standard Mounting : A) | Mounting A | |
|---|---|---|
| | (STANDARD MOUNTING)   | |
| Input Voltage | 115VAC | 230VAC |
| Output Voltage | 24V | |
| Output Current | 33.4A | |
| Standby Current | 2A | |
| Ambient Temperature | 40°C | |

### (2) Measuring Results

| | | ΔT Temperature Rise (°C) | |
|---|---|---|---|
| Input Voltage | | 115VAC | 230VAC |
| Location No. | Part name | Mounting A | |
| BD1 | Diode Bridge | 47.2 | 24 |
| C51A | E.CAP. | 33.8 | 26.1 |
| C51B | E.CAP. | 34.1 | 26.9 |
| C51C | E.CAP. | 34.4 | 27.4 |
| C52B | E.CAP. | 34.2 | 27.4 |
| C8B | E.CAP. | 19.7 | 11.8 |
| C8C | E.CAP. | 22.7 | 14.5 |
| D1 | SBD | 52.1 | 30.9 |
| L3 | CHOKE COIL | 34.2 | 18.7 |
| Q1 | MOS FET | 47.4 | 24.7 |
| Q103 | MOS FET | 55.4 | 45.8 |
| Q104 | MOS FET | 58.4 | 49.6 |
| Q301 | MOS FET | 63.9 | 55.2 |
| Q303 | MOS FET | 65.9 | 57.1 |
| SCR1 | Thyristor | 48 | 29 |
| T1 | TRANS | 68.4 | 59.9 |
| TH101 | Thermistor(PTC) | 50.1 | 41.9 |
| TH2 | Thermistor(PTC) | 44.5 | 24.9 |
| TH301 | Thermistor(PTC) | 61.4 | 52.7 |

## 4. Electrolytic Capacitor Lifetime

**MODEL : CUS800M-12**



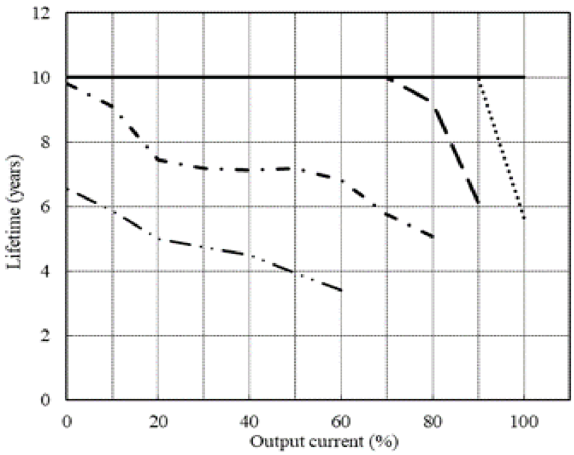

Conditions

Istb : 2A (Ta ≤ 60°C)
1.6A (Ta = 70°C)

Ta 30°C : ————
40°C : ..........
50°C : — — — —
60°C : —·—·—
70°C : —··—···

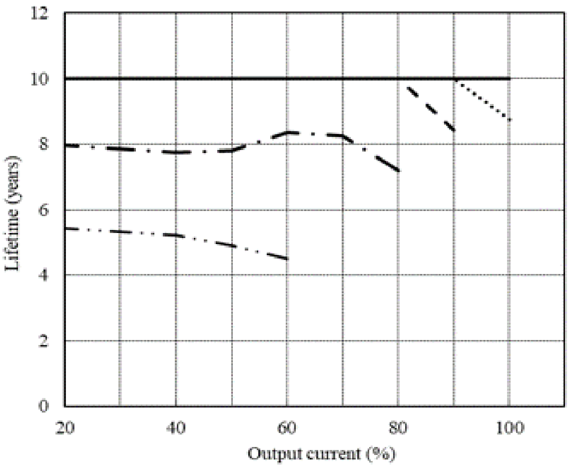
Vin=115VAC

| Load (%) | Lifetime (years) | | | | |
|---|---|---|---|---|---|
| | Ta=30℃ | Ta=40℃ | Ta=50℃ | Ta=60℃ | Ta=70℃ |
| 100 | 10 | 5.7 | - | - | - |
| 90 | 10 | 10 | 6.1 | - | - |
| 80 | 10 | 10 | 9.2 | 5.1 | - |
| 60 | 10 | 10 | 10 | 6.8 | 3.4 |
| 40 | 10 | 10 | 10 | 7.1 | 4.5 |
| 20 | 10 | 10 | 10 | 7.4 | 5.0 |
| 0 | 10 | 10 | 10 | 9.8 | 6.6 |



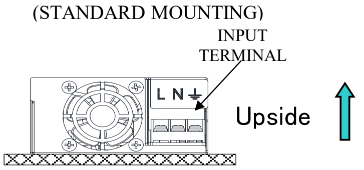

Vin=230VAC

| Load (%) | Lifetime (years) | | | | |
|---|---|---|---|---|---|
| | Ta=30℃ | Ta=40℃ | Ta=50℃ | Ta=60℃ | Ta=70℃ |
| 100 | 10 | 8.7 | - | - | - |
| 90 | 10 | 10 | 8.4 | - | - |
| 80 | 10 | 10 | 10 | 7.2 | - |
| 60 | 10 | 10 | 10 | 8.4 | 4.5 |
| 40 | 10 | 10 | 10 | 7.8 | 5.2 |
| 20 | 10 | 10 | 10 | 8.0 | 5.4 |
| 0 | 10 | 10 | 10 | 9.9 | 6.6 |



## 4. Electrolytic Capacitor Lifetime

**MODEL : CUS800M-24**



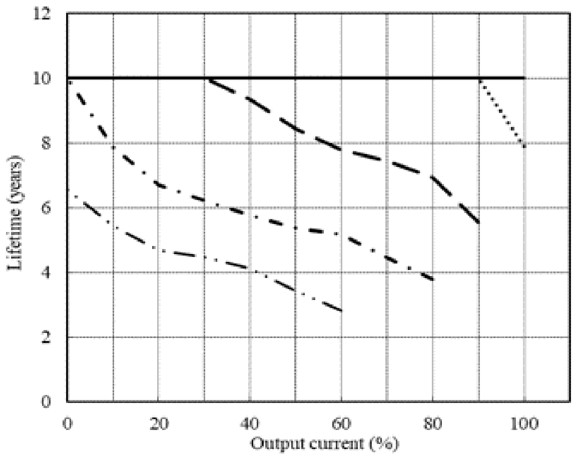

Conditions

Istb : 2A (Ta ≤ 60°C)
1.6A (Ta = 70°C)

Ta 30°C :
40°C :
50°C :
60°C :
70°C :

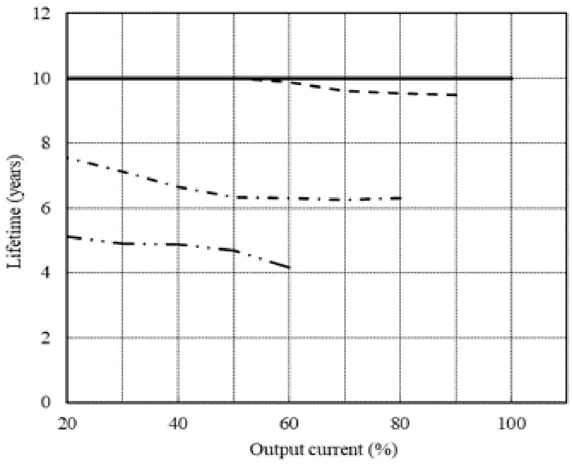
Vin=115VAC

| Load (%) | Lifetime (years) | | | | |
|---|---|---|---|---|---|
| | Ta=30℃ | Ta=40℃ | Ta=50℃ | Ta=60℃ | Ta=70℃ |
| 100 | 10 | 7.9 | - | - | - |
| 90 | 10 | 10 | 5.6 | - | - |
| 80 | 10 | 10 | 7.0 | 3.8 | - |
| 60 | 10 | 10 | 7.8 | 5.2 | 2.8 |
| 40 | 10 | 10 | 9.3 | 5.8 | 4.1 |
| 20 | 10 | 10 | 10 | 6.7 | 4.7 |
| 0 | 10 | 10 | 10 | 10 | 6.6 |



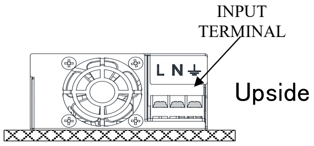

Vin=230VAC

| Load (%) | Lifetime (years) | | | | |
|---|---|---|---|---|---|
| | Ta=30℃ | Ta=40℃ | Ta=50℃ | Ta=60℃ | Ta=70℃ |
| 100 | 10 | 10 | - | - | - |
| 90 | 10 | 10 | 9.5 | - | - |
| 80 | 10 | 10 | 9.5 | 6.3 | - |
| 60 | 10 | 10 | 9.9 | 6.3 | 4.2 |
| 40 | 10 | 10 | 10 | 6.7 | 4.9 |
| 20 | 10 | 10 | 10 | 7.5 | 5.1 |
| 0 | 10 | 10 | 10 | 10 | 6.8 |



## 4. Electrolytic Capacitor Lifetime

**MODEL : CUS800M-36**

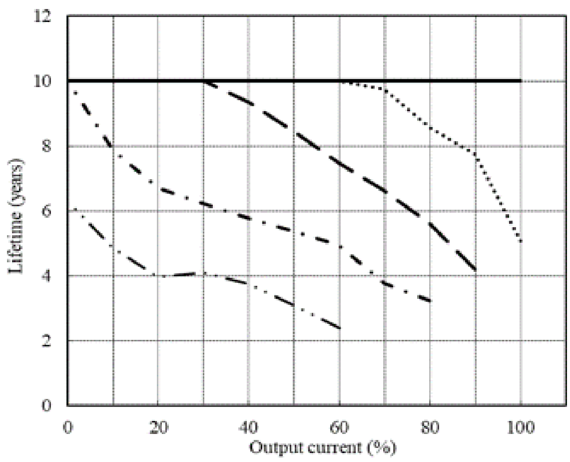



Conditions Istb : 2A (Ta ≤ 60°C)
1.6A (Ta = 70°C)

Ta 30°C : ————
40°C : ··········
50°C : — — — —
60°C : —·—·—
70°C : —··—···

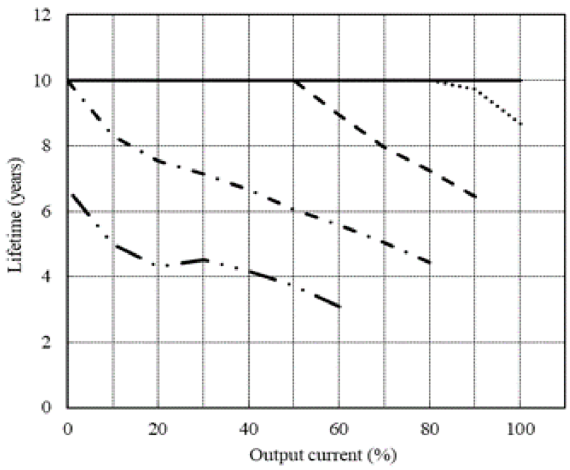
Vin=115VAC

| Load (%) | Lifetime (years) | | | | |
|---|---|---|---|---|---|
| | Ta= 30℃ | Ta= 40℃ | Ta= 50℃ | Ta= 60℃ | Ta= 70℃ |
| 100 | 10 | 5.1 | - | - | - |
| 90 | 10 | 7.7 | 4.2 | - | - |
| 80 | 10 | 8.6 | 5.6 | 3.2 | - |
| 60 | 10 | 10 | 7.5 | 4.9 | 2.4 |
| 40 | 10 | 10 | 9.3 | 5.8 | 3.8 |
| 20 | 10 | 10 | 10 | 6.7 | 4.0 |
| 0 | 10 | 10 | 10 | 10 | 6.3 |




Vin=230VAC

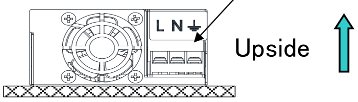
| Load (%) | Lifetime (years) | | | | |
|---|---|---|---|---|---|
| | Ta= 30℃ | Ta= 40℃ | Ta= 50℃ | Ta= 60℃ | Ta= 70℃ |
| 100 | 10 | 8.7 | - | - | - |
| 90 | 10 | 9.7 | 6.5 | - | - |
| 80 | 10 | 10 | 7.2 | 4.4 | - |
| 60 | 10 | 10 | 8.9 | 5.6 | 3.1 |
| 40 | 10 | 10 | 10 | 6.7 | 4.2 |
| 20 | 10 | 10 | 10 | 7.5 | 4.3 |
| 0 | 10 | 10 | 10 | 10 | 6.7 |



## 4. Electrolytic Capacitor Lifetime

**MODEL : CUS800M-48**

(STANDARD MOUNTING)



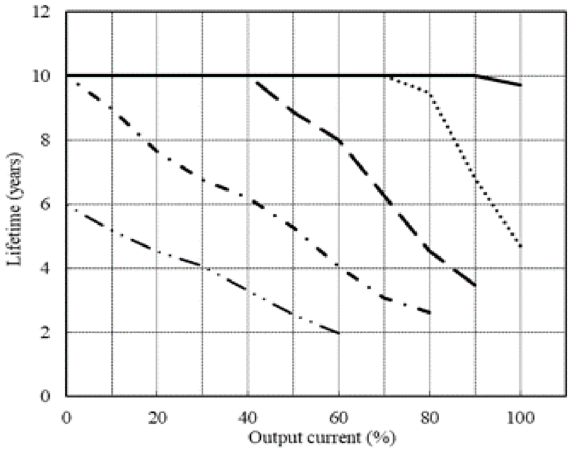

Conditions

Istb : 2A (Ta ≤ 60°C)
1.6A (Ta = 70°C)

Ta 30°C : ————
40°C : ············
50°C : — — — —
60°C : —·—·—
70°C : —··—···

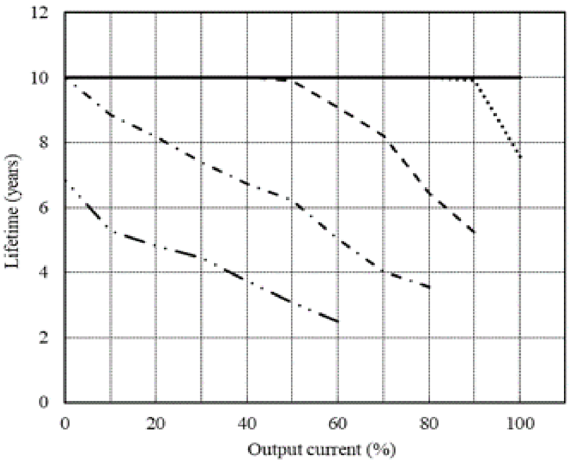
Vin=115VAC

| Load (%) | Lifetime (years) | | | | |
|---|---|---|---|---|---|
| | Ta= 30℃ | Ta= 40℃ | Ta= 50℃ | Ta= 60℃ | Ta= 70℃ |
| 100 | 9.7 | 4.7 | - | - | - |
| 90 | 10 | 6.8 | 3.5 | - | - |
| 80 | 10 | 9.5 | 4.5 | 2.6 | - |
| 60 | 10 | 10 | 8.0 | 4.1 | 2.0 |
| 40 | 10 | 10 | 10 | 6.2 | 3.3 |
| 20 | 10 | 10 | 10 | 7.6 | 4.5 |
| 0 | 10 | 10 | 10 | 10 | 6.0 |




Vin=230VAC

| Load (%) | Lifetime (years) | | | | |
|---|---|---|---|---|---|
| | Ta= 30℃ | Ta= 40℃ | Ta= 50℃ | Ta= 60℃ | Ta= 70℃ |
| 100 | 10 | 7.6 | - | - | - |
| 90 | 10 | 9.9 | 5.2 | - | - |
| 80 | 10 | 10 | 6.4 | 3.5 | - |
| 60 | 10 | 10 | 9.1 | 5.0 | 2.5 |
| 40 | 10 | 10 | 10 | 6.7 | 3.7 |
| 20 | 10 | 10 | 10 | 8.2 | 4.8 |
| 0 | 10 | 10 | 10 | 10 | 6.8 |



## 5. Abnormal Test

**MODEL : CUS800M-24**

**(1) Test Conditions**

Input : 230VAC Output : 24V, 33.4A Istb : 2A Ta : 25°C

**(2) Test Results**

(Da:Damaged)

| No. | Test position | | Test mode | | Test result *1: Equivalent one smoke less than of a cigarette | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | a | b | | c | d | e | f | g | h | I | j | k | l | |
| | Location No. | Test point | Short | Open | Fire | Slight Smoke | Smoke | Burst | Smell | Red hot | Damaged | Fuse blown | O.V.P. | O.C.P. | No output | No change | Others | Note |
| 1 | SCR1 | A | | ○ | | | | | | | | | | | | | ○ | Input Power increase 5W |
| | | K | | ○ | | | | | | | | | | | | | ○ | Input Power increase 5W |
| | | G | | ○ | | | | | | | | | | | | | ○ | Input Power increase 5W |
| | | A-K | ○ | | | | | | | | | | | | | | ○ | Input Power decrease 3.5W |
| | | A-G | ○ | | | | | | | | | | | | | ○ | | |
| | | G-K | ○ | | | | | | | | | | | | | | ○ | Input Power increase 5W |
| 2 | Q1 | G | | ○ | | | | | | | | | | | ○ | | | |
| | | D | | ○ | | | | | | | | | | | ○ | | | |
| | | S | | ○ | | | | | | | | | | | ○ | | | |
| | | G-S | ○ | | | | | | | | | | | | ○ | | | |
| | | G-D | ○ | | | | | | | | ○ | ○ | | | ○ | | | Da:F1A,F1B,Q1,R104,A102,R106,R107,Z101,Q102 |
| | | D-S | ○ | | | | | | | | ○ | ○ | | | ○ | | | Da:F1A,F1B,R104 |
| 3 | D1 | | ○ | | | | | | | | ○ | ○ | | | ○ | | | Da:F1A,F1B,Q1,SCR1,R104,A102,R112,R113,Q101 |
| | | | | ○ | | | | | | | ○ | ○ | | | ○ | | | Da:F1A,F1B,Q1,R104 |
| 4 | L4 | | ○ | | | | | | | | ○ | ○ | | | ○ | | | Da:F1B,Q1,R104 |
| | | | | ○ | | | | | | | | | | | ○ | | | |
| 5 | C1, C2 | | ○ | | | | | | | | | | | | | ○ | | |
| | | | | ○ | | | | | | | | | | | | ○ | | |
| 6 | SA1 | | ○ | | | | | | | | ○ | ○ | | | ○ | | | Da： F1A, F1B |
| | | | | ○ | | | | | | | | | | | | ○ | | |
| 7 | C7 | | ○ | | | | | | | | ○ | ○ | | | ○ | | | Da:F1A,F1B |
| | | | | ○ | | | | | | | | | | | | | ○ | Input Power increase 3W |
| 8 | BD1 | 1 | | ○ | | | | | | | | | | | ○ | | | |
| | | 2 | | ○ | | | | | | | | | | | ○ | | | |
| | | 3 | | ○ | | | | | | | | | | | ○ | | | |
| | | 4 | | ○ | | | | | | | | | | | ○ | | | |
| | | 1~2 | ○ | | | | | | | | ○ | ○ | | | ○ | | | Da： F1A, F1B |
| | | 2~3 | ○ | | | | | | | | ○ | ○ | | | ○ | | | Da： F1A, F1B |
| | | 3~4 | ○ | | | | | | | | ○ | ○ | | | ○ | | | Da： F1A, F1B |
| | | 1~4 | ○ | | | | | | | | ○ | ○ | | | ○ | | | Da： F1A, F1B |
| 9 | Q103 | G | | ○ | | | | | | | ○ | ○ | | | ○ | | | Da:Q103,Q104,F3 |
| | | D | | ○ | | | | | | | ○ | ○ | | | ○ | | | Da:Q103,Q104,F3.A107 |
| | | S | | ○ | | | | | | | ○ | ○ | | | ○ | | | Da:Q103,Q104,F3,A106 |
| | | G-S | ○ | | | | | | | | | | | | ○ | | | |
| | | G-D | ○ | | | | | | | | ○ | ○ | | | ○ | | | Da:Q103,Q104,F3,A106 |
| | | D-S | ○ | | | | | | | | ○ | ○ | | | ○ | | | Da:Q104,F3 |
| 10 | Q104 | G | | ○ | | | | | | | ○ | ○ | | | ○ | | ○ | Da:F3,Q103,Q104 |
| | | D | | ○ | | | | | | | | | | | ○ | | | |
| | | S | | ○ | | | | | | | | | | | ○ | | | |
| | | G-S | ○ | | | | | | | | | | | | ○ | | | |
| | | G-D | ○ | | | | | | | | | | | | ○ | | | |
| | | D-S | ○ | | | | | | | | ○ | ○ | | | ○ | | ○ | Da:F3,Q103 |

## 5. Abnormal Test

**MODEL : CUS800M-24**

**(1) Test Conditions**

Input : 230VAC   Output : 24V, 33.4A   Istb : 2A   Ta : 25°C

**(2) Test Results**

(Da:Damaged)

| No. | Test position: Location No. | Test position: Test point | Test mode: Short | Test mode: Open | a Fire | b Slight Smoke | b Smoke | c Burst | d Smell | e Red hot | f Damaged | g Fuse blown | h O.V.P. | I O.C.P. | j No output | k No change | l Others | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | Test result<br>*1: Equivalent one smoke less than of a cigarette |
| 11 | T2 | 2 | | ○ | | | | | | | | | | | ○ | | ○ | Standby power :No output |
| | | 3 | | ○ | | | | | | | | | | | ○ | | ○ | Standby power :No output |
| | | 5 | | ○ | | | | | | | | | | | ○ | | ○ | Standby power :No output |
| | | 6 | | ○ | | | | | | | | | | | ○ | | ○ | Standby power :No output |
| | | 7 | | ○ | | | | | | | | | | | ○ | | ○ | Standby power hiccup |
| | | 8 | | ○ | | | | | | | | | | | ○ | | ○ | Standby power hiccup |
| | | 2~3 | ○ | | | | | | | | | | | | ○ | | ○ | Standby power hiccup & OCP |
| | | 5~6 | ○ | | | | | | | | | | | | ○ | | ○ | Standby power :No output |
| | | 6~7 | ○ | | | | | | | | ○ | ○ | | | ○ | | ○ | Da:F2, Standby power :No output |
| | | 7~8 | ○ | | | | | | | | | | | | ○ | | ○ | Standby power hiccup & OCP |
| 12 | Q301 | d | | ○ | | | | | | | | | | | | | ○ | Input Power increase 1.5W |
| | | s | | ○ | | | | | | | | | | | | | ○ | Input Power increase 1.5W |
| | | g | | ○ | | | | | | | ○ | | | | ○ | | ○ | Da: Q301 |
| | | d~s | ○ | | | | | | | | | | | ○ | ○ | | | |
| | | g~s | ○ | | | | | | | | | | | | | | ○ | Input Power increase 16W, Main power is OTP |
| | | g~d | ○ | | | | | | | | ○ | | | ○ | | | ○ | DA:A301 |
| 13 | Q303 | d | | ○ | | | | | | | | | | | | | ○ | Input Power increase 1.5W |
| | | s | | ○ | | | | | | | | | | | | | ○ | Input Power increase 1.5W |
| | | g | | ○ | | | | | | | ○ | | | | ○ | | ○ | Da: Q303 |
| | | d~s | ○ | | | | | | | | | | | ○ | ○ | | | |
| | | g~s | ○ | | | | | | | | | | | | | | ○ | Input Power increase 16W, Main power is OTP |
| | | g~d | ○ | | | | | | | | ○ | | | ○ | | | ○ | DA:A301 |
| 14 | T1 | 1 | | ○ | | | | | | | | | | ○ | ○ | | | |
| | | 4 | | ○ | | | | | | | | | | ○ | ○ | | | |
| | | 2 | | ○ | | | | | | | | | | ○ | ○ | | | |
| | | 3 | | ○ | | | | | | | | | | ○ | ○ | | | |
| | | 5、8 | | ○ | | | | | | | | | | ○ | ○ | | | |
| | | 1~4 | ○ | | | | | | | | | | | ○ | ○ | | | |
| | | 2~3 | ○ | | | | | | | | | | | ○ | ○ | | | |
| | | 5~8 | ○ | | | | | | | | | | | ○ | ○ | | | |

## 6. Vibration Test

**MODEL : CUS800M-12/24/36/48**

### (1) Vibration Test Class

Frequency variable endurance test

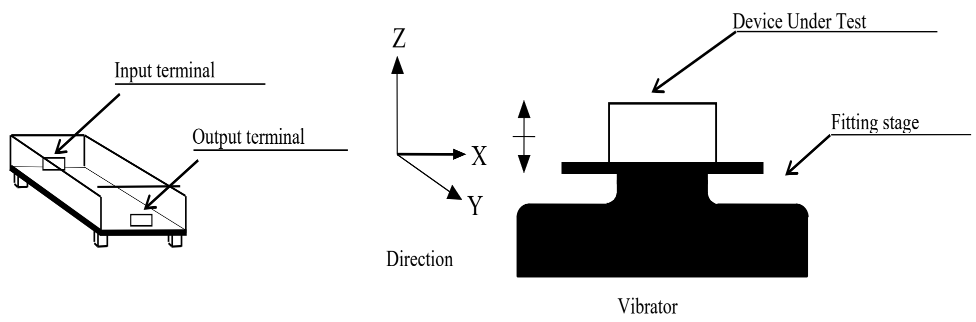
### (2) Equipment Used

IMV CORP. DC-3200-36

### (3) Test Conditions

| | | | |
|---|---|---|---|
| ・Sweep frequency | : 10～55Hz | ・Direction | : X, Y, Z |
| ・Sweep time | : 1.0min | ・Sweep count | : 1 hour each |
| ・Acceleration | : Constant 19.6m/s$^2$ (2G) | | |

### (4) Test Method




### (5) Acceptable Conditions

1. Not to be broken

2. No abnormal output after test.

### (6) Test Results

**Judgement : OK**

## 7. Noise Simulate Test

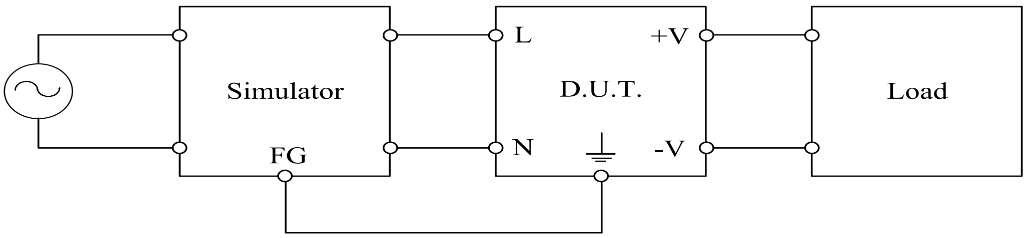
**MODEL：CUS800M-12/24/36/48**

### (1) Equipment Used

| | |
|---|---|
| Simulator | : INS-400L (Noise Laboratory Co.,LTD) |
| Capacitive Coupling Adaptors | : CA-805B |

### (2) Test Method and Device Test Point

Apply to (N, L, ⏚), (N, L), (N), (L), (⏚), (V+, V-), (STBY+, STBY-), (R+, R-), (S+, S-), (PG)




### (3) Test Conditions

| | | | |
|---|---|---|---|
| ・Input voltage | : 100, 230VAC | ・Noise level | : 0～2kV(Input Port)<br>: 0～2kV(Output Port)<br>: 0～750V(Signal Port) |
| ・Output voltage | : Rated | | |
| ・Output current | : 0%, 100% | ・Standby current | : 0%, 100% |
| ・Polarity | : ＋,－ | ・Mode | : Common, Normal(Input Port)<br>: Common(Output Port)<br>: Common(Signal Port) |
| ・Ambient temperature | : 25°C | | |
| ・Pulse width | : 50～1000ns | ・Trigger select | : Line |
| ・Phase | : 0～360 deg | | |

### (4) Acceptable Conditions

1. The regulation of output voltage must not exceed 5% of initial value during test.
2. The output voltage must be within the regulation of specification after the test.
3. Smoke and fire are not allowed.

### (5) Test Results

**Judgement : OK**

## 8. Thermal Shock Test

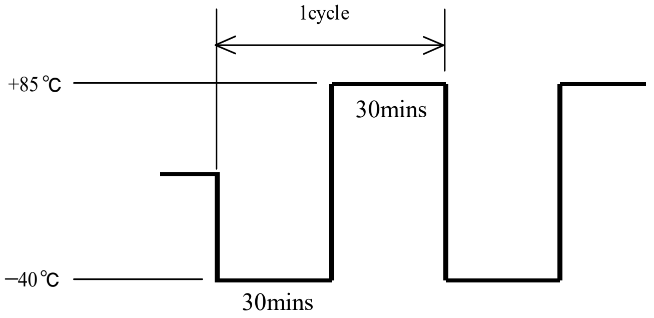
**MODEL : CUS800M-12**

### (1) Equipment Used (Thermal Shock Chamber)

Hitachi ES-77LH

### (2) Test Conditions

- Ambient Temperature : -40°C 85°C
- Test Time : 30 mins each temp.
- Test Cycle : 700 Cycles
- Not Operating




### (3) Test Method

Before testing, check if there is no abnormal output, then put the D.U.T. in testing chamber, and test it according to the above cycle. 700 cycles later, leave it for 1 hour at the room temperature , then check if there is no abnormal output.

### (4) Acceptable Conditions

No abnormal output after test.

### (5) Test Results

**Judgement : OK**

## 9. FAN Life Expectancy

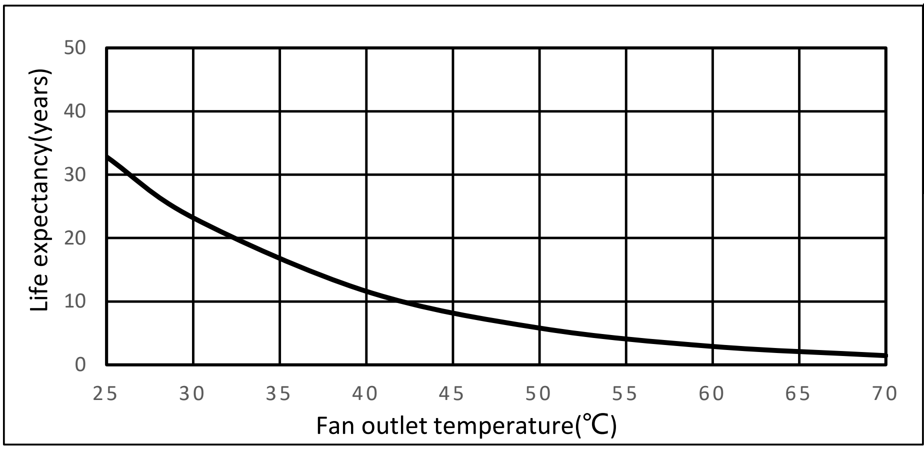
**MODEL：CUS800M-12**

**(1) Part Name**

EFB0412HHDFT3 (DELTA)

**(2) Life Expectancy**

The data shows fan life expectancy for fan only by manufacture(90% survival tate).
Fig. 1 shows measuring point of fan outlet temperature.




| Temperature(℃) | Life(years) |
|---|---|
| 30 | 23.2 |
| 40 | 11.6 |
| 50 | 5.8 |
| 60 | 2.9 |
| 70 | 1.4 |

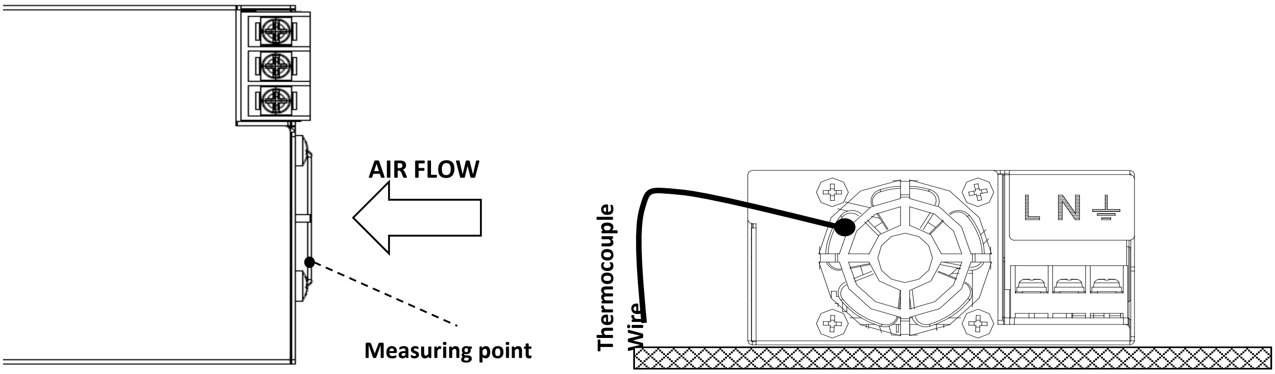



Fig.1 Measuring point of fan outlet temperature.