CUS1000M

RELIABILITY DATA

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※ 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：CUS1000M-12

Calculating Method

Calculated based on parts stress reliability prediction of Telcordia (*1).
Individual failure rate λ_{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 ,Method I,Quality level II)

＜Formula＞

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

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

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

λ_{Gi} : Generic failure rate for the ith part

π_{Qi} : Quality factor for the ith part

π_{Si} : Stress factor for the ith part

π_{Ti} : Temperature factor for the ith part

m : Number of different part types

N_i : Quantity of ith part type

π_E : Equipment environmental factor

MTBF Values

Conditions

- Input voltage ： 115VAC
- Output voltage & current ： 12VDC, 66.7A
- Standby voltage & current ： 5VDC, 2A
- Environmental factor ： GB (Ground, Benign)
- Mounting method ： Standard mounting A

SR-332,Issue3

MTBF(Ta=25℃) ≒ 483,341 (Hours)

MTBF(Ta=30℃) ≒ 434,091 (Hours)

MTBF(Ta=40℃) ≒ 285,860 (Hours)

1. Calculated Values of MTBF

Parts stress reliability prediction MTBF

MODEL：CUS1000M-24

Calculating Method

Calculated based on parts stress reliability prediction of Telcordia (*1).
Individual failure rate λ_{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 ,Method I,Quality level II)

＜Formula＞

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

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

λ_{equip} : Total equipment failure rate (FITs = Failures in10^9 hours)

λ_{Gi} : Generic failure rate for the ith part

π_{Qi} : Quality factor for the ith part

π_{Si} : Stress factor for the ith part

π_{Ti} : Temperature factor for the ith part

m : Number of different part types

N_i : Quantity of ith part type

π_E : Equipment environmental factor

MTBF Values

Conditions

- Input voltage ： 115VAC
- Output voltage & current ： 24VDC, 41.7A
- Standby voltage & current ： 5VDC, 2A
- Environmental factor ： GB (Ground, Benign)
- Mounting method ： Standard mounting A

SR-332,Issue3

MTBF(Ta=25℃) ≒ 867,161 (Hours)

MTBF(Ta=30℃) ≒ 757,679 (Hours)

MTBF(Ta=40℃) ≒ 522,715 (Hours)

2. Components Derating

MODEL : CUS1000M-12

(1) Calculating Method

(a) Measuring method

・Mounting method	: Standard mounting A	・Input voltage	: 115, 230VAC
・Output voltage & current	: 12V, 66.7A	・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°C in General
Ta	:	Ambient Temperature at Start Point of Derating;25°C in General
Tl	:	Lead Temperature at Start Point of Derating;25°C 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 Vin = 115VAC Iout = 66.7A	Istb = 2A	Ta = 40°C
BD1 D35XB80-7000 SHINDENGEN	Tch (max) = 150 °C Pch= 11.0 W Tch = Tc + ((θch-c) × Pch) = 88.3 °C D.F. = 58.9 %	θch-c = 0.8 °C/W ΔTc = 39.5 °C	 Tc = 79.5 °C
SCR1 TN1605H-6FP STMICRO	Tch (max) = 150 °C Pch = 2.3 W Tch = Tc + ((θch-c) × Pch) = 86.5 °C D.F. = 57.7 %	θch-c = 4.5 °C/W ΔTc = 36.1 °C	 Tc = 76.1 °C
D1 TRS12A65F,S1Q(S2 TOSHIBA	Tch (max) = 175 °C Pch= 3.7 W Tch = Tc + ((θch-c) × Pch) = 91.5 °C D.F. = 52.3 %	θch-c = 3.65 °C/W ΔTc = 38.0 °C	 Tc = 78 °C
Q1 IPW60R045P7 INFINEON	Tj (max) = 150 °C Pd = 8.2 W Tj = Tc + ((θj-c) × Pd) = 79.7 °C D.F. = 53.1 %	θj-c = 0.62 °C/W ΔTc = 34.6 °C	 Tc = 74.6 °C
Q103,Q104 IPT60R045CFD7 INFINEON	Tj (max) = 150 °C Pd = 1.9 W Tj = Tc + ((θj-c) × Pd) = 74.7 °C D.F. = 49.8 %	θj-c = 0.46 °C/W ΔTc = 33.8 °C	 Tc = 73.8 °C
D61 SB360-E3/73 VISHAY	Tj (max) = 150 °C Pd = 0.9 W Tj = Tl + ((θj-l) × Pd) = 108.2 °C D.F. = 72.1 %	θj-l = 10 °C/W ΔTl = 59.2 °C	 Tl = 99.2 °C
Q301~ Q304 BSC014N06NS INFINEON	Tj (max) = 150 °C Pd = 1.1 W Tj = Tc + ((θj-c) × Pd) = 105.4 °C D.F. = 70.3 %	θj-c = 0.8 °C/W ΔTc = 64.5 °C	 Tc = 104.5 °C

Terminology Used

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

(2) Component Derating List

Location No.	Measurement condition Vin = 230VAC Iout = 66.7A Istb = 2A Ta = 40°C		
BD1 D35XB80-7000 SHINDENGEN	Tch (max) = 150 °C Pch= 5.1 W Tch = Tc + ((θch-c) × Pch) = 64.2 °C D.F. = 42.8 %	θch-c = 0.8 °C/W ΔTc = 20.1 °C	 Tc = 60.1 °C
SCR1 TN1605H-6FP STMICRO	Tch (max) = 150 °C Pch = 2.3 W Tch = Tc + ((θch-c) × Pch) = 73.1 °C D.F. = 48.7 %	θch-c = 4.5 °C/W ΔTc = 22.7 °C	 Tc = 62.7 °C
D1 TRS12A65F,S1Q(S2 TOSHIBA	Tch (max) = 175 °C Pch= 3.7 W Tch = Tc + ((θch-c) × Pch) = 76.9 °C D.F. = 43.9 %	θch-c = 3.65 °C/W ΔTc = 23.4 °C	 Tc = 63.4 °C
Q1 IPW60R045P7 INFINEON	Tj (max) = 150 °C Pd = 3.5 W Tj = Tc + ((θj-c) × Pd) = 60.8 °C D.F. = 40.5 %	θj-c = 0.62 °C/W ΔTc = 18.6 °C	 Tc = 58.6 °C
Q103,Q104 IPT60R045CFD7 INFINEON	Tj (max) = 150 °C Pd = 1.9 W Tj = Tc + ((θj-c) × Pd) = 69.7 °C D.F. = 46.5 %	θj-c = 0.46 °C/W ΔTc = 28.8 °C	 Tc = 68.8 °C
D61 SB360-E3/73 VISHAY	Tj (max) = 150 °C Pd = 0.9 W Tj = Tl + ((θj-l) × Pd) = 103.4°C D.F. = 68.9 %	θj-l = 10 °C/W ΔTl = 54.4 °C	 Tl = 94.4 °C
Q301~ Q304 BSC014N06NS INFINEON	Tj (max) = 150 °C Pd = 1.1 W Tj = Tc + ((θj-c) × Pd) = 98.5 °C D.F. = 65.7 %	θj-c = 0.8 °C/W ΔTc = 57.6 °C	 Tc = 97.6 °C

Terminology Used

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

2. Components Derating

MODEL：CUS1000M-24

(1) Calculating Method

(a) Measuring method

・Mounting method	: Standard mounting A	・Input voltage	: 115, 230VAC
・Output voltage & current	: 24V, 41.7A	・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°C in General
Ta	:	Ambient Temperature at Start Point of Derating；25°C in General
Tl	:	Lead Temperature at Start Point of Derating；25°C 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 Vin = 115VAC Iout = 41.7A Istb = 2A Ta = 40°C		
BD1 D35XB80-7000 SHINDENGEN	Tch (max) = 150 °C Pch= 14.5 W Tch = Tc + ((θch-c) × Pch) = 107.5 °C D.F. = 71.7 %	θch-c = 0.8 °C/W ΔTc = 55.9 °C	 Tc = 95.9 °C
SCR1 TN1605H-6FP STMICRO	Tch (max) = 150 °C Pch = 2.9 W Tch = Tc + ((θch-c) × Pch) = 100.9 °C D.F. = 67.3 %	θch-c = 4.5 °C/W ΔTc = 47.8 °C	 Tc = 87.8 °C
D1 TRS12A65F,S1Q(S2 TOSHIBA	Tch (max) = 175 °C Pch= 4.3 W Tch = Tc + ((θch-c) × Pch) = 114.8 °C D.F. = 65.6 %	θch-c = 3.65 °C/W ΔTc = 59.1 °C	 Tc = 99.1 °C
Q1 IPW60R045P7 INFINEON	Tj (max) = 150 °C Pd = 11.0 W Tj = Tc + ((θj-c) × Pd) = 96.7 °C D.F. = 64.5 %	θj-c = 0.62 °C/W ΔTc = 49.9 °C	 Tc = 89.9 °C
Q103,Q104 IPT60R045CFD7 INFINEON	Tj (max) = 150 °C Pd = 2.2 W Tj = Tc + ((θj-c) × Pd) = 93.2 °C D.F. = 62.1 %	θj-c = 0.46 °C/W ΔTc = 52.2 °C	 Tc = 92.2 °C
D61 SB360-E3/73 VISHAY	Tj (max) = 150 °C Pd = 0.9 W Tj = Tl + ((θj-l) × Pd) = 105.7 °C D.F. = 70.5 %	θj-l = 10 °C/W ΔTl = 56.7 °C	 Tl = 96.7 °C
Q301~ Q304 TPH2R408QM,LQ(M1 INFINEON	Tj (max) = 175 °C Pd = 0.7 W Tj = Tc + ((θj-c) × Pd) = 99.5 °C D.F. = 56.9%	θj-c = 0.71 °C/W ΔTc = 59 °C	 Tc = 99 °C

Terminology Used

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

(2) Component Derating List

Location No.	Measurement condition Vin = 230VAC Iout = 41.7A Istb = 2A Ta = 40°C		
BD1 D35XB80-7000 SHINDENGEN	Tch (max) = 150 °C Pch= 6.67 W Tch = Tc + ((θch-c) × Pch) = 73.4 °C D.F. = 49.0 %	θch-c = 0.8 °C/W ΔTc = 28.1 °C	 Tc = 68.1 °C
SCR1 TN1605H-6FP STMICRO	Tch (max) = 150 °C Pch = 2.9 W Tch = Tc + ((θch-c) × Pch) = 80.6 °C D.F. = 53.7 %	θch-c = 4.5 °C/W ΔTc = 27.8 °C	 Tc = 67.8 °C
D1 TRS12A65F,S1Q(S2 TOSHIBA	Tch (max) = 175 °C Pch= 4.3 W Tch = Tc + ((θch-c) × Pch) = 90.0 °C D.F. = 51.4 %	θch-c = 3.65 °C/W ΔTc = 34.3 °C	 Tc = 74.3 °C
Q1 IPW60R045P7 INFINEON	Tj (max) = 150 °C Pd = 4.2 W Tj = Tc + ((θj-c) × Pd) = 68.0 °C D.F. = 45.3 %	θj-c = 0.62 °C/W ΔTc = 25.4 °C	 Tc = 65.4 °C
Q103,Q104 IPT60R045CFD7 INFINEON	Tj (max) = 150 °C Pd = 2.2 W Tj = Tc + ((θj-c) × Pd) = 83.5 °C D.F. = 55.7 %	θj-c = 0.46 °C/W ΔTc = 42.5 °C	 Tc = 82.5 °C
D61 SB360-E3/73 VISHAY	Tj (max) = 150 °C Pd = 0.9 W Tj = Tl + ((θj-l) × Pd) = 96.2 °C D.F. = 64.1 %	θj-l = 10 °C/W ΔTl = 47.2 °C	 Tl = 87.2 °C
Q301~ Q304 TPH2R408QM,LQ(M1 INFINEON	Tj (max) = 175 °C Pd = 0.7 W Tj = Tc + ((θj-c) × Pd) = 88.5 °C D.F. = 50.6 %	θj-c = 0.71 °C/W ΔTc = 48 °C	 Tc = 88 °C

Terminology Used

Vin : Input Voltage

Iout : Output Current

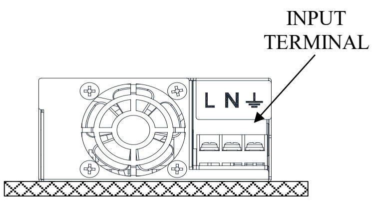
Istb : Output current of standby

Ta : Ambient temperature

3. Main Components Temperature Rise △T List

MODEL : CUS1000M-12

(1) Measuring Conditions

Mounting Method (Standard Mounting : A)	Mounting A (STANDARD MOUNTING) 	
Input Voltage	115VAC	230VAC
Output Voltage	12V	
Output Current	66.7A	
Standby Current	2A	
Ambient Temperature	40°C	

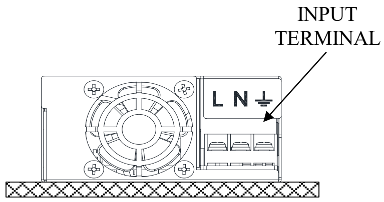
(2) Measuring Results

		ΔT Temperature Rise (°C)	
Input Voltage		115VAC	230VAC
Location No.	Part name	Mounting A	
A103	IC	10.2	6.1
A104	IC	12	7.5
A108	IC	18.4	13.4
A110	IPD	41.2	36.6
A301	IC	57.5	51.8
A306	IC	34.1	28.6
A307	IC	55.7	50.8
BD1	Diode Bridge	39.5	20.1
C7	E.CAP.	6.3	3.5
C10	E.CAP.	6.9	4
C51C	E.CAP.	54.5	48.1
C52C	E.CAP.	53.2	47.7
C8C	E.CAP.	19.2	12.8
C9B	E.CAP.	19.6	14.8
C61	E.CAP.	35.1	29.9
D1	SBD	38	23.4
D61	SBD	54.8	50.7
L1	CHOKE COIL	8	2.5
L2	CHOKE COIL	31.1	9.2
L3	CHOKE COIL	27.8	13.5
L301	CHOKE COIL	34.9	32
Q1	MOS FET	34.6	18.6
Q103,Q104	MOS FET	33.8	28.8
Q301~ Q304	MOS FET	64.5	57.6
Q303	MOS FET	59	52.3
R104	RESISTOR	27.1	11.8
R376	RESISTOR	64.8	60
SCR1	Thyristor	36.1	22.7
T1	TRANS	77.9	71.5
T2	TRANS	28.9	25.7

3. Main Components Temperature Rise △T List

MODEL : CUS1000M-24

(1) Measuring Conditions

Mounting Method (Standard Mounting : A)	Mounting A (STANDARD MOUNTING)  	
Input Voltage	115VAC	230VAC
Output Voltage	24V	
Output Current	41.7A	
Standby Current	2A	
Ambient Temperature	40°C	

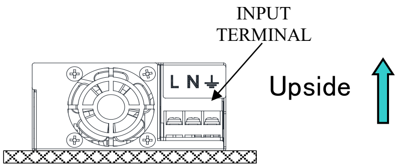
(2) Measuring Results

		ΔT Temperature Rise (°C)	
Input Voltage		115VAC	230VAC
Location No.	Part name	Mounting A	
A103	IC	11.4	7.4
A104	IC	11.6	7.8
A108	IC	24	19.3
A110	IPD	42.2	34.1
A301	IC	54.5	45.3
A306	IC	33.8	30.3
A307	IC	35.2	27.6
BD1	Diode Bridge	55.9	28.1
C7	E.CAP.	5.9	3.4
C10	E.CAP.	10.1	6.4
C51C	E.CAP.	46.8	36.2
C52C	E.CAP.	38.7	28.6
C8C	E.CAP.	27.3	16.5
C9B	E.CAP.	32	26.3
C61	E.CAP.	41.1	35.4
D1	SBD	59.1	34.3
D61	SBD	53.4	45.7
L1	CHOKE COIL	12	5.1
L2	CHOKE COIL	47.6	14.1
L3	CHOKE COIL	33.7	16.2
L301	CHOKE COIL	35.2	31.1
Q1	MOS FET	49.9	25.4
Q103,Q104	MOS FET	52.2	42.5
Q301~ Q304	MOS FET	59	48
Q303	MOS FET	56.7	45.7
R104	RESISTOR	42.7	18,6
R376	RESISTOR	46.4	38.2
SCR1	Thyristor	47.8	27.8
T1	TRANS	70.4	59.4
T2	TRANS	32.4	30.4

4. Electrolytic Capacitor Lifetime

MODEL : CUS1000M-12

(STANDARD MOUNTING)

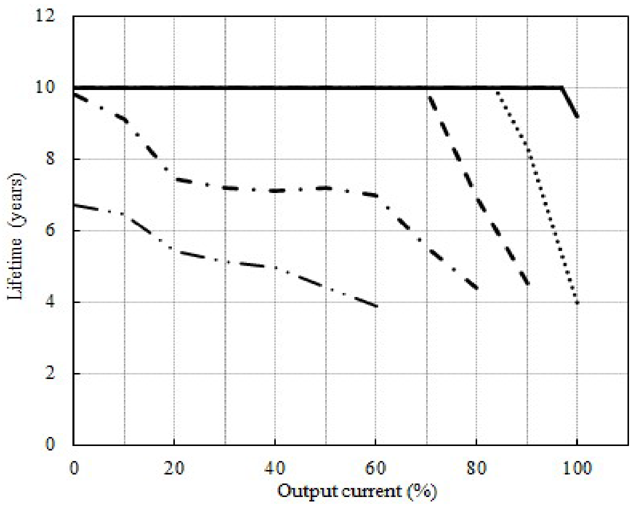


Conditions Istb : 2A（Ta ≦ 60°C）
1.6A（Ta = 70°C）

Ta
30°C :
40°C :
50°C :
60°C :
70°C :

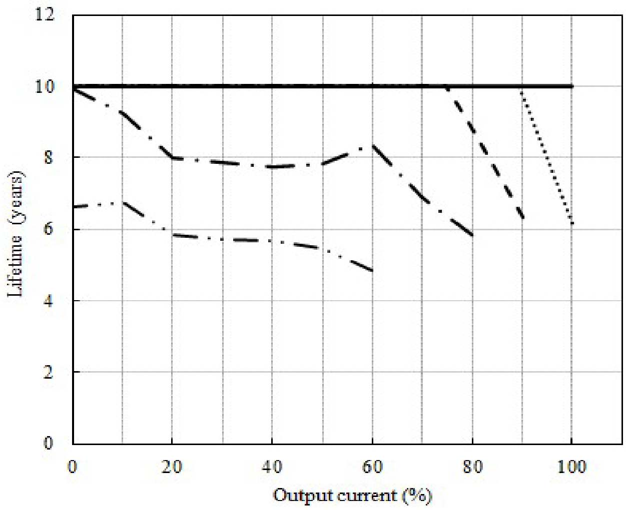
Vin=115VAC

Load (%)	Lifetime (years)				
	Ta= 30°C	Ta= 40°C	Ta= 50°C	Ta= 60°C	Ta= 70°C
100	9.2	4	-	-	-
90	10	8.3	4.5	-	-
80	10	10	6.9	4.4	-
60	10	10	10	7	3.9
40	10	10	10	7.1	5
20	10	10	10	7.4	5.4
0	10	10	10	9.8	6.7



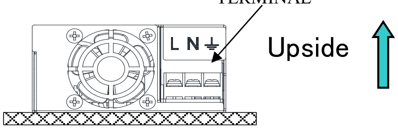
Vin=230VAC

Load (%)	Lifetime (years)				
	Ta= 30°C	Ta= 40°C	Ta= 50°C	Ta= 60°C	Ta= 70°C
100	10	6.2	-	-	-
90	10	9.7	6.3	-	-
80	10	10	8.8	5.8	-
60	10	10	10	8.4	4.9
40	10	10	10	7.8	5.7
20	10	10	10	8	5.8
0	10	10	10	9.9	6.6



4. Electrolytic Capacitor Lifetime

MODEL : CUS1000M-24

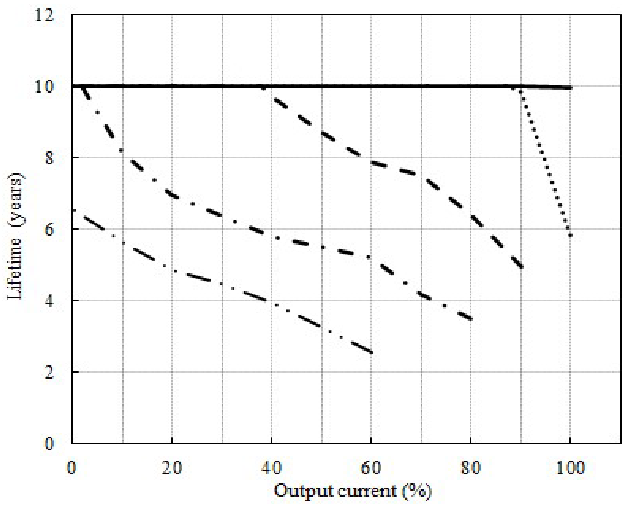


Conditions Istb : 2A（Ta ≤ 60°C）
1.6A（Ta = 70°C）

Ta
30°C :
40°C :
50°C :
60°C :
70°C :

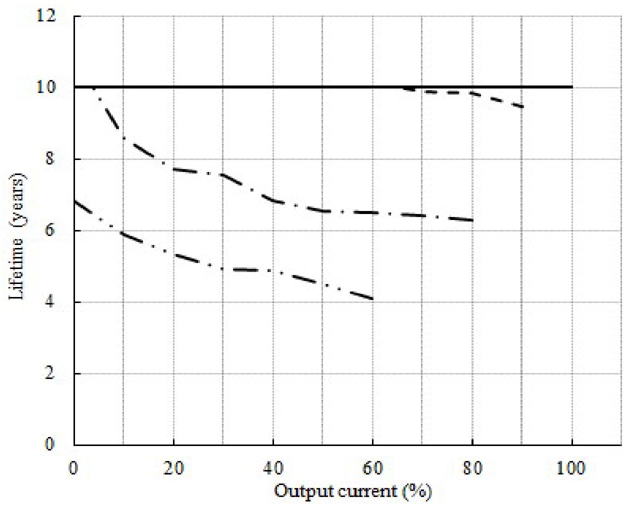
Vin=115VAC

Load (%)	Lifetime (years)				
	Ta= 30°C	Ta= 40°C	Ta= 50°C	Ta= 60°C	Ta= 70°C
100	10	5.8	-	-	-
90	10	9.9	5	-	-
80	10	10	6.4	3.5	-
60	10	10	7.9	5.2	2.6
40	10	10	9.7	5.8	3.9
20	10	10	10	7	4.9
0	10	10	10	10	6.6



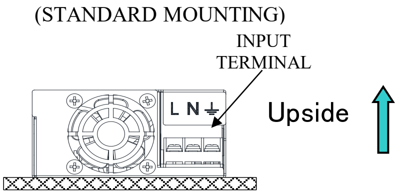
Vin=230VAC

Load (%)	Lifetime (years)				
	Ta= 30°C	Ta= 40°C	Ta= 50°C	Ta= 60°C	Ta= 70°C
100	10	10	-	-	-
90	10	10	9.5	-	-
80	10	10	9.8	6.3	-
60	10	10	10	6.5	4.1
40	10	10	10	6.8	4.9
20	10	10	10	7.7	5.3
0	10	10	10	10	6.8



4. Electrolytic Capacitor Lifetime

MODEL : CUS1000M-36

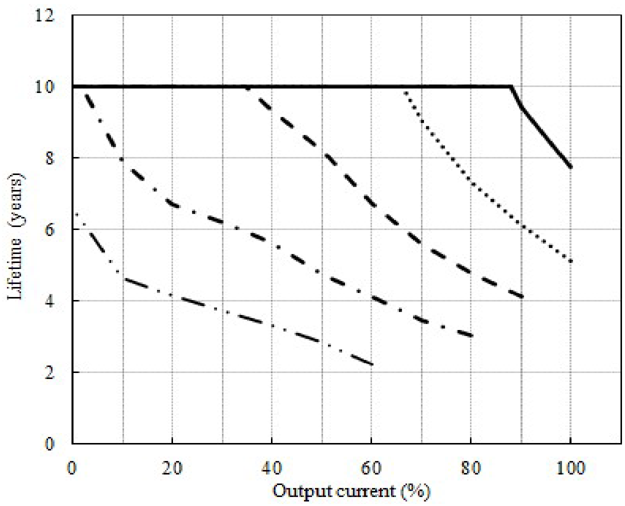


Conditions Istb : 2A（Ta ≦ 60°C）
1.6A（Ta = 70°C）

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

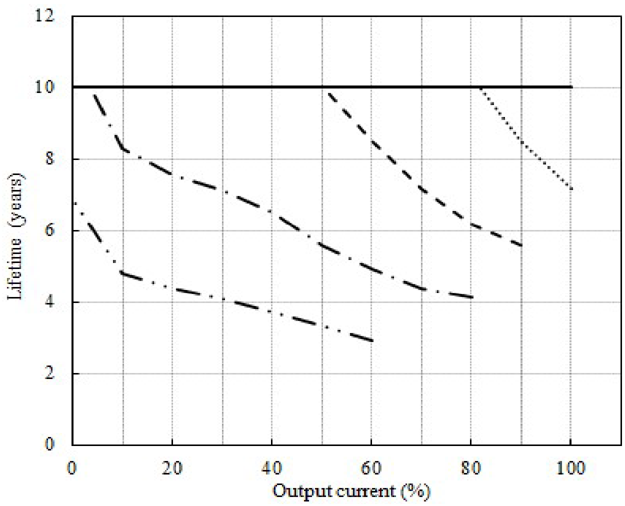
Vin=115VAC

Load (%)	Lifetime (years)				
	Ta= 30°C	Ta= 40°C	Ta= 50°C	Ta= 60°C	Ta= 70°C
100	7.8	5.1	-	-	-
90	9.4	6.1	4.1	-	-
80	10	7.3	4.8	3.0	-
60	10	10	6.7	4.1	2.2
40	10	10	9.3	5.6	3.3
20	10	10	10	6.7	4.1
0	10	10	10	10	6.6



Vin=230VAC

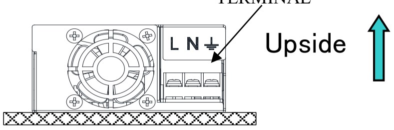
Load (%)	Lifetime (years)				
	Ta= 30°C	Ta= 40°C	Ta= 50°C	Ta= 60°C	Ta= 70°C
100	10	7.2	-	-	-
90	10	8.5	5.6	-	-
80	10	10	6.2	4.1	-
60	10	10	8.5	4.9	2.9
40	10	10	10	6.5	3.7
20	10	10	10	7.5	4.4
0	10	10	10	10	6.8



4. Electrolytic Capacitor Lifetime

MODEL : CUS1000M-48

(STANDARD MOUNTING)

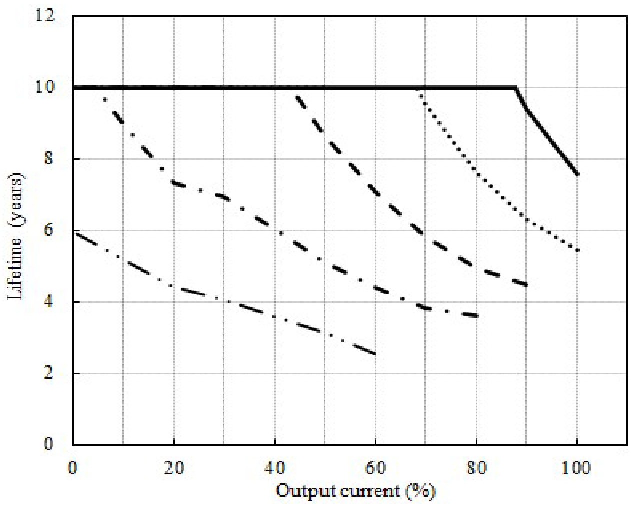


Conditions Istb : 2A（Ta ≤ 60°C）
1.6A（Ta = 70°C）

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

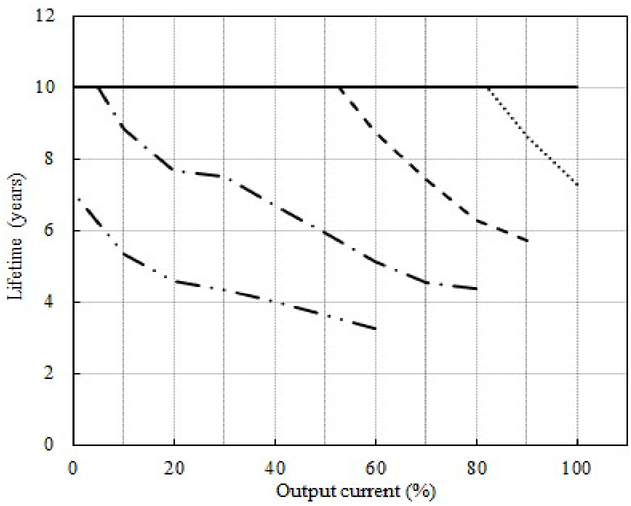
Vin=115VAC

Load (%)	Lifetime (years)				
	Ta= 30°C	Ta= 40°C	Ta= 50°C	Ta= 60°C	Ta= 70°C
100	7.5	5.4	-	-	-
90	9.4	6.3	4.5	-	-
80	10	7.6	4.9	3.6	-
60	10	10	7.1	4.4	2.6
40	10	10	10	6.0	3.6
20	10	10	10	7.3	4.4
0	10	10	10	10	6



Vin=230VAC

Load (%)	Lifetime (years)				
	Ta= 30°C	Ta= 40°C	Ta= 50°C	Ta= 60°C	Ta= 70°C
100	10	7.3	-	-	-
90	10	8.6	5.7	-	-
80	10	10	6.3	4.4	-
60	10	10	8.8	5.1	3.3
40	10	10	10	6.7	4
20	10	10	10	7.7	4.6
0	10	10	10	10	7.1



5. Abnormal Test

MODEL : CUS1000M-24

(1) Test Conditions

Input : 230VAC Output : 24V, 41.7A Istb : 2A Ta : 25°C

(2) Test Results

(Da:Damaged)

No.	Test position				Test result													
					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 2.5W
		A-G	○													○		
		G-K	○														○	Input Power increase 5W
2	Q1	G		○							○	○			○			Da: F1A,F1B,Q1,R104
		D		○													○	Output ripple voltge increase, PF value decrease, Input Power increase 10W
		S		○													○	Output ripple voltge increase, PF value decrease, Input Power increase 10W
		G-S	○														○	Output ripple voltge increase, PF value decrease, Input Power increase 10W
		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	L3		○								○	○			○			Da: F1B,Q1,R104
				○											○			
5	C3		○								○	○			○			Da: F1A, F1B
				○												○		
6	SA1		○								○	○			○			Da: F1A, F1B
				○												○		
7	C7		○								○	○			○			Da: F1A,F1B
				○													○	Input Power increase 3.5W
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 : CUS1000M-24

(1) Test Conditions

Input : 230VAC Output : 24V, 41.7A Istb : 2A Ta : 25°C

(2) Test Results

(Da:Damaged)

No.	Test position: Location No.	Test position: Test point	Short	Open	Test result: Fire	Slight Smoke	Smoke	Burst	Smell	Red hot	Damaged	Fuse blown	O.V.P.	O.C.P.	No output	No change	Others	Note
					a	b		c	d	e	f	g	h	I	j	k	l	
11	T2	2		O											O		O	Standby power : No output
		3		O											O		O	Standby power : No output
		5		O											O		O	Standby power : No output
		6		O											O		O	Standby power : No output
		7		O											O		O	Standby power hiccup
		8		O											O		O	Standby power hiccup
		2~3	O												O		O	Standby power hiccup & OCP
		5~6	O												O		O	Standby power : No output
		6~7	O								O	O			O		O	Da: F2, Standby power : No output
		7~8	O												O		O	Standby power hiccup & OCP
12	Q301，Q302	d		O													O	Input Power increase 1.5W
		s		O													O	Input Power increase 1.5W
		g		O							O				O			Da: Q301 or Q302
		d~s	O											O	O			
		g~s	O														O	Input Power increase 14W
		g~d	O								O			O				Da: A301
13	Q303，Q304	d		O													O	Input Power increase 1.5W
		s		O													O	Input Power increase 1.5W
		g		O							O				O			Da: Q303 or Q304
		d~s	O											O	O			
		g~s	O														O	Input Power increase 14W
		g~d	O								O			O				Da: A301
14	T1	1		O										O	O			
		4		O										O	O			
		2		O										O	O			
		3		O										O	O			
		5、8		O										O	O			
		1~4	O											O	O			
		2~3	O											O	O			
		5~8	O											O	O			

6. Vibration Test

MODEL：CUS1000M-12/24/36/48

(1) Vibration Test Class

Frequency variable endurance test

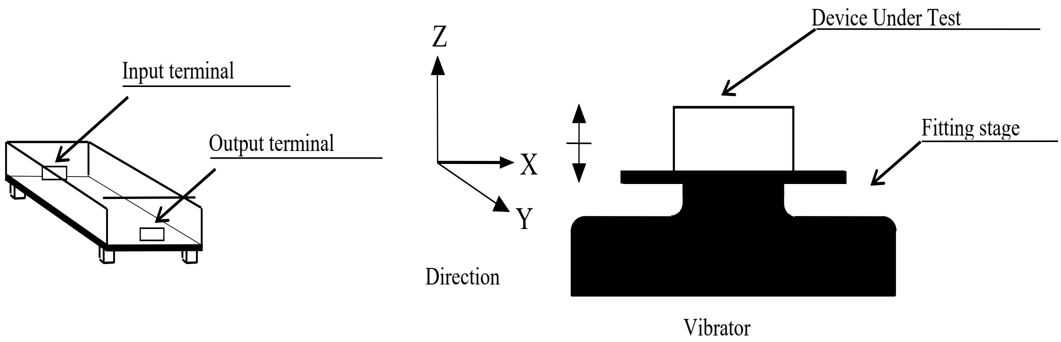
(2) Equipment Used

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：CUS1000M-12/24/36/48

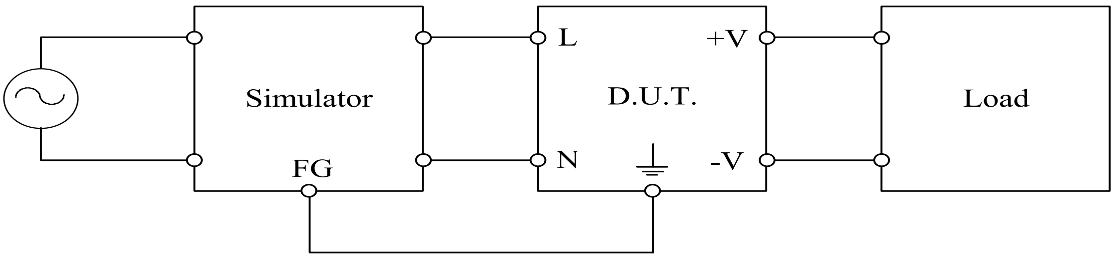
(1) Equipment Used

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

・Output voltage : Rated

・Output current : 0%, 100%

・Polarity : ＋,－

・Ambient temperature : 25℃

・Pulse width : 50～1000ns

・Phase : 0～360 deg

・Noise level : 0～2kV(Input Port)
: 0～2kV(Output Port)
: 0～750V(Signal Port)

・Standby current : 0%, 100%

・Mode : Common, Normal(Input Port)
: Common(Output Port)
: Common(Signal Port)

・Trigger select : Line

(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

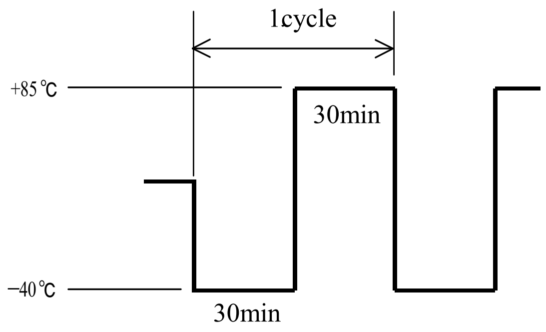
8. Thermal Shock Test

MODEL : CUS1000M-12

(1) Equipment Used (Thermal Shock Chamber)

Hitachi ES-77LH

(2) Test Conditions



・Ambient Temperature : -40℃ ⇔ 85℃

・Test Time : 30 min 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

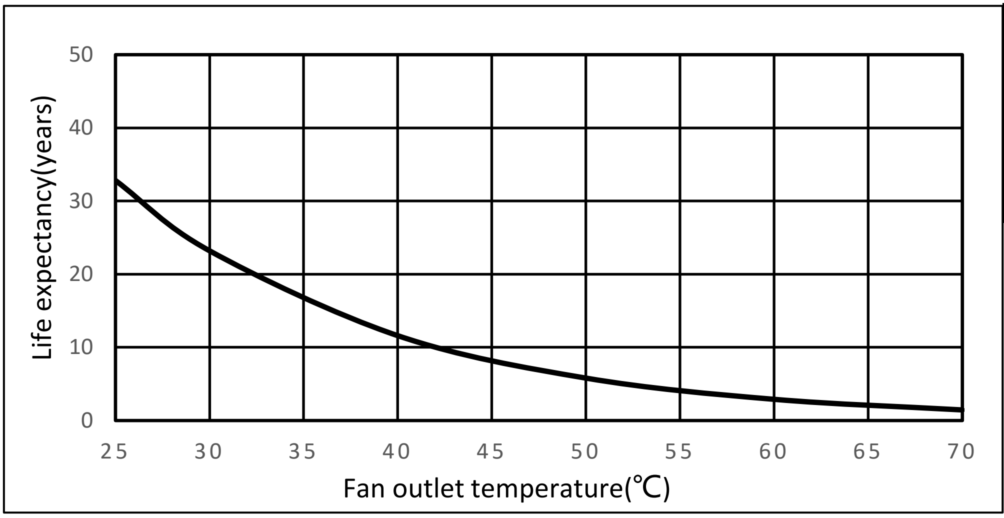
MODEL：CUS1000M-12

(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

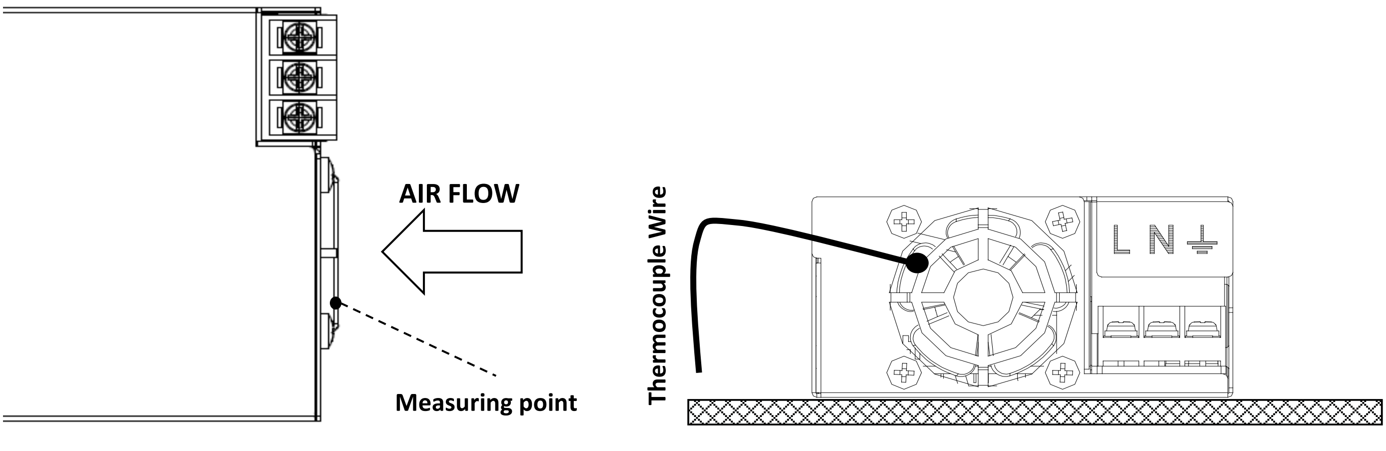


Fig.1 Measuring point of fan outlet temperature.