CUS500M1

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 : CUS500M1-12

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)

<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 : 12VDC, 25A
- Environmental factor : GB (Ground, Benign)
- Mounting method : Standard mounting A
- Cooling : Convection

SR-332,Issue3

MTBF(Ta=25℃) ≒ 1,058,727 (Hours)

MTBF(Ta=35℃) ≒ 742,729 (Hours)

2. Components Derating

MODEL： CUS500M1-12

(1) Calculating Method

(a) Measuring method

・Mounting method	： Standard mounting A	・ Ambient temperature	： 40℃
・Input voltage	： 115, 230VAC	・ Output voltage & current	： 12V, 25A
・Cooling	： Convection		

(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

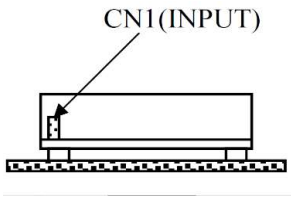
Location No.	Vin = 115VAC Load = 25A Ta = 40°C Convection cooling		
BD1 D25XB60-7000 SHINDENGEN	Tch (max) = 150 °C Pch= 4.1 W Tch = Tc + ((θch-c) × Pch) = 127.2 °C D.F. = 84.8 %	θch-c = 1 °C/W ΔTc =83.1 °C	Tc = 123.1°C
SCR1 TN1605H-6FP STMICRO	Tch (max) = 150 °C Pch = 0.9 W Tch = Tc + ((θch-c) × Pch) = 120.9 °C D.F. = 80.6 %	θch-c = 4.5 °C/W ΔTc =76.8 °C	Tc = 116.8 °C
D1 TRS4A65F,S1Q TOSHIBA	Tch (max) = 175 °C Pch= 1.3 W Tch = Tc + ((θch-c) × Pch) = 128.5 °C D.F. = 73.4 %	θch-c = 4.47 °C/W ΔTc = 82.7 °C	Tc = 122.7 °C
Q1 TK31A60W,S4VX TOSHIBA	Tj (max) = 150 °C Pd = 2.6 W Tj = Tc + ((θj-c) × Pd) = 129.2°C D.F. = 86.1%	θj-c = 2.78 °C/W ΔTc = 82 °C	Tc = 122 °C
Q2A,Q2B TK20A60W5 TOSHIBA	Tj (max) = 150 °C Pd = 0.9 W Tj = Tc + ((θj-c) × Pd) = 121.5°C D.F. = 81 %	θj-c = 2.78 °C/W ΔTc = 79°C	Tc = 119 °C
Q201,Q202 TPW1R005PL,L1Q TOSHIBA	Tj (max) = 175 °C Pd = 0.5 W Tj = Tc + ((θj-c) × Pd) = 111.3 °C D.F. = 63.6 %	θj-c = 0.93 °C/W ΔTc = 70.8 °C	Tc = 110.8 °C

Location No.	Vin = 230VAC Load = 25A Ta = 40°C Convection cooling		
BD1 D25XB60-7000 SHINDENGEN	Tch (max) = 150 °C Pch= 2.1 W Tch = Tc + ((θch-c) × Pch) = 100.5 °C D.F. = 67 %	θch-c = 1 °C/W ΔTc = 58.4 °C	Tc = 98.4 °C
SCR1 TN1605H-6FP STMICRO	Tch (max) = 150 °C Pch = 0.9 W Tch = Tc + ((θch-c) × Pch) = 101.3 °C D.F. = 67.5 %	θch-c = 4.5 °C/W ΔTc = 57.2°C	Tc =97.2 °C
D1 TRS4A65F,S1Q TOSHIBA	Tch (max) = 175 °C Pch= 1.0 W Tch = Tc + ((θch-c) × Pch) = 106 °C D.F. = 60.6 %	θch-c = 4.47 °C/W ΔTc = 61.5 °C	Tc = 101.5 °C
Q1 TK31A60W,S4VX TOSHIBA	Tj (max) = 150 °C Pd = 1.3 W Tj = Tc + ((θj-c) × Pd) = 102.5 °C D.F. = 68.3 %	θj-c = 2.78°C/W ΔTc = 58.9 °C	Tc = 98.9 °C
Q2A,Q2B TK20A60W5 TOSHIBA	Tj (max) = 150 °C Pd = 0.9 W Tj = Tc + ((θj-c) × Pd) = 102.3°C D.F. =68.2 %	θj-c = 2.78 °C/W ΔTc = 59.8°C	Tc = 99.8 °C
Q201,Q202 TPW1R005PL,L1Q TOSHIBA	Tj (max) = 175 °C Pd = 0.5 W Tj = Tc + ((θj-c) × Pd) = 107.8 °C D.F. = 61.6 %	θj-c = 0.93 °C/W ΔTc = 67.3 °C	Tc = 107.3 °C

3. Main Components Temperature Rise △T List

MODEL : CUS500M1-12

(1) Measuring Conditions

Mounting Method (Standard Mounting : A)	Mounting A 	
Input Voltage	115VAC	230VAC
Output Voltage	12V	
Output Current	25A	
Cooling	Convect cooling	

(2) Measuring Results

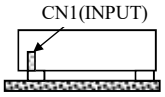
		ΔT Temperature Rise (°C)	
Input Voltage		115VAC	230VAC
Location No.	Part name	Mounting A	
A101	IC	62.9	47.6
A102	IC	57.2	42.5
A103	IC	64.6	52.5
A104	IPD	43.3	36.6
A201	IC	59.4	56.8
BD1	Diode Bridge	83.1	58.4
C51A	E.CAP.	35.7	34.2
C51B	E.CAP.	37.3	34.8
C51C	E.CAP.	40.6	38.9
C6	E.CAP.	39.4	31.6
C7	Cap., Film	31.4	26.5
C8	Cap., Film	24.8	21.3
D1	SBD	82.7	61.5
L2	CHOKE COIL	52.5	34.7
L4	CHOKE COIL	68.1	47.5
Q1	MOS FET	82	58.9
Q2A	MOS FET	79	59.8
Q2B	MOS FET	76.9	58.2
Q201	MOS FET	70.8	67.3
Q202	MOS FET	67.9	64.6
R108	RESISTOR	72	50.2
SCR1	Thyristor	76.8	57.2
T1	TRANS	70.9	64.8

4. Electrolytic Capacitor Lifetime

MODEL : CUS500M1-12

Cooling condition : Convection cooling

Mounting A

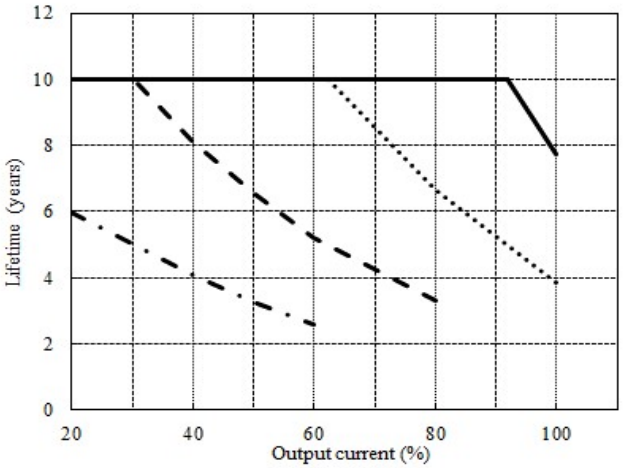


Conditions

Ta 30℃ : ——————
40℃ : ··········
50℃ : — — — —
60℃ : — · — · —

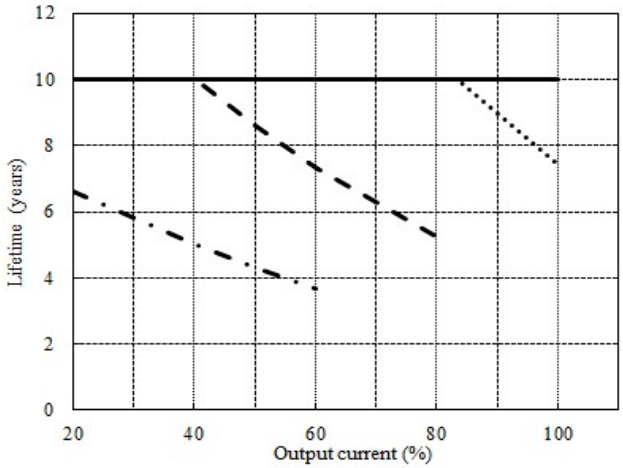
Vin=115VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	6.0
40	10.0	10.0	8.1	4.1
50	10.0	10.0	6.6	3.3
60	10.0	10.0	5.2	2.6
80	10.0	6.7	3.3	-
100	7.7	3.9	-	-



Vin=230VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	6.6
40	10.0	10.0	10.0	5.0
50	10.0	10.0	8.6	4.3
60	10.0	10.0	7.3	3.7
80	10.0	10.0	5.3	-
100	10.0	7.4	-	-

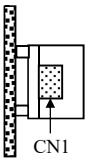


4. Electrolytic Capacitor Lifetime

MODEL : CUS500M1-12

Cooling condition : Convection cooling

Mounting B



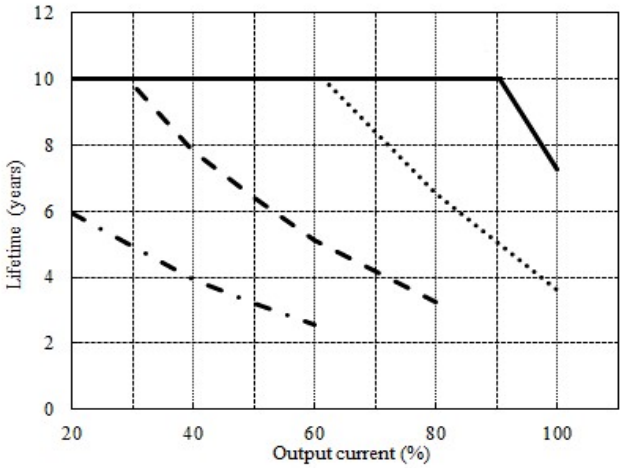
Upside

Conditions

Ta 30℃ : ——————
40℃ : ··········
50℃ : — — — —
60℃ : — · — · —

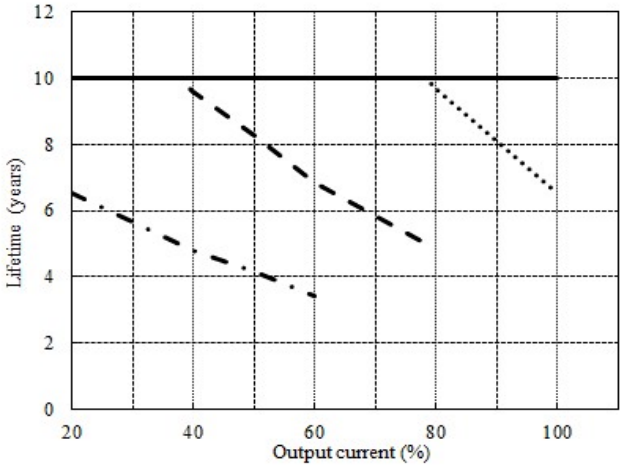
Vin=115VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	5.9
40	10.0	10.0	7.8	3.9
50	10.0	10.0	6.4	3.2
60	10.0	10.0	5.1	2.6
80	10.0	6.5	3.3	-
100	7.3	3.6	-	-



Vin=230VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	6.5
40	10.0	10.0	9.6	4.8
50	10.0	10.0	8.3	4.1
60	10.0	10.0	6.9	3.4
80	10.0	9.7	4.8	-
100	10.0	6.5	-	-

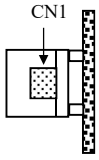


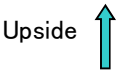
4. Electrolytic Capacitor Lifetime

MODEL : CUS500M1-12

Cooling condition : Convection cooling

Mounting C



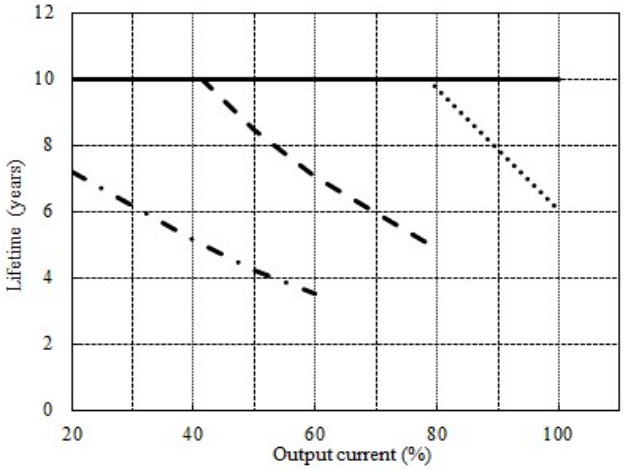


Conditions

Ta 30℃ : ——————
40℃ : ··········
50℃ : — — — —
60℃ : — · — · —

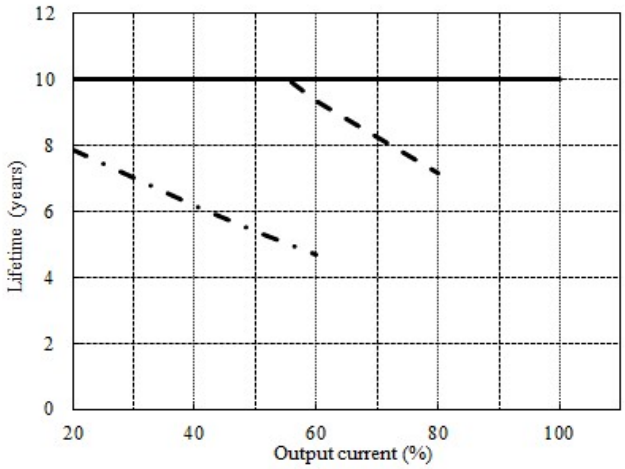
Vin=115VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	7.2
40	10.0	10.0	10.0	5.1
50	10.0	10.0	8.4	4.2
60	10.0	10.0	7.0	3.5
80	10.0	9.7	4.8	-
100	10.0	6.0	-	-



Vin=230VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	7.8
40	10.0	10.0	10.0	6.2
50	10.0	10.0	10.0	5.4
60	10.0	10.0	9.4	4.7
80	10.0	10.0	7.1	-
100	10.0	10.0	-	-

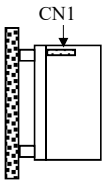


4. Electrolytic Capacitor Lifetime

MODEL : CUS500M1-12

Cooling condition : Convection cooling

Mounting D



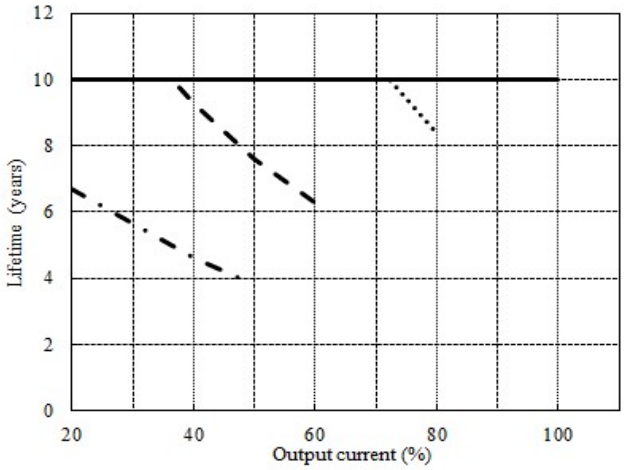
Upside

Conditions

Ta 30℃ : ——————
40℃ : ··············
50℃ : — — — —
60℃ : — · — · —

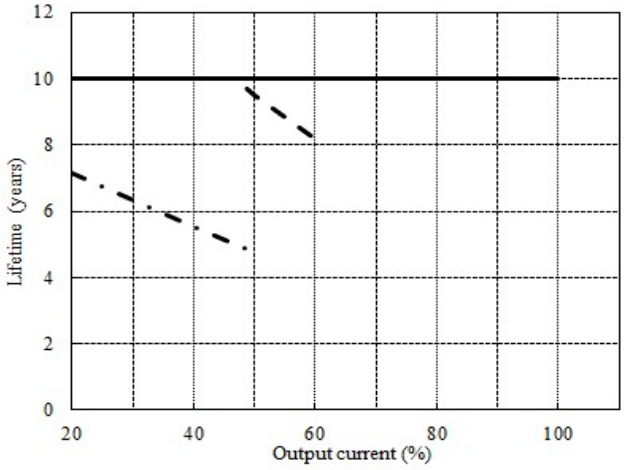
Vin=115VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	6.7
40	10.0	10.0	9.3	4.6
50	10.0	10.0	7.6	3.8
60	10.0	10.0	6.3	-
80	10.0	8.4	-	-
100	10.0	-	-	-



Vin=230VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	7.2
40	10.0	10.0	10.0	5.5
50	10.0	10.0	9.5	4.7
60	10.0	10.0	8.2	-
80	10.0	10.0	-	-
100	10.0	-	-	-

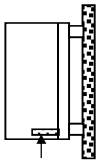


4. Electrolytic Capacitor Lifetime

MODEL : CUS500M1-12

Cooling condition : Convection cooling

Mounting E



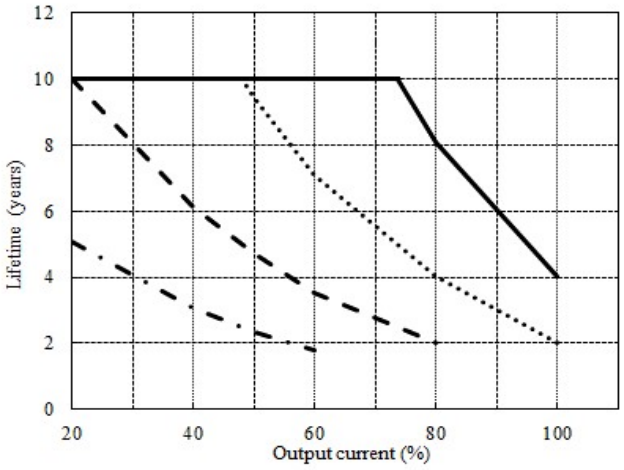
Upside

Conditions

Ta 30℃ : ——————
40℃ : ··········
50℃ : — — — —
60℃ : — · — · —

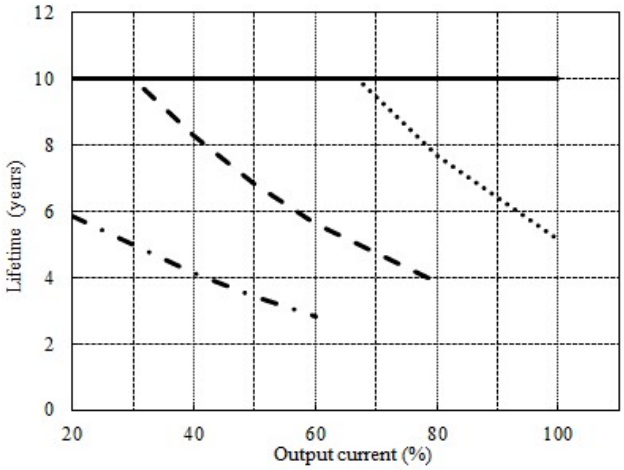
Vin=115VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	5.1
40	10.0	10.0	6.1	3.1
50	10.0	9.4	4.7	2.4
60	10.0	7.1	3.5	1.8
80	8.1	4.0	2.0	-
100	4.0	2.0	-	-



Vin=230VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	5.9
40	10.0	10.0	8.3	4.1
50	10.0	10.0	6.9	3.4
60	10.0	10.0	5.6	2.8
80	10.0	7.7	3.8	-
100	10.0	5.2	-	-

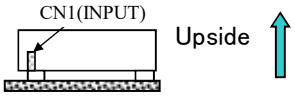


4. Electrolytic Capacitor Lifetime

MODEL : CUS500M1-24

Cooling condition : Convection cooling

Mounting A

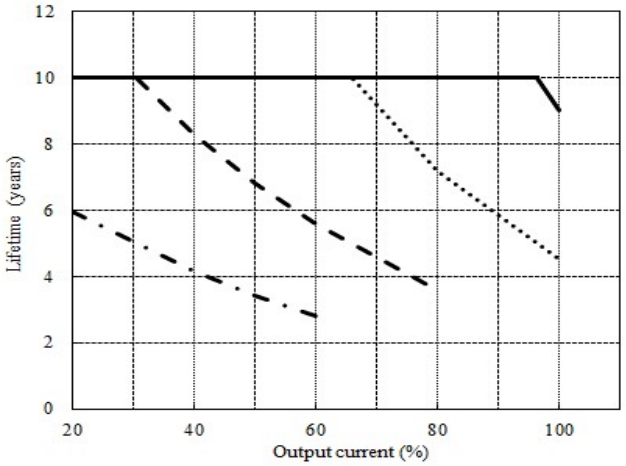


Conditions

Ta 30℃ : ——
40℃ : ·····
50℃ : – – – –
60℃ : –·–·–

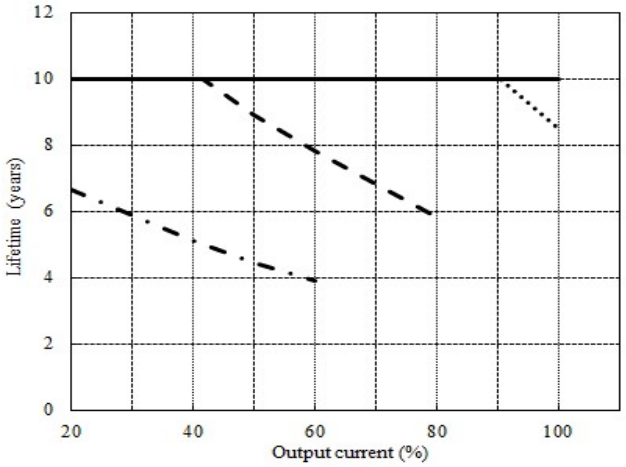
Vin=115VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	5.9
40	10.0	10.0	8.3	4.1
50	10.0	10.0	6.8	3.4
60	10.0	10.0	5.6	2.8
80	10.0	7.2	3.6	-
100	9.0	4.5	-	-



Vin=230VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	6.6
40	10.0	10.0	10.0	5.1
50	10.0	10.0	8.9	4.5
60	10.0	10.0	7.8	3.9
80	10.0	10.0	5.8	-
100	10.0	8.5	-	-

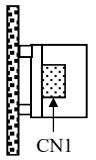


4. Electrolytic Capacitor Lifetime

MODEL : CUS500M1-24

Cooling condition : Convection cooling

Mounting B



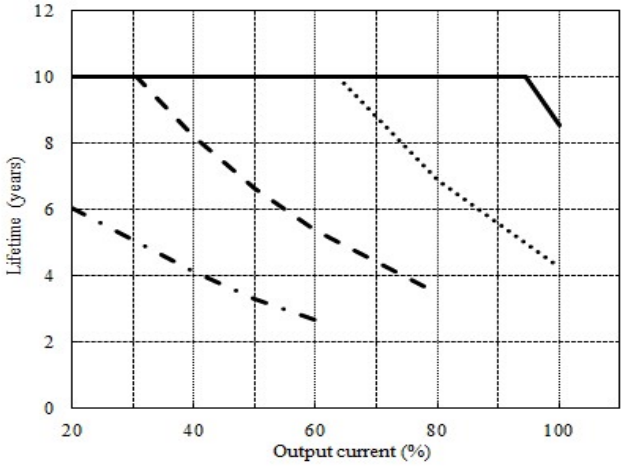
Upside

Conditions

Ta 30℃ :
40℃ :
50℃ :
60℃ :

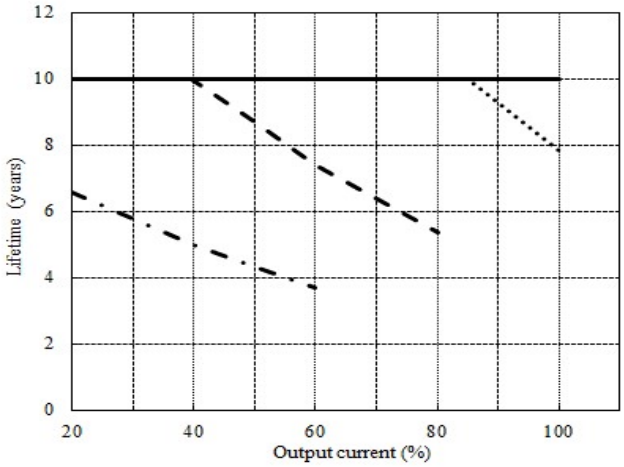
Vin=115VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	6.0
40	10.0	10.0	8.2	4.1
50	10.0	10.0	6.6	3.3
60	10.0	10.0	5.4	2.7
80	10.0	6.9	3.4	-
100	8.5	4.3	-	-



Vin=230VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	6.6
40	10.0	10.0	9.9	5.0
50	10.0	10.0	8.7	4.3
60	10.0	10.0	7.4	3.7
80	10.0	10.0	5.3	-
100	10.0	7.8	-	-

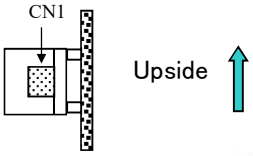


4. Electrolytic Capacitor Lifetime

MODEL : CUS500M1-24

Cooling condition : Convection cooling

Mounting C

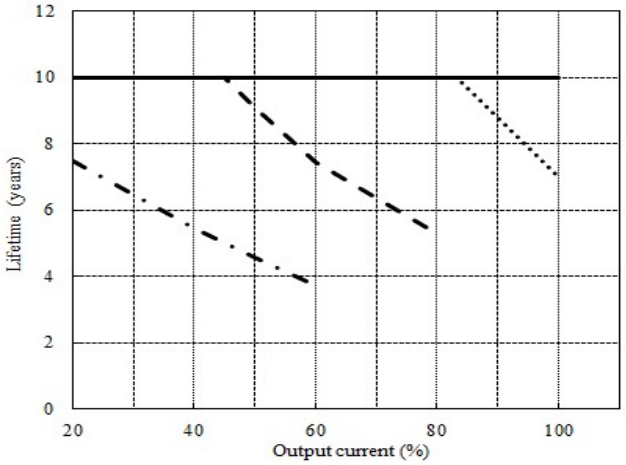


Conditions

Ta 30℃ :
40℃ :
50℃ :
60℃ :

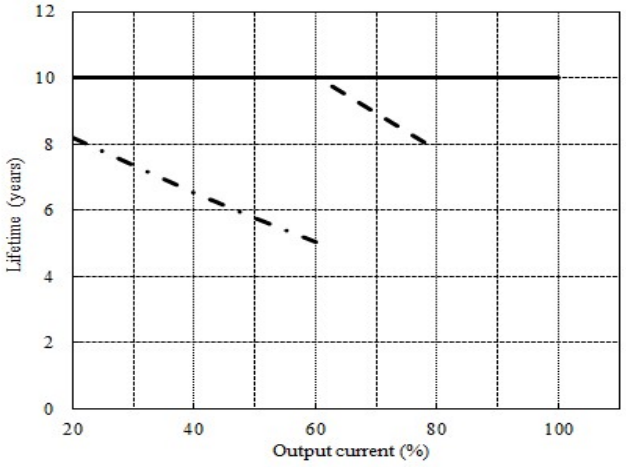
Vin=115VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	7.5
40	10.0	10.0	10.0	5.5
50	10.0	10.0	9.1	4.6
60	10.0	10.0	7.4	3.7
80	10.0	10.0	5.3	-
100	10.0	7.0	-	-



Vin=230VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	8.2
40	10.0	10.0	10.0	6.5
50	10.0	10.0	10.0	5.8
60	10.0	10.0	10.0	5.0
80	10.0	10.0	7.8	-
100	10.0	10.0	-	-

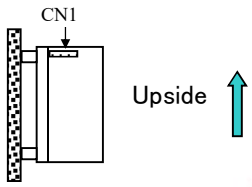


4. Electrolytic Capacitor Lifetime

MODEL : CUS500M1-24

Cooling condition : Convection cooling

Mounting D

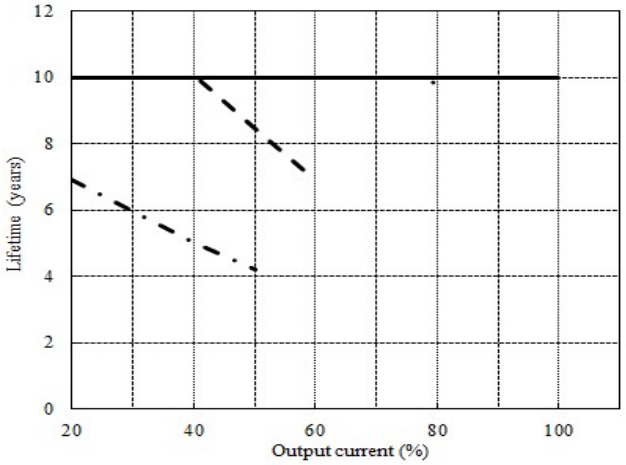


Conditions

Ta 30℃ : ——————
40℃ : ··········
50℃ : — — — —
60℃ : —·—·—·—

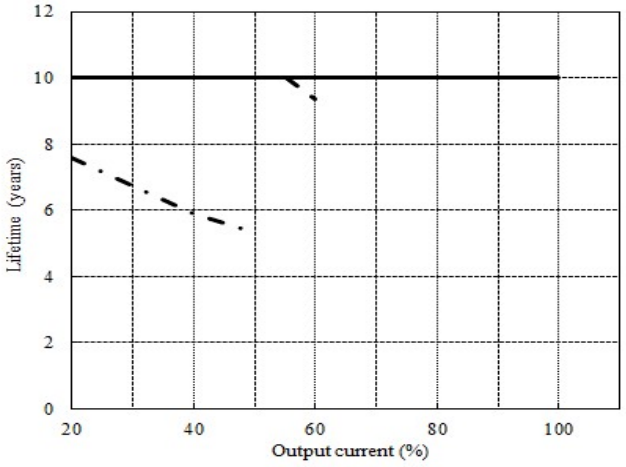
Vin=115VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	6.9
40	10.0	10.0	10.0	5.0
50	10.0	10.0	8.4	4.2
60	10.0	10.0	6.9	-
80	10.0	9.8	-	-
100	10.0	-	-	-



Vin=230VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	7.6
40	10.0	10.0	10.0	5.9
50	10.0	10.0	10.0	5.3
60	10.0	10.0	9.4	-
80	10.0	10.0	-	-
100	10.0	-	-	-

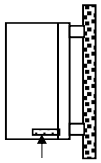


4. Electrolytic Capacitor Lifetime

MODEL : CUS500M1-24

Cooling condition : Convection cooling

Mounting E



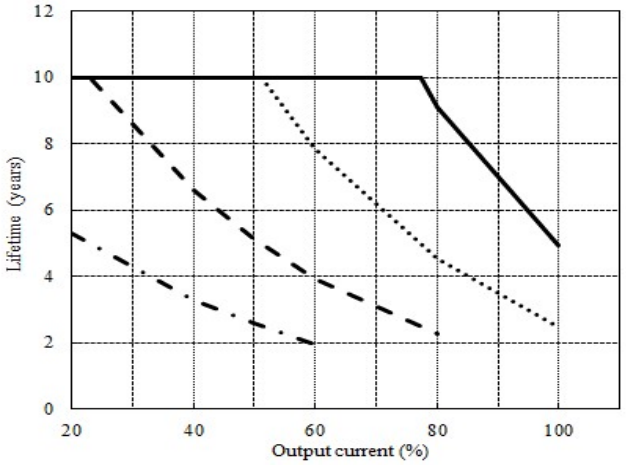
Upside

Conditions

Ta 30℃ :
40℃ :
50℃ :
60℃ :

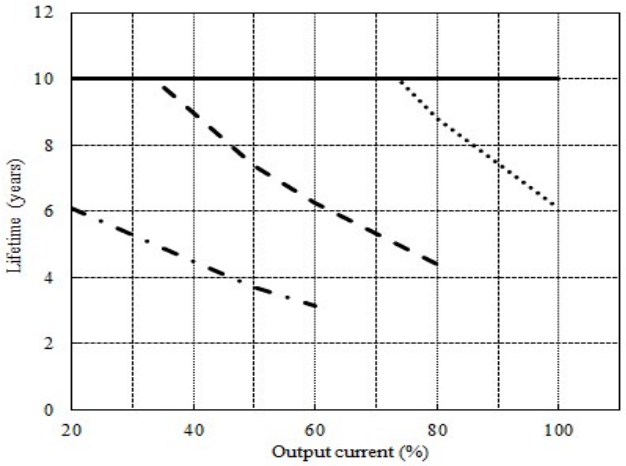
Vin=115VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	5.3
40	10.0	10.0	6.6	3.3
50	10.0	10.0	5.2	2.6
60	10.0	7.9	3.9	2.0
80	9.1	4.5	2.3	-
100	4.9	2.5	-	-



Vin=230VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	6.1
40	10.0	10.0	8.9	4.5
50	10.0	10.0	7.4	3.7
60	10.0	10.0	6.3	3.1
80	10.0	8.8	4.4	-
100	10.0	6.1	-	-

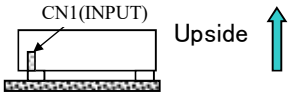


4. Electrolytic Capacitor Lifetime

MODEL : CUS500M1-48

Cooling condition : Convection cooling

Mounting A

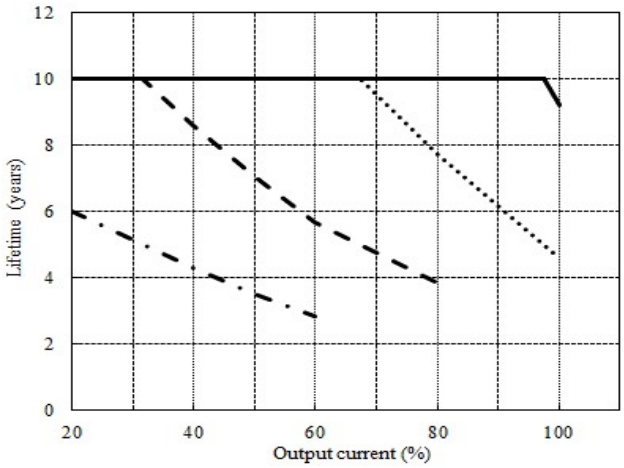


Conditions

Ta 30℃ : ——————
40℃ : ··········
50℃ : — — — —
60℃ : — · — · —

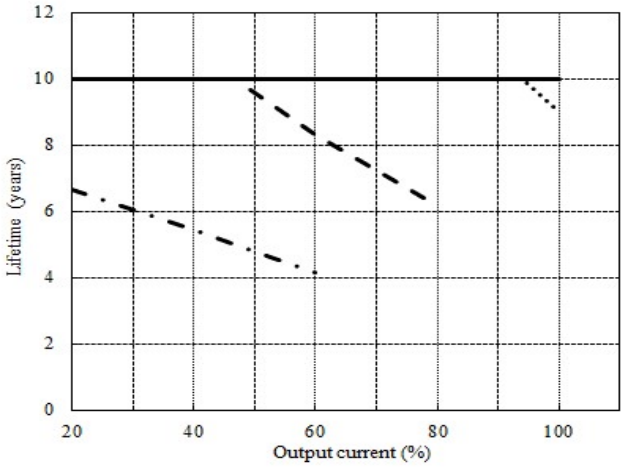
Vin=115VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	6.0
40	10.0	10.0	8.6	4.3
50	10.0	10.0	7.0	3.5
60	10.0	10.0	5.7	2.8
80	10.0	7.7	3.9	-
100	9.2	4.6	-	-



Vin=230VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	6.6
40	10.0	10.0	10.0	5.4
50	10.0	10.0	9.6	4.8
60	10.0	10.0	8.3	4.2
80	10.0	10.0	6.1	-
100	10.0	9.0	-	-

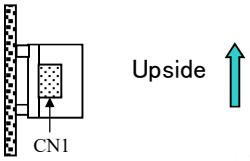


4. Electrolytic Capacitor Lifetime

MODEL : CUS500M1-48

Cooling condition : Convection cooling

Mounting B

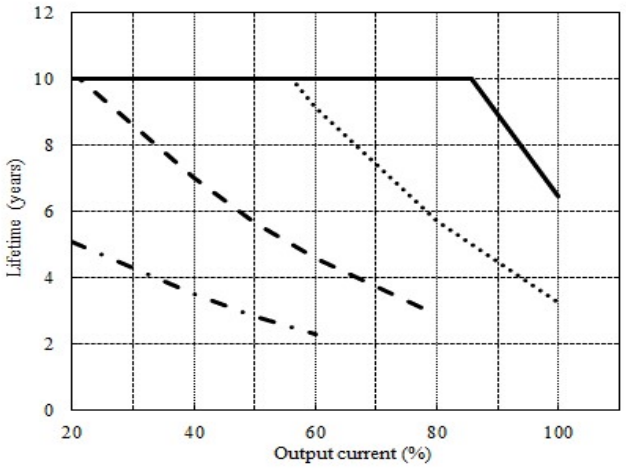


Conditions

Ta 30℃ :
40℃ :
50℃ :
60℃ :

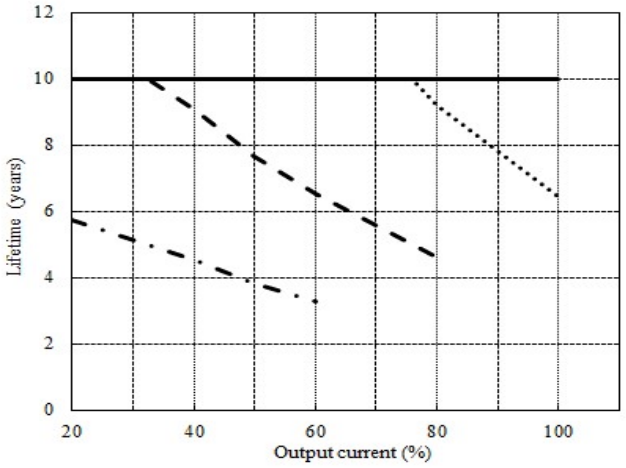
Vin=115VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	5.1
40	10.0	10.0	7.0	3.5
50	10.0	10.0	5.7	2.8
60	10.0	9.1	4.6	2.3
80	10.0	5.7	2.9	-
100	6.5	3.2	-	-



Vin=230VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	5.7
40	10.0	10.0	9.1	4.5
50	10.0	10.0	7.7	3.8
60	10.0	10.0	6.5	3.3
80	10.0	9.2	4.6	-
100	10.0	6.4	-	-

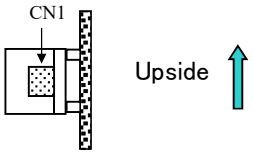


4. Electrolytic Capacitor Lifetime

MODEL : CUS500M1-48

Cooling condition : Convection cooling

Mounting C

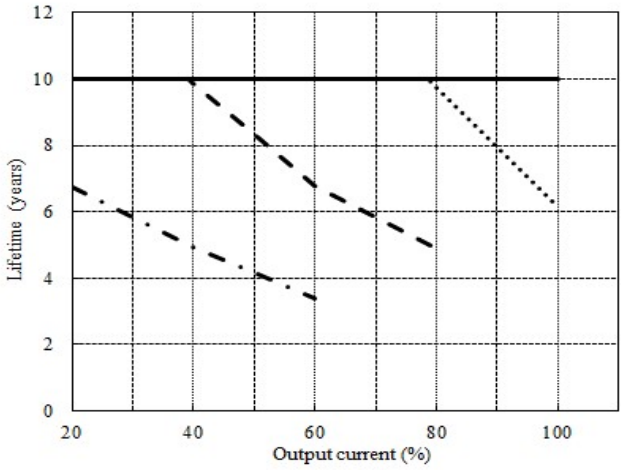


Conditions

Ta 30℃ : ——————
40℃ : ··········
50℃ : — — — —
60℃ : — · — · —

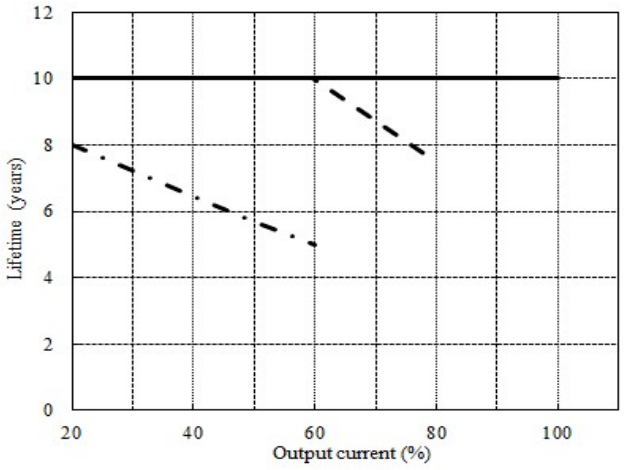
Vin=115VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	6.7
40	10.0	10.0	9.9	4.9
50	10.0	10.0	8.3	4.2
60	10.0	10.0	6.8	3.4
80	10.0	9.8	4.9	-
100	10.0	6.1	-	-



Vin=230VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	8.0
40	10.0	10.0	10.0	6.5
50	10.0	10.0	10.0	5.7
60	10.0	10.0	10.0	5.0
80	10.0	10.0	7.5	-
100	10.0	10.0	-	-

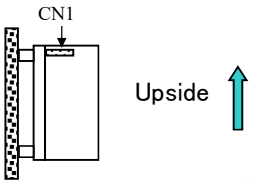


4. Electrolytic Capacitor Lifetime

MODEL : CUS500M1-48

Cooling condition : Convection cooling

Mounting D

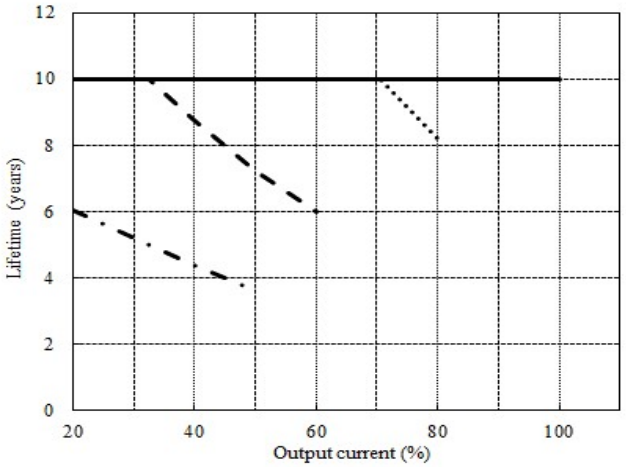


Conditions

Ta 30℃ :
40℃ :
50℃ :
60℃ :

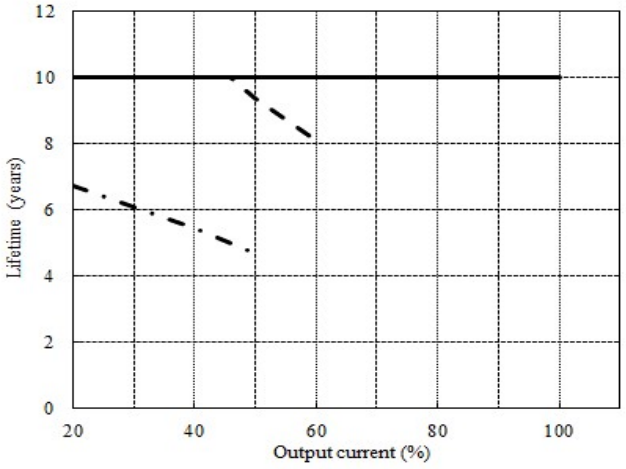
Vin=115VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	6.0
40	10.0	10.0	8.8	4.4
50	10.0	10.0	7.2	3.6
60	10.0	10.0	6.0	-
80	10.0	8.2	-	-
100	10.0	-	-	-



Vin=230VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	6.7
40	10.0	10.0	10.0	5.5
50	10.0	10.0	9.4	4.7
60	10.0	10.0	8.1	-
80	10.0	10.0	-	-
100	10.0	-	-	-

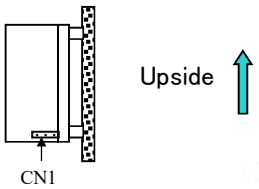


4. Electrolytic Capacitor Lifetime

MODEL : CUS500M1-48

Cooling condition : Convection cooling

Mounting E

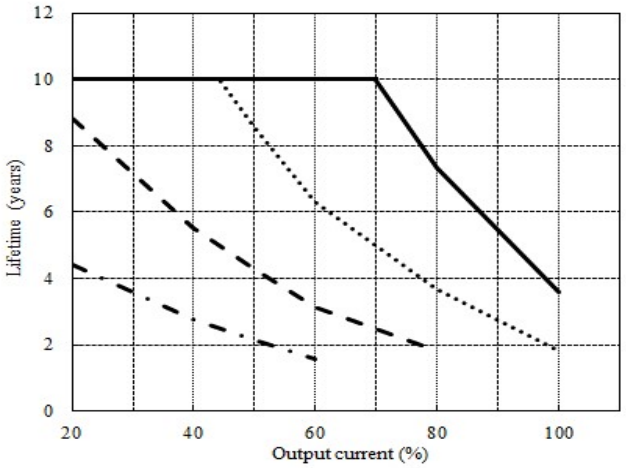


Conditions

Ta 30℃ : ——————
40℃ : ··········
50℃ : — — — —
60℃ : — · — · —

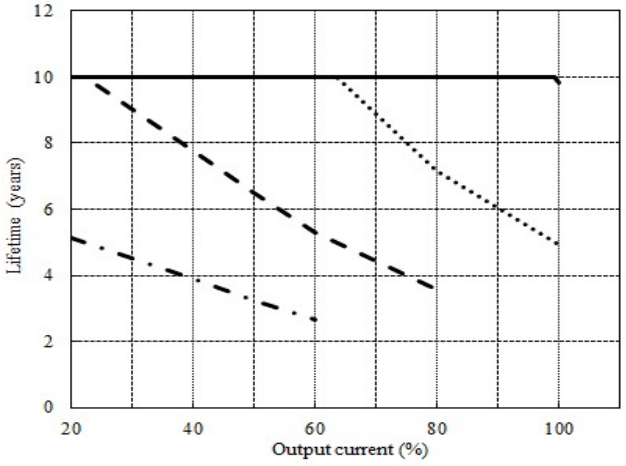
Vin=115VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	8.8	4.4
40	10.0	10.0	5.5	2.8
50	10.0	8.6	4.3	2.1
60	10.0	6.3	3.1	1.6
80	7.3	3.7	1.8	-
100	3.6	1.8	-	-



Vin=230VAC

Load (%)	Lifetime (years)			
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃
20	10.0	10.0	10.0	5.1
40	10.0	10.0	7.8	3.9
50	10.0	10.0	6.5	3.2
60	10.0	10.0	5.3	2.7
80	10.0	7.1	3.6	-
100	9.8	4.9	-	-



5. Abnormal Test

MODEL : CUS500M1-24

(1) Test Conditions

Input : 115VAC Output : 24V, 20.9A Ta : 25℃

(2) Test Results

No.	Test position		Test mode		Test result *1：Equivalent one smoke less than of a cigarette															Note
					a	b		c	d	e	f	g	h	I	j	k	l	
	Location No.	Test point	Short	Open	Fire	Slight	Smoke	Burst	Smell	Red hot	Damaged	Fuse blown	O.V.P.	O.C.P.	No output	No change	Others	
1	SCR1	A		○													○	Input Power increase
		K		○													○	Input Power increase
		G		○												○		
		A-K	○														○	Input Power decrease
		A-G	○													○		
		G-K	○													○		
2	Q1	G		○							○	○			○			Da: F1A ,F1B,R108, D117
		D		○											○			
		S		○											○			
		G-S	○												○			
		G-D	○								○	○			○			Da: F1A ,F1B,Q1, R108, D117, R110
		D-S	○								○	○			○			Da: F1A ,F1B,R108, D117
3	D1		○								○	○			○			Da: F1A ,Q1, R108, D117
				○											○			Da: F1A ,Q1, R108, D117
4	L4		○								○	○			○			Da: F1A ,F1B, Q1, R108, D117
				○											○			
5	C1		○								○	○			○			Da: F1A ,F1B
				○												○		
6	SA1		○								○	○			○			Da: F1A ,F1B
				○												○		
7	C4		○								○	○			○			Da: F1A ,F1B
				○														
8	C7		○								○	○			○			Da:F1A,F1B,R108,D117,Q2B
				○										○	○			
9	C8		○								○	○			○			Da:F1A,F1B,R108,D117,Q2A
				○										○	○			
10	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
11	Q2A	d		○											○			
		s		○							○				○			Da: Q2A, A103, Z102, Q103, A101
		g		○							○	○			○			Da: Q2A, Q2B, F1A, F1B, D117, R108
		d~s	○								○	○			○			Da: Q2B, F1A, F1B, D117, R108
		g~s	○												○			
		g~d	○								○	○			○			Da: Q2A, Q2B, F1A ,F1B, D117, R108

5. Abnormal Test

MODEL : CUS500M1-24

(1) Test Conditions

Input : 115VAC Output : 24V, 20.9A Ta : 25℃

(2) Test Results

No.	Test position		Test mode		Test result *1：Equivalent one smoke less than of a cigarette														Note
					a	b		c	d	e	f	g	h	I	j	k	l		
	Location No.	Test point	Short	Open	Fire	Slight	Smoke	Burst	Smell	Red hot	Damaged	Fuse blown	O.V.P.	O.C.P.	No output	No change	Others		
12	Q2B	d		○											○				
		s		○											○				
		g		○							○	○			○				Da: Q2A, Q2B, F1A, F1B, D117, R108
		d~s	○								○	○			○				Da: Q2A, F1A ,F1B, D117, R108
		g~s	○												○				
		g~d	○								○	○			○				Da: Q2A, Q2B, F1A ,F1B, D117, R108
13	Q201	d		○										○	○				
		s		○										○	○				
		g		○							○				○				Da:Q201
		d~s	○												○				
		g~s	○												○		○		OTP
		g~d	○												○				
14	Q202	d		○										○	○				
		s		○										○	○				
		g		○							○				○				Da:Q202
		d~s	○												○				
		g~s	○												○		○		OTP
		g~d	○												○				
15	T1	1		○										○	○				
		2		○										○	○				
		3		○										○	○				
		4		○										○	○				
		5		○											○				
		8		○											○				
		3~4	○											○	○				
		2~3	○											○	○				
		5~8	○											○	○				
16	T2	3		○											○				
		4		○											○				
		5		○											○				
		7		○											○				
		3~4	○												○				
		5~7	○												○				

6. Vibration Test

MODEL： CUS500M1-12/19/24/28/32/36/48

(1) Vibration Test Class

Frequency variable endurance test

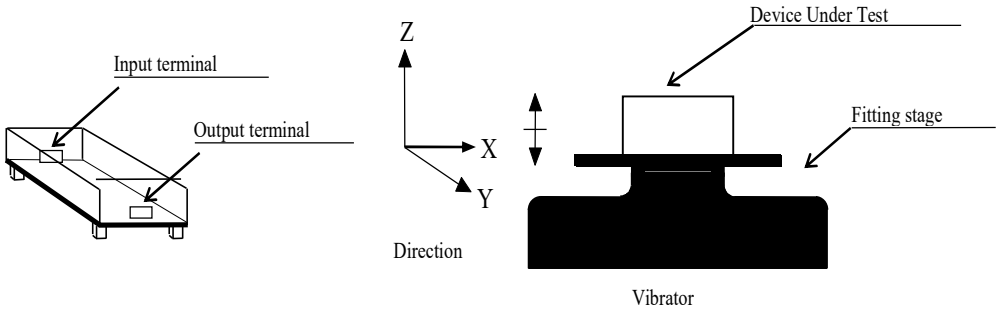
(2) Equipment Used

IMV CORP. DC-6000-65

(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.

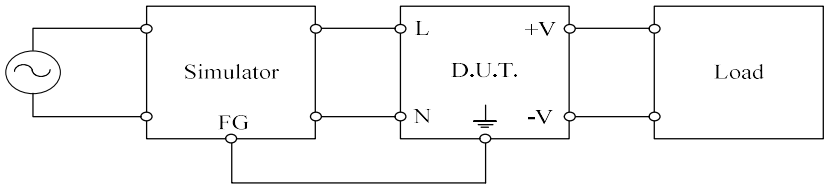
(6) Test Results

Judgement : OK

7. Noise Simulate Test

MODEL : CUS500M1-12/19/24/28/32/36/48

(1) Test Circuit and Equipment



Simulator : INS-400L (Noise Laboratory Co.,LTD)

(2) Test Conditions

・Input voltage	: 115, 230VAC	・Noise level	: 0～2kV
・Output voltage	: Rated	・Phase	: 0～360 deg
・Output current	: 0%, Full load	・Polarity	: ＋,－
・Ambient temperature	: 25℃	・Mode	: Common, Normal
・Pulse width	: 50～1000ns	・Trigger select	: Line

(3) 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.

(4) Test Results

Judgement : OK

8. Thermal Shock Test

MODEL : CUS500M1-12

(1) Equipment Used (Thermal Shock Chamber)

ESPEC CORP. TSA-101S-W

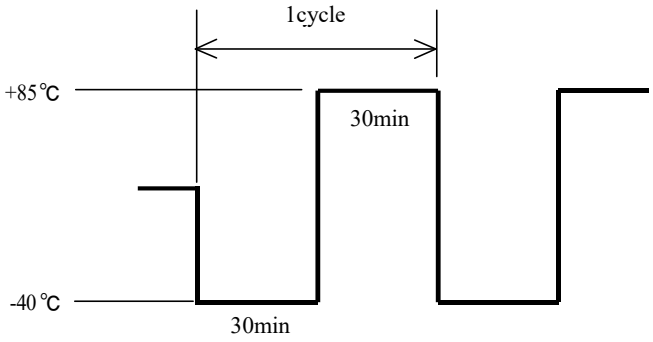
(2) Test Conditions

・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