CUS1200M

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 : CUS1200M-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, 50A
- Standby voltage & current : 5VDC, 2A
- Environmental factor : GB (Ground, Benign)
- Mounting method : Standard mounting A

SR-332,Issue3

MTBF(Ta=25℃) ≒ 872903 (Hours)

MTBF(Ta=35℃) ≒ 655436 (Hours)

1. Calculated Values of MTBF

Parts stress reliability prediction MTBF

MODEL : CUS1200M-36

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 : 36VDC, 33.3A
- Standby voltage & current : 5VDC, 2A
- Environmental factor : GB (Ground, Benign)
- Mounting method : Standard mounting A

SR-332,Issue3

MTBF(Ta=25℃) ≒ 1142266 (Hours)

MTBF(Ta=40℃) ≒ 742196 (Hours)

2. Components Derating

MODEL : CUS1200M-24

(1) Calculating Method

(a) Measuring method

・Mounting method	: Standard mounting A	・Input voltage	: 115, 230VAC
・Output voltage & current	: 24V, 50A	・Ambient temperature	: 35°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 = 50A	Istb = 2A	Ta = 35°C
BD1 D35XB80-7000 SHINDENGEN	Tch (max) = 150 °C Pch= 18.5 W Tch = Tc + ((θch-c) × Pch) = 104.6 °C D.F. = 69.7 %	θch-c = 0.8 °C/W ΔTc = 54. 8°C	Tc = 89.8°C
SCR1 TN3015H-6I STMICRO	Tch (max) = 150 °C Pch = 3.9 W Tch = Tc + ((θch-c) × Pch) = 98.5°C D.F. = 65.7 %	θch-c = 1.9 °C/W ΔTc = 56. 2°C	Tc = 91.2 °C
D1 TRS12A65F,S1Q(S2 TOSHIBA	Tch (max) = 175 °C Pch=6.4W Tch = Tc + ((θch-c) × Pch) = 119.3°C D.F. = 68.1 %	θch-c = 3.65 °C/W ΔTc = 60.9 °C	Tc = 95.9 °C
Q1 IPW60R024P7 INFINEON	Tj (max) = 150 °C Pd = 13.5W Tj = Tc + ((θj-c) × Pd) = 93.5 °C D.F. = 62.3 %	θj-c = 0.43 °C/W ΔTc = 52.7 °C	Tc = 87.7 °C
Q103,Q104 IPT60R045CFD7 INFINEON	Tj (max) = 150 °C Pd = 2.9 W Tj = Tc + ((θj-c) × Pd) = 80.1 °C D.F. = 53.4 %	θj-c = 0.46 °C/W ΔTc = 43.8 °C	Tc = 78.8 °C
D61 SB360-E3/73 VISHAY	Tj (max) = 150 °C Pd = 0.9 W Tj = Tl + ((θj-l) × Pd) = 94.6 °C D.F. = 63.1 %	θj-l = 10 °C/W ΔTl = 50.6 °C	Tl = 85.6 °C
Q301~ Q304 TPH2R408QM,LQ(M1 TOSHIBA	Tj (max) = 150 °C Pd = 1 W Tj = Tc + ((θj-c) × Pd) = 88 °C D.F. = 58.7 %	θj-c = 0.71 °C/W ΔTc = 52. 3 °C	Tc = 87.3 °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 = 50A	Istb = 2A	Ta = 35°C
BD1 D35XB80-7000 SHINDENGEN	Tch (max) = 150 °C Pch= 9.2 W Tch = Tc + ((θch-c) × Pch) = 71.2°C D.F. = 47.5 %	θch-c = 0.8 °C/W ΔTc = 28. 9°C	Tc = 63.9°C
SCR1 TN3015H-6I STMICRO	Tch (max) = 150 °C Pch = 3.5 W Tch = Tc + ((θch-c) × Pch) = 77.2°C D.F. = 51.5 %	θch-c = 1.9 °C/W ΔTc = 35. 5°C	Tc =70.5 °C
D1 TRS12A65F,S1Q(S2 TOSHIBA	Tch (max) = 175 °C Pch=4.8W Tch = Tc + ((θch-c) × Pch) = 90.3°C D.F. = 51.6 %	θch-c = 3.65 °C/W ΔTc = 37.9 °C	Tc = 72.9 °C
Q1 IPW60R024P7 INFINEON	Tj (max) = 150 °C Pd = 5.8W Tj = Tc + ((θj-c) × Pd) = 66.2 °C D.F. = 44.1 %	θj-c = 0.43 °C/W ΔTc = 28.7 °C	Tc =63.7 °C
Q103,Q104 IPT60R045CFD7 INFINEON	Tj (max) = 150 °C Pd = 2.9 W Tj = Tc + ((θj-c) × Pd) = 73.7 °C D.F. = 49.2%	θj-c = 0.46 °C/W ΔTc = 37. 4 °C	Tc = 72.4 °C
D61 SB360-E3/73 VISHAY	Tj (max) = 150 °C Pd = 0.9 W Tj = Tl + ((θj-l) × Pd) = 89.6 °C D.F. = 63.1 %	θj-l = 10 °C/W ΔTl = 45.6 °C	Tl = 80.6 °C
Q301~ Q304 TPH2R408QM,LQ(M1 TOSHIBA	Tj (max) = 150 °C Pd = 1W Tj = Tc + ((θj-c) × Pd) = 84 °C D.F. = 56 %	θj-c = 0.71 °C/W ΔTc = 48. 3 °C	Tc = 83.3 °C

Terminology Used

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

2. Components Derating

MODEL : CUS1000M-36

(1) Calculating Method

(a) Measuring method

・Mounting method	: Standard mounting A	・Input voltage	: 115, 230VAC
・Output voltage & current	: 36V, 33.3A	・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 = 33.3A Istb = 2A Ta = 40°C		
BD1 D35XB80-7000 SHINDENGEN	Tch (max) = 150 °C Pch= 18.5 W Tch = Tc + ((θch-c) × Pch) = 107.5 °C D.F. = 71.7 %	θch-c = 0.8 °C/W ΔTc = 52.7°C	Tc = 92.7°C
SCR1 TN3015H-6I STMICRO	Tch (max) = 150 °C Pch = 3.9 W Tch = Tc + ((θch-c) × Pch) = 99.1°C D.F. = 66.1 %	θch-c = 1.9 °C/W ΔTc = 51. 7°C	Tc = 91.7 °C
D1 TRS12A65F,S1Q(S2 TOSHIBA	Tch (max) = 175 °C Pch=6.4W Tch = Tc + ((θch-c) × Pch) = 122.9°C D.F. = 70.2 %	θch-c = 3.65 °C/W ΔTc = 59. 5 °C	Tc = 99.5°C
Q1 IPW60R024P7 INFINEON	Tj (max) = 150 °C Pd = 13.5W Tj = Tc + ((θj-c) × Pd) = 99.1 °C D.F. = 66.1 %	θj-c = 0.43 °C/W ΔTc = 53. 3°C	Tc = 93.3 °C
Q103,Q104 IPT60R045CFD7 INFINEON	Tj (max) = 150 °C Pd = 2.9 W Tj = Tc + ((θj-c) × Pd) = 77.7 °C D.F. = 51.8 %	θj-c = 0.46 °C/W ΔTc =36. 4 °C	Tc = 76.4 °C
D61 SB360-E3/73 VISHAY	Tj (max) = 150 °C Pd = 0.9 W Tj = Tl + ((θj-l) × Pd) = 100.7 °C D.F. = 67.1 %	θj-l = 10 °C/W ΔTl = 51. 7 °C	Tl = 91.7 °C
Q301~ Q304 BSC060N10NS3 G INFINEON	Tj (max) = 150 °C Pd = 1.3 W Tj = Tc + ((θj-c) × Pd) = 90.2 °C D.F. = 60.2 %	θj-c = 1 °C/W ΔTc = 48. 9 °C	Tc = 88.9°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 = 33.3A Istb = 2A Ta = 40°C		
BD1 D35XB80-7000 SHINDENGEN	Tch (max) = 150 °C Pch= 9.2 W Tch = Tc + ((θch-c) × Pch) = 74.7°C D.F. = 49.8 %	θch-c = 0.8 °C/W ΔTc =27.4°C	Tc = 67.4°C
SCR1 TN3015H-6I STMICRO	Tch (max) = 150 °C Pch = 3.5 W Tch = Tc + ((θch-c) × Pch) = 78.9°C D.F. = 52.6 %	θch-c = 1. 9 °C/W ΔTc = 32. 2°C	Tc =72.2 °C
D1 TRS12A65F,S1Q(S2 TOSHIBA	Tch (max) = 175 °C Pch=4.8W Tch = Tc + ((θch-c) × Pch) =94.5°C D.F. = 54 %	θch-c = 3.65 °C/W ΔTc = 37.1 °C	Tc = 77.1 °C
Q1 IPW60R024P7 INFINEON	Tj (max) = 150 °C Pd = 5.8W Tj = Tc + ((θj-c) × Pd) = 70.6 °C D.F. = 47.1 %	θj-c = 0.43 °C/W ΔTc = 28.1 °C	Tc =68.1 °C
Q103,Q104 IPT60R045CFD7 INFINEON	Tj (max) = 150 °C Pd = 2.9 W Tj = Tc + ((θj-c) × Pd) = 72.2°C D.F. = 48.2%	θj-c = 0.46 °C/W ΔTc = 30. 9 °C	Tc = 70.9 °C
D61 SB360-E3/73 VISHAY	Tj (max) = 150 °C Pd = 0.9 W Tj = Tl + ((θj-l) × Pd) = 96.6 °C D.F. = 64.4 %	θj-l = 10 °C/W ΔTl = 47.6 °C	Tl = 87.6°C
Q301~ Q304 BSC060N10NS3 G INFINEON	Tj (max) = 150 °C Pd = 1.3 W Tj = Tc + ((θj-c) × Pd) = 85.1 °C D.F. = 56.8%	θj-c = 1 °C/W ΔTc = 43. 8 °C	Tc = 83.8 °C

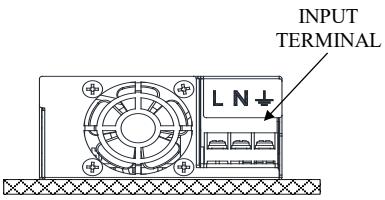
Terminology Used

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

3. Main Components Temperature Rise △T List

MODEL : CUS1200M-24

(1) Measuring Conditions

Mounting Method (Standard Mounting : A)	Mounting A (STANDARD MOUNTING)  	
Input Voltage	115VAC	230VAC
Output Voltage	24V	
Output Current	50A	
Standby Current	2A	
Ambient Temperature	35°C	

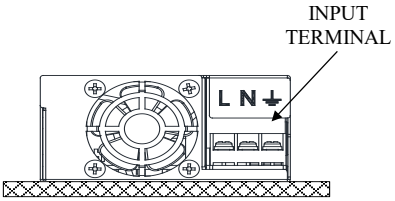
(2) Measuring Results

		ΔT Temperature Rise (°C)	
Input Voltage		115VAC	230VAC
Location No.	Part name	Mounting A	
A103	IC	16.7	9
A104	IC	19.2	11.1
A108	IC	20.9	15.5
A110	IPD	47.1	41.5
A301	IC	46.2	43.3
A306	IC	31.8	27.3
A307	IC	42.5	39.4
BD1	Diode Bridge	54.8	28.9
C7	Cap., Film	11.4	4.2
C10	Cap., Film	32.6	27
C51B	E.CAP.	45.6	41.4
C52C	E.CAP.	34.2	29.3
C8C	E.CAP.	27.4	18.3
C9B	Cap., Film	38	32.2
C61	E.CAP.	37.8	32.5
D1	SBD	60.9	37.9
D61	SBD	50.6	45.6
L1	CHOKE COIL	11.2	3
L2	CHOKE COIL	50.1	14.8
L3	CHOKE COIL	45.5	22.3
L301	CHOKE COIL	34.8	29.4
Q1	MOS FET	52.7	28.7
Q103,Q104	MOS FET	43.8	37.4
Q301,Q302	MOS FET	50	45.8
Q303,Q304	MOS FET	52.3	48.3
R104	RESISTOR	50	21.5
R376	RESISTOR	50.9	48.2
SCR1	Thyristor	56.2	35.5
T1	TRANS	84.6	81
T2	TRANS	31.9	26.6

3. Main Components Temperature Rise △T List

MODEL : CUS1200M-36

(1) Measuring Conditions

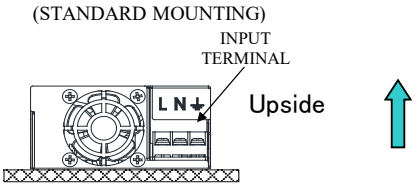
Mounting Method (Standard Mounting : A)	Mounting A (STANDARD MOUNTING)  	
Input Voltage	115VAC	230VAC
Output Voltage	36V	
Output Current	33.3A	
Standby Current	2A	
Ambient Temperature	40°C	

(2) Measuring Results

		ΔT Temperature Rise (°C)	
Input Voltage		115VAC	230VAC
Location No.	Part name	Mounting A	
A103	IC	18.4	10.4
A104	IC	19.7	11.8
A108	IC	26.9	20.4
A110	IPD	48.1	40.5
A301	IC	42.8	38.9
A306	IC	33.7	27.9
A307	IC	37.4	33.4
BD1	Diode Bridge	52.7	27.4
C7	Cap., Film	12.9	6.9
C10	Cap., Film	27.1	20.4
C51B	E.CAP.	36.6	31.9
C52C	E.CAP.	27.8	22.1
C8C	E.CAP.	24.1	15.9
C9B	Cap., Film	31.1	25.1
C61	E.CAP.	33	27.5
D1	SBD	59.5	37.1
D61	SBD	51.7	47.6
L1	CHOKE COIL	12.7	4.3
L2	CHOKE COIL	50.5	14.2
L3	CHOKE COIL	38.3	17.5
L301	CHOKE COIL	34.2	27.8
Q1	MOS FET	53.3	28.1
Q103,Q104	MOS FET	36.4	30.9
Q301,Q302	MOS FET	44.2	39.4
Q303,Q304	MOS FET	48.9	43.8
R104	RESISTOR	49.7	20.1
R376	RESISTOR	41.5	37.1
SCR1	Thyristor	51.7	32.2
T1	TRANS	75.3	71
T2	TRANS	29	24.2

4. Electrolytic Capacitor Lifetime

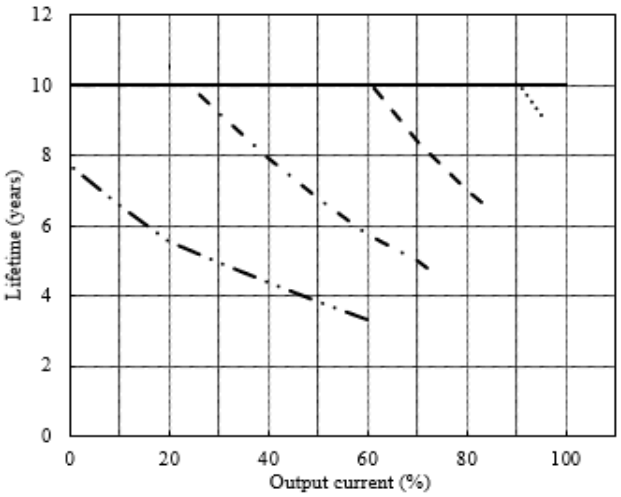
MODEL : CUS1200M-24



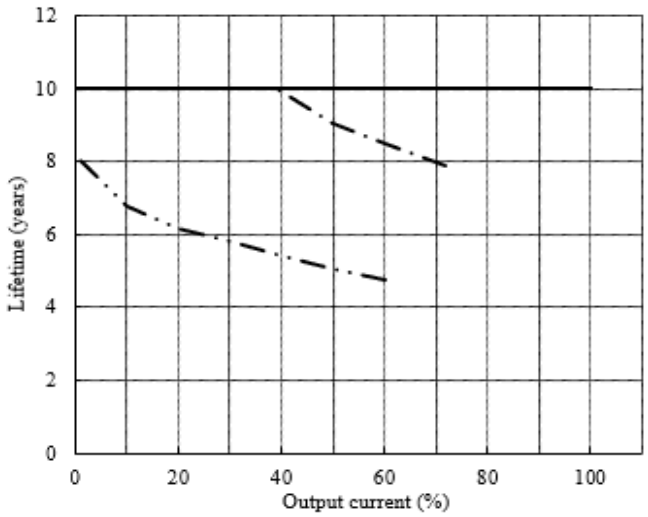
Conditions Istb : 2A（Ta ≦ 60°C）
1.6A（Ta = 70°C）

Ta 30℃ :
35℃ :
40℃ :
50℃ :
60℃ :
70℃ :

Vin=115VAC						
Load (%)	Lifetime (years)					
	Ta= 30℃	Ta= 35℃	Ta= 40℃	Ta= 50℃	Ta= 60℃	Ta= 70℃
100	10.0	10.0	-	-	-	-
95	10.0	10.0	9.2	-	-	-
90	10.0	10.0	10.0	-	-	-
83	10.0	10.0	10.0	6.6	-	-
80	10.0	10.0	10.0	7.0	-	-
72	10.0	10.0	10.0	8.0	4.8	-
70	10.0	10.0	10.0	8.4	5.0	-
60	10.0	10.0	10.0	10.0	5.8	3.3
50	10.0	10.0	10.0	10.0	6.8	3.8
40	10.0	10.0	10.0	10.0	7.9	4.4
30	10.0	10.0	10.0	10.0	9.2	4.9
20	10.0	10.0	10.0	10.0	10.0	5.5
10	10.0	10.0	10.0	10.0	10.0	6.6
0	10.0	10.0	10.0	10.0	10.0	7.7

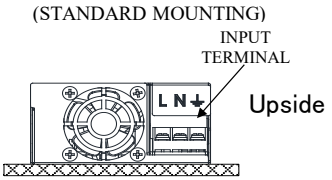


Vin=230VAC						
Load (%)	Lifetime (years)					
	Ta= 30℃	Ta= 35℃	Ta= 40℃	Ta= 50℃	Ta= 60℃	Ta= 70℃
100	10.0	10.0	-	-	-	-
95	10.0	10.0	10.0	-	-	-
90	10.0	10.0	10.0	-	-	-
83	10.0	10.0	10.0	10.0	-	-
80	10.0	10.0	10.0	10.0	-	-
72	10.0	10.0	10.0	10.0	7.9	-
70	10.0	10.0	10.0	10.0	8.0	-
60	10.0	10.0	10.0	10.0	8.5	4.7
50	10.0	10.0	10.0	10.0	9.0	5.0
40	10.0	10.0	10.0	10.0	9.9	5.4
30	10.0	10.0	10.0	10.0	10.0	5.8
20	10.0	10.0	10.0	10.0	10.0	6.2
10	10.0	10.0	10.0	10.0	10.0	6.8
0	10.0	10.0	10.0	10.0	10.0	8.2



4. Electrolytic Capacitor Lifetime

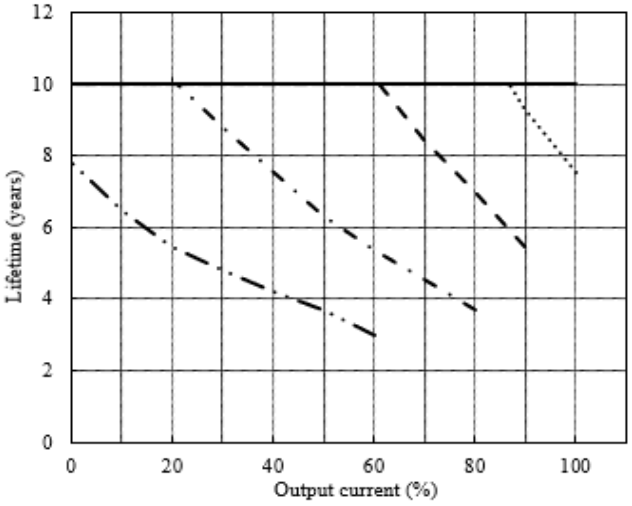
MODEL : CUS1200M-36



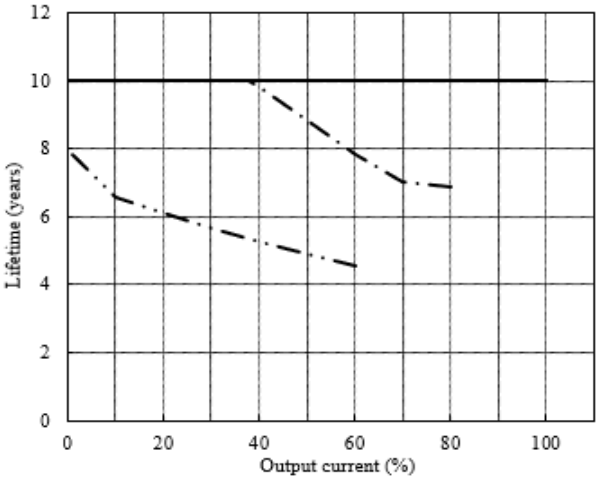
Conditions Istb : 2A (Ta ≦ 60°C)
1.6A (Ta = 70°C)

Ta 30℃ : ——————
40℃ : ··········
50℃ : — — — — —
60℃ : —·—·—·—
70℃ : —··—··—··

Vin=115VAC					
Load (%)	Lifetime (years)				
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃	Ta= 70℃
100	10.0	7.5	-	-	-
90	10.0	9.3	5.5	-	-
80	10.0	10.0	7.0	3.7	-
70	10.0	10.0	8.4	4.6	-
60	10.0	10.0	10.0	5.4	3.0
50	10.0	10.0	10.0	6.3	3.7
40	10.0	10.0	10.0	7.6	4.2
30	10.0	10.0	10.0	8.8	4.8
20	10.0	10.0	10.0	10.0	5.5
10	10.0	10.0	10.0	10.0	6.5
0	10.0	10.0	10.0	10.0	7.8

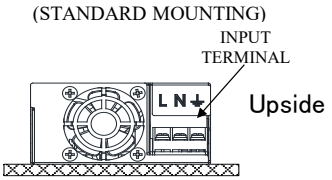


Vin=230VAC					
Load (%)	Lifetime (years)				
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃	Ta= 70℃
100	10.0	10.0	-	-	-
90	10.0	10.0	10.0	-	-
80	10.0	10.0	10.0	6.9	-
70	10.0	10.0	10.0	7.0	-
60	10.0	10.0	10.0	7.8	4.5
50	10.0	10.0	10.0	8.9	4.9
40	10.0	10.0	10.0	9.8	5.2
30	10.0	10.0	10.0	10.0	5.6
20	10.0	10.0	10.0	10.0	6.1
10	10.0	10.0	10.0	10.0	6.6
0	10.0	10.0	10.0	10.0	8.0



4. Electrolytic Capacitor Lifetime

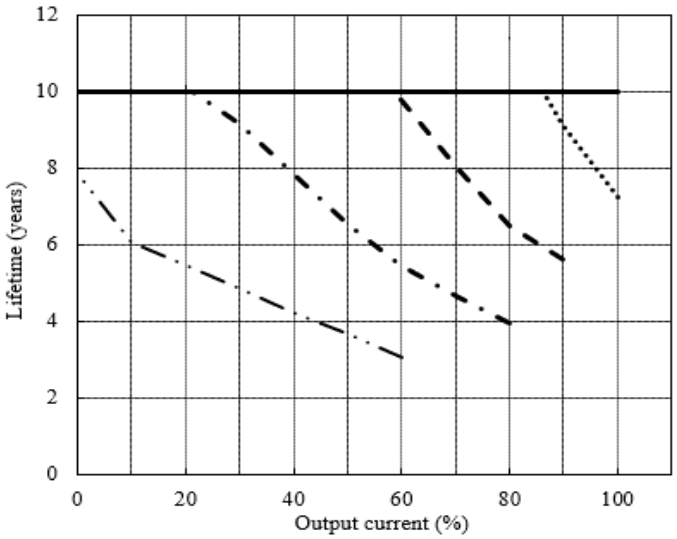
MODEL : CUS1200M-48



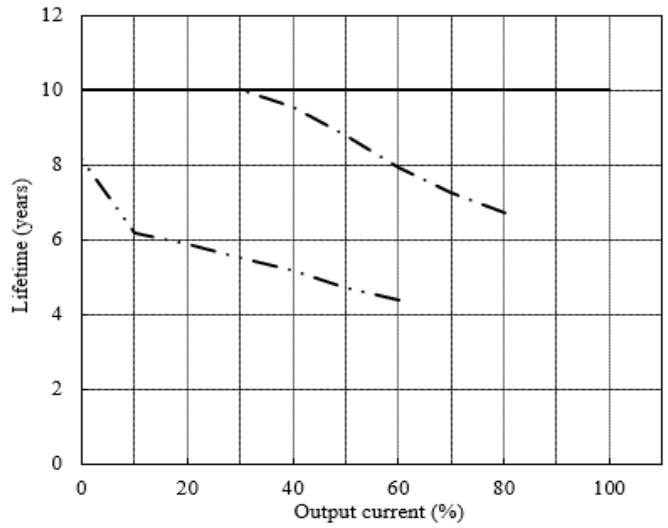
Conditions Istb : 2A (Ta ≦ 60°C)
1.6A (Ta = 70°C)

Ta 30℃ : ——————
40℃ : .....
50℃ : — — — — —
60℃ : —·—·—·—
70℃ : —··—··—··

Vin=115VAC					
Load (%)	Lifetime (years)				
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃	Ta= 70℃
100	10.0	7.2	-	-	-
90	10.0	9.1	5.6	-	-
80	10.0	10.0	6.5	3.9	-
70	10.0	10.0	8.0	4.6	-
60	10.0	10.0	9.8	5.5	3.0
50	10.0	10.0	10.0	6.5	3.6
40	10.0	10.0	10.0	7.8	4.2
30	10.0	10.0	10.0	9.1	4.8
20	10.0	10.0	10.0	10.0	5.4
10	10.0	10.0	10.0	10.0	6.0
0	10.0	10.0	10.0	10.0	7.9



Vin=230VAC					
Load (%)	Lifetime (years)				
	Ta= 30℃	Ta= 40℃	Ta= 50℃	Ta= 60℃	Ta= 70℃
100	10.0	10.0	-	-	-
90	10.0	10.0	10.0	-	-
80	10.0	10.0	10.0	6.7	-
70	10.0	10.0	10.0	7.3	-
60	10.0	10.0	10.0	7.9	4.4
50	10.0	10.0	10.0	8.8	4.7
40	10.0	10.0	10.0	9.5	5.2
30	10.0	10.0	10.0	10.0	5.5
20	10.0	10.0	10.0	10.0	5.9
10	10.0	10.0	10.0	10.0	6.1
0	10.0	10.0	10.0	10.0	8.2



5. Abnormal Test

MODEL : CUS1200M-24

(1) Test Conditions

Input : 230VAC Output : 24V, 50A 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 3W
		A-G	○													○				
		G-K	○														○			Input Power increase 5W
2	Q1	G		○							○	○			○					Da:F1A,F1B,Q1,R104
		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	L3		○								○	○			○					Da:F1B,Q1,R104
				○											○					
5	C3		○								○	○			○					Da:F1A,F1B
				○												○				
6	SA1		○								○	○			○					Da:F1A,F1B
				○												○				
7	C7		○								○	○			○					Da:F1A,F1B
				○													○			Input Power increase 6W PF value decrease
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,F2
		D		○							○	○			○					Da:Q103,Q104,F2.A107
		S		○							○	○			○					Da:Q103,Q104,F2,A106
		G-S	○												○					
		G-D	○								○	○			○					Da:Q103,Q104,F2,A106
		D-S	○								○	○			○					Da:Q104,F2

5. Abnormal Test

MODEL : CUS1200M-24

(1) Test Conditions

Input : 230VAC Output : 24V, 50A 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
10	Q104	G		○							○	○			○					Da:F2,Q103,Q104
		D		○											○					
		S		○											○					
		G-S	○												○					
		G-D	○												○					
		D-S	○								○	○			○					Da:F2,Q103
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:R1, Standby power :No output
		7~8	○												○		○			Standby power hiccup & OCP
12	Q301，Q302	d		○													○			Input Power increase 2.5W
		s		○													○			Input Power increase 2.5W
		g		○							○				○					Da: Q301 or Q302
		d~s	○											○	○					
		g~s	○														○			Input Power increase 30W
		g~d	○								○			○						DA:A301
13	Q303，Q304	d		○													○			Input Power increase 2.5W
		s		○													○			Input Power increase 2.5W
		g		○							○				○					Da: Q303 or Q304
		d~s	○											○	○					
		g~s	○														○			Input Power increase 30W
		g~d	○								○			○						DA:A301
14	T1	1		○										○	○					
		4		○										○	○					
		2		○										○	○					
		3		○										○	○					
		5、8		○											○					
		1~4	○											○	○					
		2~3	○											○	○					
		5~8	○											○	○					

6. Vibration Test

MODEL：CUS1200M-24/36/48

(1) Vibration Test Class

Frequency variable endurance test

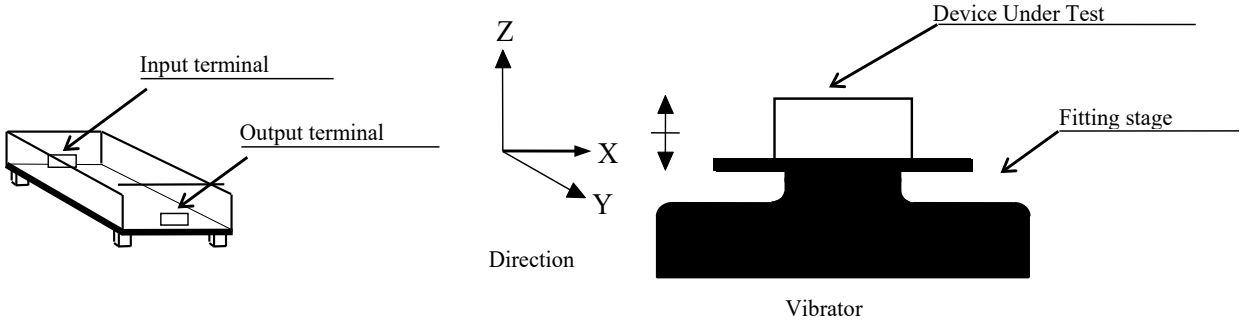
(2) Equipment Used

IMV CORP. : DC-3200-36

(3) Test Conditions

1-1	・Frequency range	10～55Hz	・Vibration coordinate	X,Y,Z
	・Sweep	1.0min	・testing time	each 1Hr
	・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 : CUS1200M-24/36/48

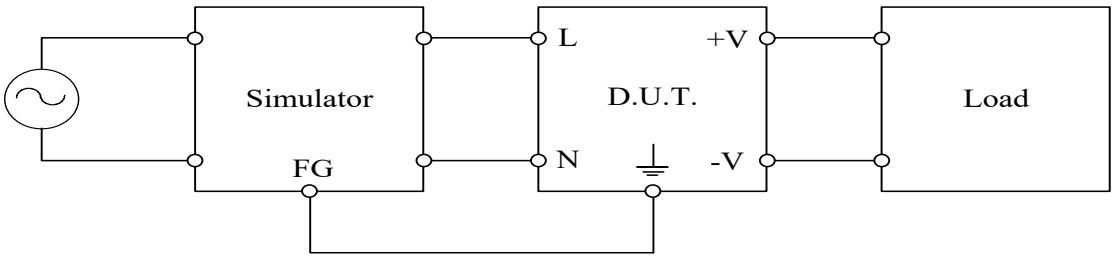
(1) Equipment Used

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) : 0～1kV(Output Port)
・Output voltage	: Rated		: 0～1kV(Signal Port)
・Output current	: 0%, 100%	・Standby current	: 0%, 100%
・Polarity	: ＋,－	・Mode	: Common, Normal(Input Port) : Common(Output Port)
・Ambient temperature	: 25℃		: Common(Signal Port)
・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 : CUS1200M-24

(1) Equipment Used (Thermal Shock Chamber)

Hitachi ES-77LH

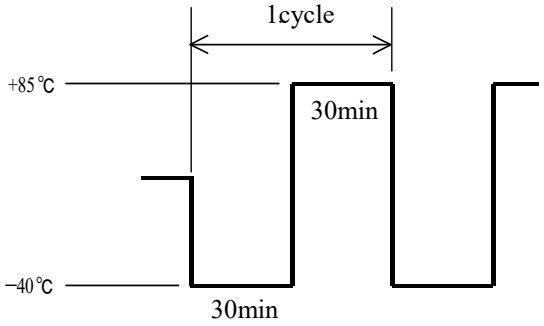
(2) Test Conditions

・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

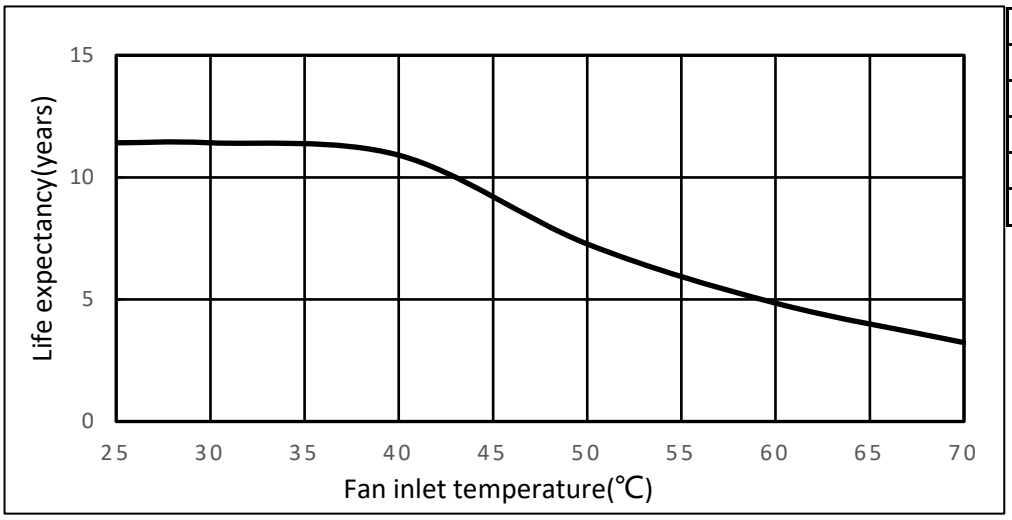
MODEL : CUS1200M-24

(1) Part Name

04020VA-12P-AA-08 (Minebea)

(2) Life Expectancy

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



Temperature(℃)	Life(years)
30	11.4
40	10.9
50	7.3
60	4.8
70	3.2

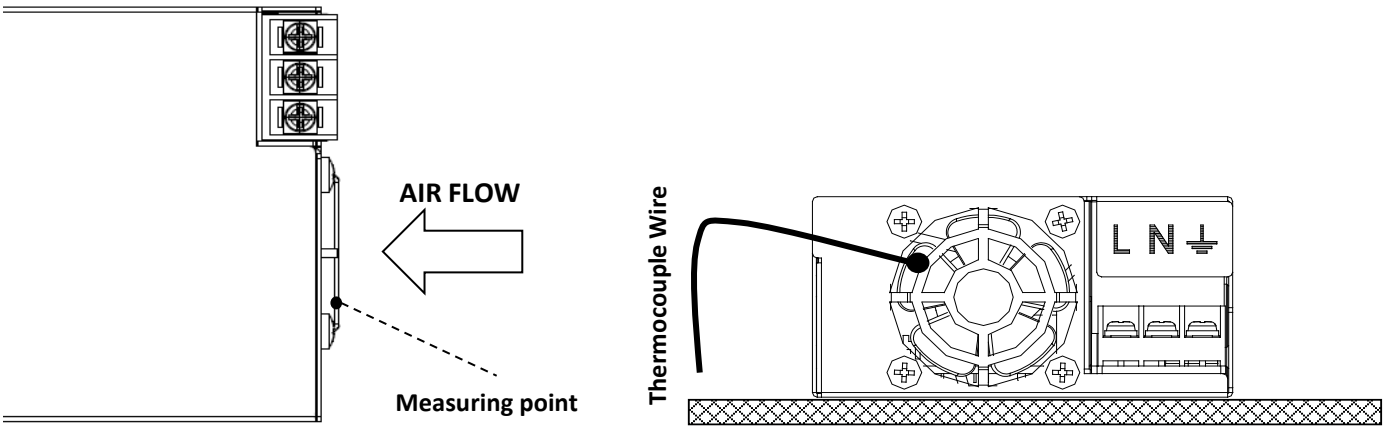


Fig.1 Measuring point of fan inlet temperature.