CUS2000M

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： CUS2000M-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 Issue 3, Method I, Quality level II)

＜Formula＞ $$MTBF = \frac{1}{\lambda_{equip}} = \frac{1}{\pi_E \sum_{i=1}^{m}(N_i \cdot \lambda_{ssi})} \times 10^9$$ (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, 125A
- Standby voltage & current ： 5VDC, 2A
- Environmental factor ： GB (Ground, Benign)
- Mounting method ： Standard mounting A

SR-332, Issue 3

MTBF(Ta=25℃) ≒ 344,049 (Hours)

MTBF(Ta=30℃) ≒ 284,892 (Hours)

MTBF(Ta=40℃) ≒ 178,928 (Hours)

1. Calculated Values of MTBF

Parts stress reliability prediction MTBF

MODEL： CUS2000M-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 Issue 3, 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 ： 230VAC
- Output voltage & current ： 12VDC, 133.4A
- Standby voltage & current ： 5VDC, 2A
- Environmental factor ： GB (Ground, Benign)
- Mounting method ： Standard mounting A

SR-332, Issue 3

MTBF(Ta=25℃) ≒ 379,248 (Hours)

MTBF(Ta=30℃) ≒ 315,258 (Hours)

MTBF(Ta=40℃) ≒ 197,905 (Hours)

1. Calculated Values of MTBF

Parts stress reliability prediction MTBF

MODEL： CUS2000M-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 Issue 3, 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 ： 24VDC, 66.7A
- Standby voltage & current ： 5VDC, 2A
- Environmental factor ： GB (Ground, Benign)
- Mounting method ： Standard mounting A

SR-332, Issue 3

MTBF(Ta=25℃) ≒ 539,199 (Hours)

MTBF(Ta=40℃) ≒ 467,299 (Hours)

MTBF(Ta=40℃) ≒ 329,279 (Hours)

1. Calculated Values of MTBF

Parts stress reliability prediction MTBF

MODEL： CUS2000M-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 Issue 3, 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 ： 230VAC
- Output voltage & current ： 24VDC, 83.4A
- Standby voltage & current ： 5VDC, 2A
- Environmental factor ： GB (Ground, Benign)
- Mounting method ： Standard mounting A

SR-332, Issue 3

MTBF(Ta=25℃) ≒ 565,575 (Hours)

MTBF(Ta=30℃) ≒ 488,240 (Hours)

MTBF(Ta=40℃) ≒ 332,059 (Hours)

2. Components Derating

MODEL： CUS2000M-12

(1) Calculating Method

(a) Measuring method

・Mounting method	: Standard mounting A	・Input voltage	: 115, 230VAC
・Output voltage & current	: 12V, Full load	・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

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

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 = 125A Istb = 2A Ta = 40°C		
BD1 D35XB80-7000 SHINDENGEN	Tch (max) = 150 °C Pch= 23.2 W Tch = Tc + ((θch-c) × Pch) = 99.4 °C D.F. = 66.3 %	θch-c = 0.8 °C/W ΔTc = 40.8 °C	 Tc = 80.8 °C
SCR1 TYN30W-800TNQ WEEN SEMI.	Tch (max) = 150 °C Pch = 3.5W Tch = Tc + ((θch-c) × Pch) =74.3 °C D.F. = 49.5 %	θch-c = 0.5°C/W ΔTc = 32.5 °C	 Tc = 72.5 °C
D1 TRS20N65FB,S1Q TOSHIBA	Tch (max) = 175 °C Pch= 4.8 W Tch = Tc + ((θch-c) × Pch) = 80.3 °C D.F. = 45.9 %	θch-c = 1.4 °C/W ΔTc = 33.6 °C	 Tc = 73.6 °C
Q1 IPW60R016CM8 INFINEON	Tj (max) = 150 °C Pd = 12.1 W Tj = Tc + ((θj-c) × Pd) = 73.8 °C D.F. = 49.2 %	θch-c = 0.24 °C/W ΔTc = 30.9 °C	 Tc = 70.9 °C
Q2A,Q2B IPW60R040CFD7 INFINEON	Tj (max) = 150 °C Pd = 5.1 W Tj = Tc + ((θj-c) × Pd) = 77.7 °C D.F. = 51.8 %	θj-c = 0.55 °C/W ΔTc = 34.9 °C	 Tc = 74.9 °C
D51 SB360-E3/73 VISHAY	Tj (max) = 150 °C Pd = 0.9 W Tj = Tl + ((θj-l) × Pd) = 95.4 °C D.F. = 63.6 %	θj-l = 10 °C/W ΔTl = 46.4 °C	 Tl = 86.4 °C
Q301~Q304,Q308~Q311 BSC014N06NS INFINEON	Tj (max) = 150 °C Pd = 0.9 W Tj = Tc + ((θj-c) × Pd) = 107.3 °C D.F. = 71.5 %	θj-c = 0.8 °C/W ΔTc = 66.6 °C	 Tc = 106.6 °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 = 133.4A	Istb = 2A	Ta = 40°C
BD1 D35XB80-7000 SHINDENGEN	Tch (max) = 150 °C Pch= 11.5 W Tch = Tc + ((θch-c) × Pch) = 72.1 °C D.F. = 48.1 %	θch-c = 0.8 °C/W ΔTc = 22.9 °C	 Tc = 62.9 °C
SCR1 TYN30W-800TNQ WEEN SEMI.	Tch (max) = 150 °C Pch = 3.8 W Tch = Tc + ((θch-c) × Pch) = 63.3 °C D.F. = 42.2 %	θch-c = 0.5°C/W ΔTc = 21.4 °C	 Tc = 61.4 °C
D1 TRS20N65FB,S1Q TOSHIBA	Tch (max) = 175 °C Pch= 5.1 W Tch = Tc + ((θch-c) × Pch) = 69.1 °C D.F. = 39.5 %	θch-c = 1.4 °C/W ΔTc = 22 °C	 Tc = 62 °C
Q1 IPW60R016CM8 INFINEON	Tj (max) = 150 °C Pd = 4.8 W Tj = Tc + ((θj-c) × Pd) = 59.3 °C D.F. = 39.5 %	θch-c = 0.24 °C/W ΔTc = 18.1 °C	 Tc = 58.1 °C
Q2A,Q2B IPW60R040CFD7 INFINEON	Tj (max) = 150 °C Pd = 5.4 W Tj = Tc + ((θj-c) × Pd) = 66.3 °C D.F. = 44.2%	θj-c = 0.55 °C/W ΔTc = 23.3 °C	 Tc = 63.3 °C
D51 SB360-E3/73 VISHAY	Tj (max) = 150 °C Pd = 0.9 W Tj = Tl + ((θj-l) × Pd) = 88.4°C D.F. = 58.9 %	θj-l = 10 °C/W ΔTl = 39.4 °C	 Tl = 79.4 °C
Q301~Q304,Q308~Q311 BSC014N06NS INFINEON	Tj (max) = 150 °C Pd = 1 W Tj = Tc + ((θj-c) × Pd) = 107.4 °C D.F. = 71.6 %	θj-c = 0.8 °C/W ΔTc = 66.6 °C	 Tc = 106.6 °C

Terminology Used

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

2. Components Derating

MODEL : CUS2000M-24

(1) Calculating Method

(a) Measuring method

・Mounting method	: Standard mounting A	・Input voltage	: 115, 230VAC
・Output voltage & current	: 24V, Full load	・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

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

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= 24.8 W Tch = Tc + ((θch-c) × Pch) = 106.7 °C D.F. = 71.1 %	θch-c = 0.8 °C/W ΔTc = 46.9 °C	 Tc = 86.9 °C
SCR1 TYN30W-800TNQ WEEN SEMI.	Tch (max) = 150 °C Pch = 3.8 W Tch = Tc + ((θch-c) × Pch) = 82.6 °C D.F. = 55.1 %	θch-c = 0.5°C/W ΔTc = 40.7 °C	 Tc = 80.7 °C
D1 TRS20N65FB,S1Q TOSHIBA	Tch (max) = 175 °C Pch= 5.2 W Tch = Tc + ((θch-c) × Pch) = 88.5 °C D.F. = 50.6 %	θch-c = 1.4 °C/W ΔTc = 41.2 °C	 Tc = 81.2 °C
Q1 IPW60R016CM8 INFINEON	Tj (max) = 150 °C Pd = 12.9 W Tj = Tc + ((θj-c) × Pd) = 86.3 °C D.F. = 57.5 %	θch-c = 0.24 °C/W ΔTc = 43.2 °C	 Tc = 83.2 °C
Q2A,Q2B IPW60R040CFD7 INFINEON	Tj (max) = 150 °C Pd = 5 W Tj = Tc + ((θj-c) × Pd) = 80.95 °C D.F. = 54 %	θj-c = 0.55 °C/W ΔTc = 38.2 °C	 Tc = 78.2 °C
D51 SB360-E3/73 VISHAY	Tj (max) = 150 °C Pd = 0.9 W Tj = Tl + ((θj-l) × Pd) = 95.9 °C D.F. = 63.9 %	θj-l = 10 °C/W ΔTl = 46.9 °C	 Tl = 86.9 °C
Q301~Q304,Q308~Q311 TPH2R408QM,LQ(M1 TOSHIBA	Tj (max) = 175 °C Pd = 0.5 W Tj = Tc + ((θj-c) × Pd) = 89.2 °C D.F. = 50.9%	θj-c = 0.71 °C/W ΔTc = 48.8 °C	 Tc = 88.8 °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 = 83.4A Istb = 2A Ta = 40°C		
BD1 D35XB80-7000 SHINDENGEN	Tch (max) = 150 °C Pch= 14.3 W Tch = Tc + ((θch-c) × Pch) = 81.5 °C D.F. = 54.3 %	θch-c = 0.8 °C/W ΔTc = 30.1 °C	 Tc = 70.1 °C
SCR1 TYN30W-800TNQ WEEN SEMI.	Tch (max) = 150 °C Pch = 4.7 W Tch = Tc + ((θch-c) × Pch) = 72.7 °C D.F. = 48.5 %	θch-c = 0.5°C/W ΔTc = 30.3 °C	 Tc = 70.3 °C
D1 TRS20N65FB,S1Q TOSHIBA	Tch (max) = 175 °C Pch= 6.9 W Tch = Tc + ((θch-c) × Pch) = 79.8 °C D.F. = 45.6 %	θch-c = 1.4 °C/W ΔTc = 30.1 °C	 Tc = 70.1 °C
Q1 IPW60R016CM8 INFINEON	Tj (max) = 150 °C Pd = 5.7 W Tj = Tc + ((θj-c) × Pd) = 69.6 °C D.F. = 46.4 %	θch-c = 0.24 °C/W ΔTc = 28.2 °C	 Tc = 68.2 °C
Q2A,Q2B IPW60R040CFD7 INFINEON	Tj (max) = 150 °C Pd = 7 W Tj = Tc + ((θj-c) × Pd) = 74.9 °C D.F. = 49.9 %	θj-c = 0.55 °C/W ΔTc = 31 °C	 Tc = 71 °C
D51 SB360-E3/73 VISHAY	Tj (max) = 150 °C Pd = 0.9 W Tj = Tl + ((θj-l) × Pd) = 92.8 °C D.F. = 61.9 %	θj-l = 10 °C/W ΔTl = 43.8 °C	 Tl = 83.8 °C
Q301~Q304,Q308~Q311 TPH2R408QM,LQ(M1 TOSHIBA	Tj (max) = 175 °C Pd = 0.7 W Tj = Tc + ((θj-c) × Pd) = 93.8 °C D.F. = 53.6 %	θj-c = 0.71 °C/W ΔTc = 53.3 °C	 Tc = 93.3 °C

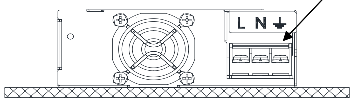
Terminology Used

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

3. Main Components Temperature Rise △T List

MODEL : CUS2000M-12

(1) Measuring Conditions

Mounting Method	Mounting A	
(Standard Mounting : A)	(STANDARD MOUNTING) INPUT TERMINAL 	
Input Voltage	115VAC	230VAC
Output Voltage	12V	
Output Current	125A	133.4A
Standby Current	2A	
Ambient Temperature	40°C	

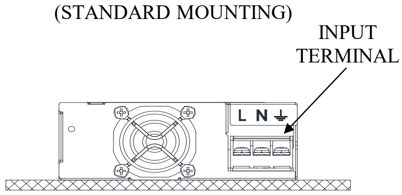
(2) Measuring Results

		ΔT Temperature Rise (°C)	
Input Voltage		115VAC	230VAC
Location No.	Part name	Mounting A	
A103	IC	14.8	8
A104	IC	14.5	8.8
A109	IC	20.2	13.7
A110	IPD	30.3	23.4
A301, A302	IC	65.7	64
A303	IC	29.3	25.1
A308	IC	54	44.9
BD1	DIODE BRIDGE	40.8	22.9
C6	CAP.	4.6	2.5
C10	CAP.	9.6	3.9
C51	E.CAP.	45.4	43.4
C52	E.CAP.	44.7	42.9
C8	E.CAP.	15.9	9.1
C7	CAP.	21.6	16.5
C56	E.CAP.	28.6	21.9
D1	SBD	33.6	22
D51	SBD	46.4	39.4
L1	CHOKE COIL	33.8	11.1
L2	CHOKE COIL	31.1	9.6
L3	CHOKE COIL	29.5	17.1
L301	CHOKE COIL	31.7	23.5
Q1	MOS FET	30.9	18.1
Q2A, Q2B	MOS FET	34.9	23.3
Q301 ~ Q304, Q308 ~ Q311	MOS FET	66.6	66.6
R107, R108	RESISTOR	29.8	13.3
R315 ~ R317	RESISTOR	56.6	54.7
SCR1	THYRISTOR	32.5	21.4
T1, T2	TRANS	72.1	72.8
T3	TRANS	27.2	22.4

3. Main Components Temperature Rise △T List

MODEL : CUS2000M-24

(1) Measuring Conditions

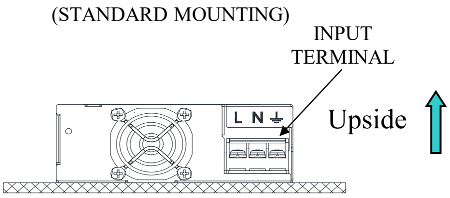
Mounting Method (Standard Mounting : A)	Mounting A	
	(STANDARD MOUNTING) 	
Input Voltage	115VAC	230VAC
Output Voltage	24V	
Output Current	66.7A	83.4A
Standby Current	2A	
Ambient Temperature	40°C	

(2) Measuring Results

		ΔT Temperature Rise (°C)	
Input Voltage		115VAC	230VAC
Location No.	Part name	Mounting A	
A103	IC	18.7	13.7
A104	IC	15.5	11
A109	IC	21.6	17.2
A110	IPD	38.9	35
A301, A302	IC	50	54.6
A303	IC	28	25.8
A308	IC	34.4	36.3
BD1	DIODE BRIDGE	46.9	30.1
C6	CAP.	5	3.1
C10	CAP.	15.2	7.8
C51	E.CAP.	42.3	44
C52	E.CAP.	37.1	36.2
C8	E.CAP.	17.2	11
C7	CAP.	25.2	21.6
C56	E.CAP.	26.6	23.7
D1	SBD	41.2	30.1
D51	SBD	46.9	43.8
L1	CHOKE COIL	51.1	19.9
L2	CHOKE COIL	43.7	17.1
L3	CHOKE COIL	28.6	16.8
L301	CHOKE COIL	27.5	25
Q1	MOS FET	43.2	28.2
Q2A, Q2B	MOS FET	38.2	31
Q301 ~ Q304, Q308 ~ Q311	MOS FET	48.8	53.3
R107, R108	RESISTOR	31.8	16.6
R315, R317	RESISTOR	36	36.4
SCR1	THYRISTOR	40.7	30.3
T1, T2	TRANS	64.4	70.3
T3	TRANS	26.1	22.1

4. Electrolytic Capacitor Lifetime

MODEL : CUS2000M-12

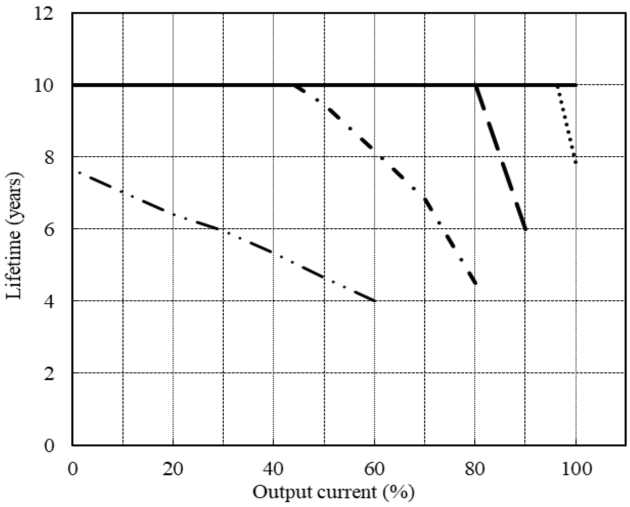


Conditions Istb : 2A（Ta ≦ 60°C）
1.6A（Ta = 70°C）

Ta 30°C :
40°C :
50°C :
60°C :
70°C :

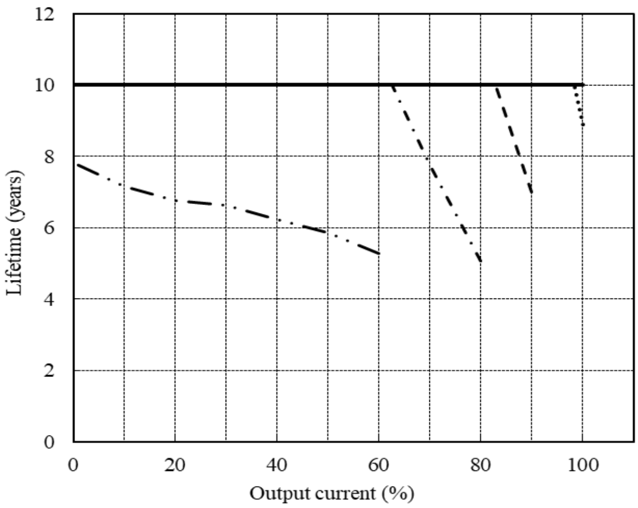
Vin=115VAC

Load (%)	Lifetime (years)				
	Ta=30°C	Ta=40°C	Ta=50°C	Ta=60°C	Ta=70°C
100	10.0	7.9	-	-	-
90	10.0	10.0	6.0	-	-
80	10.0	10.0	10.0	4.5	-
60	10.0	10.0	10.0	8.2	4.0
40	10.0	10.0	10.0	10.0	5.3
20	10.0	10.0	10.0	10.0	6.4
0	10.0	10.0	10.0	10.0	7.7



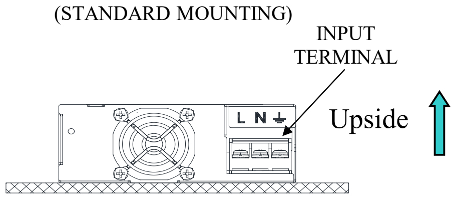
Vin=230VAC

Load (%)	Lifetime (years)				
	Ta=30°C	Ta=40°C	Ta=50°C	Ta=60°C	Ta=70°C
100	10.0	8.9	-	-	-
90	10.0	10.0	7.0	-	-
80	10.0	10.0	10.0	5.1	-
60	10.0	10.0	10.0	10.0	5.3
40	10.0	10.0	10.0	10.0	6.2
20	10.0	10.0	10.0	10.0	6.8
0	10.0	10.0	10.0	10.0	7.8



4. Electrolytic Capacitor Lifetime

MODEL : CUS2000M-24

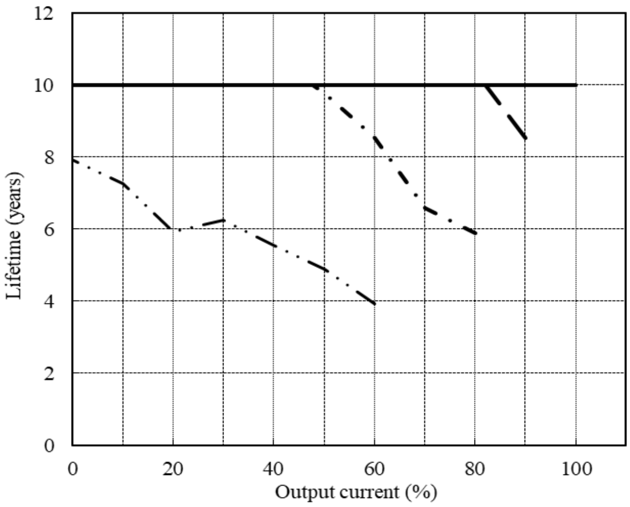


Conditions Istb : 2A (Ta ≦ 60°C)
1.6A (Ta = 70°C)

Ta 30°C :
40°C :
50°C :
60°C :
70°C :

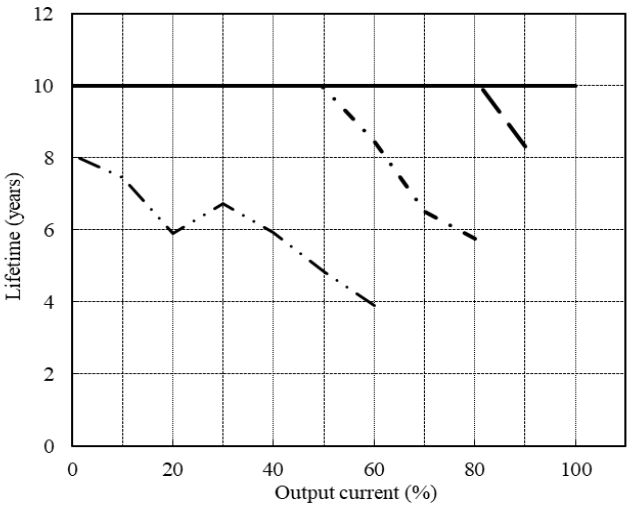
Vin=115VAC

Load (%)	Lifetime (years)				
	Ta=30°C	Ta=40°C	Ta=50°C	Ta=60°C	Ta=70°C
100	10.0	10.0	-	-	-
90	10.0	10.0	8.5	-	-
80	10.0	10.0	10.0	5.9	-
60	10.0	10.0	10.0	8.6	3.9
40	10.0	10.0	10.0	10.0	5.6
20	10.0	10.0	10.0	10.0	5.9
0	10.0	10.0	10.0	10.0	7.9



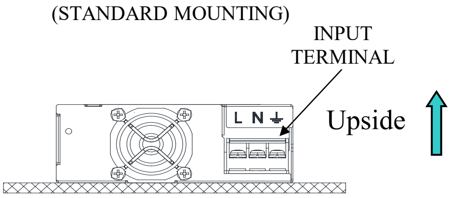
Vin=230VAC

Load (%)	Lifetime (years)				
	Ta=30°C	Ta=40°C	Ta=50°C	Ta=60°C	Ta=70°C
100	10.0	10.0	-	-	-
90	10.0	10.0	8.3	-	-
80	10.0	10.0	10.0	5.8	-
60	10.0	10.0	10.0	8.5	3.9
40	10.0	10.0	10.0	10.0	5.9
20	10.0	10.0	10.0	10.0	5.9
0	10.0	10.0	10.0	10.0	8.1



4. Electrolytic Capacitor Lifetime

MODEL : CUS2000M-36

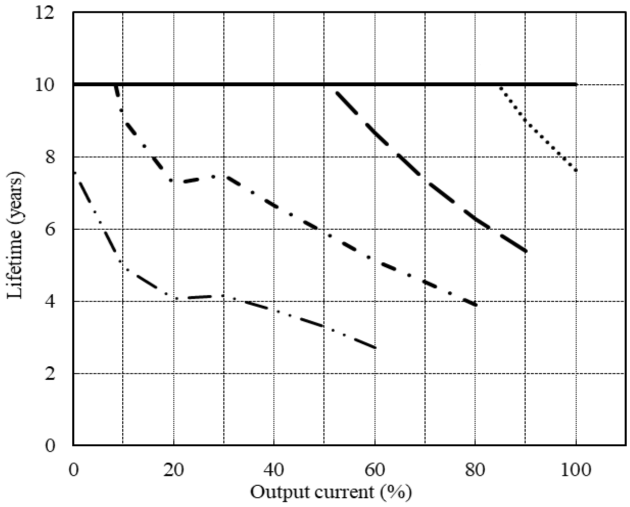


Conditions　Istb : 2A (Ta ≦ 60°C)
1.6A (Ta = 70°C)

Ta　30°C :
40°C :
50°C :
60°C :
70°C :

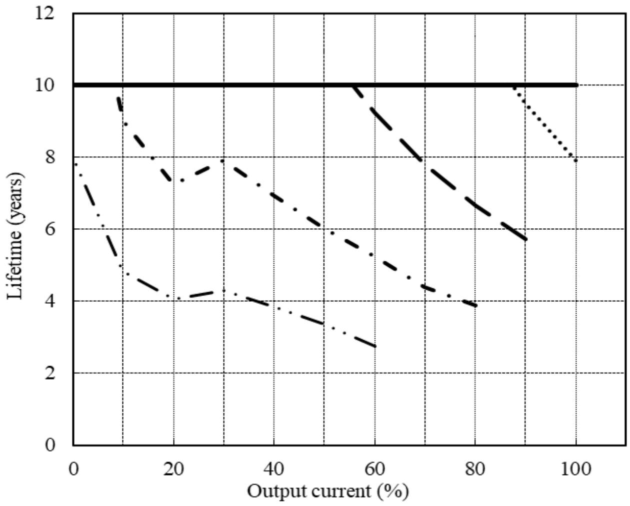
Vin=115VAC

Load (%)	Lifetime (years)				
	Ta= 30°C	Ta= 40°C	Ta= 50°C	Ta= 60°C	Ta= 70°C
100	10.0	7.6	-	-	-
90	10.0	9.0	5.4	-	-
80	10.0	10.0	6.3	3.9	-
60	10.0	10.0	8.7	5.1	2.7
40	10.0	10.0	10.0	6.7	3.7
20	10.0	10.0	10.0	7.3	4.1
0	10.0	10.0	10.0	10.0	7.7



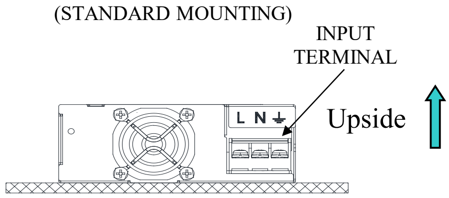
Vin=230VAC

Load (%)	Lifetime (years)				
	Ta= 30°C	Ta= 40°C	Ta= 50°C	Ta= 60°C	Ta= 70°C
100	10.0	7.9	-	-	-
90	10.0	9.5	5.7	-	-
80	10.0	10.0	6.7	3.9	-
60	10.0	10.0	9.3	5.2	2.8
40	10.0	10.0	10.0	6.9	3.8
20	10.0	10.0	10.0	7.2	4.0
0	10.0	10.0	10.0	10.0	8.0



4. Electrolytic Capacitor Lifetime

MODEL : CUS2000M-48

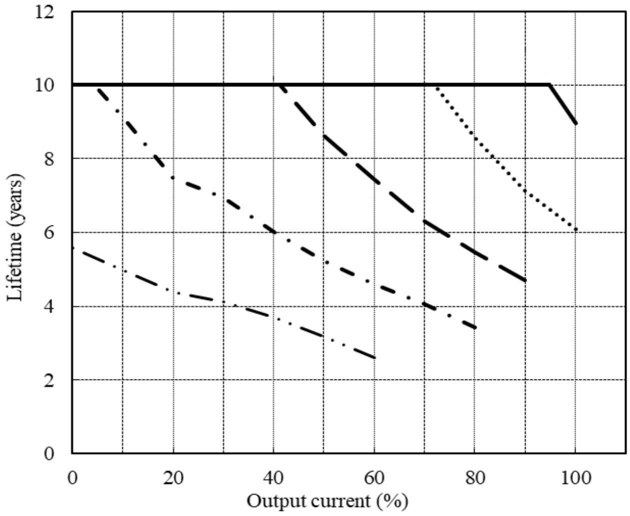


Conditions Istb : 2A（Ta ≤ 60°C）
1.6A（Ta = 70°C）

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

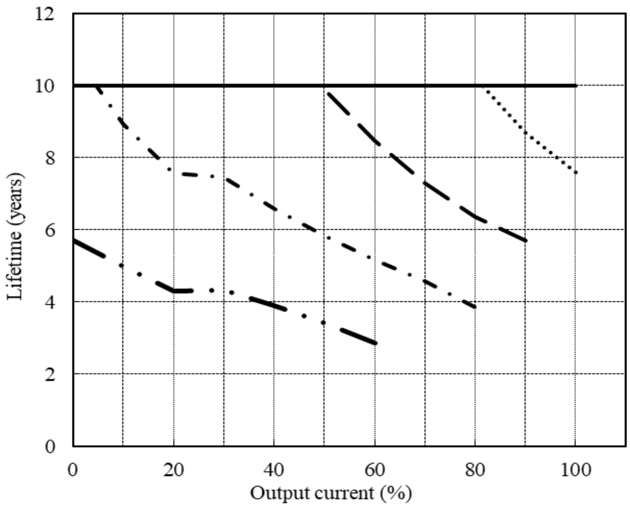
Vin=115VAC

Load (%)	Lifetime (years)				
	Ta= 30°C	Ta= 40°C	Ta= 50°C	Ta= 60°C	Ta= 70°C
100	9.0	6.1	-	-	-
90	10.0	7.1	4.7	-	-
80	10.0	8.6	5.5	3.4	-
60	10.0	10.0	7.4	4.6	2.6
40	10.0	10.0	10.0	6.0	3.7
20	10.0	10.0	10.0	7.5	4.4
0	10.0	10.0	10.0	10.0	5.6



Vin=230VAC

Load (%)	Lifetime (years)				
	Ta= 30°C	Ta= 40°C	Ta= 50°C	Ta= 60°C	Ta= 70°C
100	10.0	7.6	-	-	-
90	10.0	8.7	5.7	-	-
80	10.0	10.0	6.4	3.9	-
60	10.0	10.0	8.5	5.2	2.9
40	10.0	10.0	10.0	6.6	3.9
20	10.0	10.0	10.0	7.6	4.3
0	10.0	10.0	10.0	10.0	5.7



5. Abnormal Test

MODEL : CUS2000M-24

(1) Test Conditions

Input : 230VAC Output : 24V, 83.4A 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		○							○				○			Da:TFR2
		K		○							○				○			Da:TFR2
		G		○							○				○			Da:TFR2
		A-K	○														○	Input Power decrease 4W
		A-G	○													○		
		G-K	○								○				○			Da:TFR2
2	Q1	G		○							○	○			○			Da:F1A,F1B,Q1,A102,D101,D102,R107,R108
		D		○											○			
		S		○											○			
		G-S	○												○			
		G-D	○								○	○			○			Da:F1A,F1B,A102,R107,R108,D101,D102,R112
		D-S	○								○	○			○			Da:F1A,F1B,R107,R108
3	D1	1,2&2,3	○								○				○			Da:A102,Q102,R117
		1,3		○													○	Input Power increase 13W
		2		○							○	○			○			Da:F1A,F1B,A102,D101,D102,R107,R108
4	L3		○								○				○			Da: F1B,Q1,R107,R108
				○											○			
5	C5		○								○	○			○			Da:F1A,F1B
				○												○		
6	SA1		○								○	○			○			Da:F1A,F1B
				○												○		
7	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

5. Abnormal Test

MODEL : CUS2000M-24

(1) Test Conditions

Input : 230VAC Output : 24V, 83.4A Istb : 2A Ta : 25°C

(2) Test Results

(Da:Damaged)

No.	Test position					Test result													
	Location No.	Test point	Short	Open	a	b		c	d	e	f	g	h	I	j	k	l	Note
					Fire	Slight Smoke	Smoke	Burst	Smell	Red hot	Damaged	Fuse blown	O.V.P.	O.C.P.	No output	No change	Others	
8	Q2A	G		○							○	○			○			Da:Q2A,Q2B,F2
		D		○							○	○			○			Da:Q2A,Q2B,F2,A107
		S		○							○	○			○			Da:Q2A,Q2B,F2,A106
		G-S	○												○			
		G-D	○								○	○			○			Da:Q2A,Q2B,F2,A106
		D-S	○								○	○			○			Da:Q2A,F2
9	Q2B	G		○							○	○			○			Da:Q2A,Q2B,F2
		D		○											○			
		S		○											○			
		G-S	○												○			
		G-D	○								○	○			○			Da:Q2A,Q2B,F2,A106,A107,R181,R182
		D-S	○								○	○			○			Da:Q2A,F2
10	T3	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:TFR1, Standby power :No output
		7~8	○												○		○	Standby power hiccup & OCP
11	Q301,Q302	D		○													○	Input Power increase 1W
		S		○													○	Input Power increase 1W
		G		○							○				○			Da:Q301 or Q302
		D~S	○												○			
		G~S	○														○	Input Power increase 4W
		G~D	○								○				○			Da:A301

5. Abnormal Test

MODEL : CUS2000M-24

(1) Test Conditions

Input : 230VAC Output : 24V, 83.4A Istb : 2A Ta : 25°C

(2) Test Results

(Da:Damaged)

No.	Test position					Test result													
	Location No.	Test point	Short	Open	a	b		c	d	e	f	g	h	I	j	k	l	Note
					Fire	Slight Smoke	Smoke	Burst	Smell	Red hot	Damaged	Fuse blown	O.V.P.	O.C.P.	No output	No change	Others	
12	Q303,Q304	D		○													○	Input Power increase 1W
		S		○													○	Input Power increase 1W
		G		○							○				○			Da:Q303 or Q304
		D~S	○												○			
		G~S	○														○	Input Power increase 4W
		G~D	○								○				○			Da:A301
13	Q308,Q309	D		○													○	Input Power increase 2W
		S		○													○	Input Power increase 2W
		G		○							○				○			Da:Q308 or Q309
		D~S	○												○			
		G~S	○														○	Input Power increase 2W
		G~D	○								○				○			Da:A302
14	Q310,Q311	D		○													○	Input Power increase 2W
		S		○													○	Input Power increase 2W
		G		○							○				○			Da:Q310 or Q311
		D~S	○												○			
		G~S	○														○	Input Power increase 2W
		G~D	○								○				○			Da:A302
15	T1,T2	1		○											○			
		2		○											○			
		3		○											○			
		4		○											○			
		5,8		○											○			
		1~4	○											○	○			
		2~3	○											○	○			
		5~8	○											○	○			

6. Vibration Test

MODEL : CUS2000M-12/24/36/48

(1) Vibration Test Class

Frequency variable endurance test

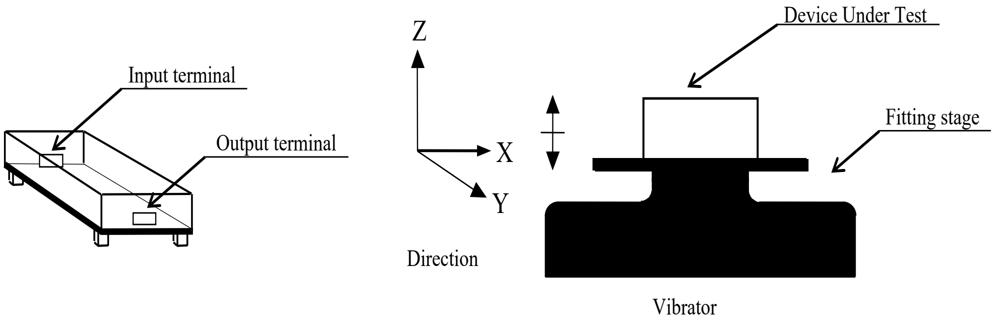
(2) Equipment Used

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 : CUS2000M-12/24/36/48

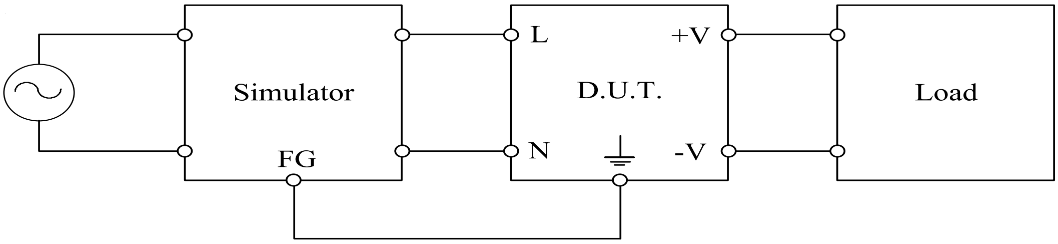
(1) Equipment Used

Simulator : INS-4040 (Noiseken)

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 : 0～360deg

・Noise level : 0～2kV (Input Port)
: 0～1kV (Output Port)
: 0～1kV (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

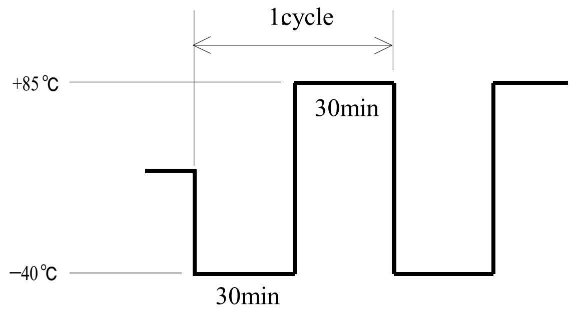
8. Thermal Shock Test

MODEL： CUS2000M-12

(1) Equipment Used (Thermal Shock Chamber)

Hitachi ES-107LH

(2) Test Conditions



・Ambient Temperature ： -40℃ ⇔ 85℃

・Test Time :30 min each temp.

・Test Cycle :700 Cycles

・No 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

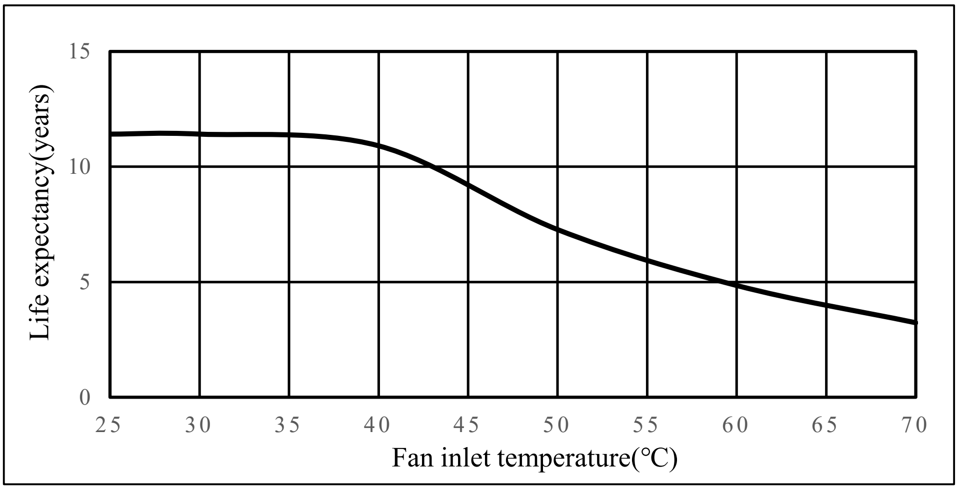
MODEL : CUS2000M-12

(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

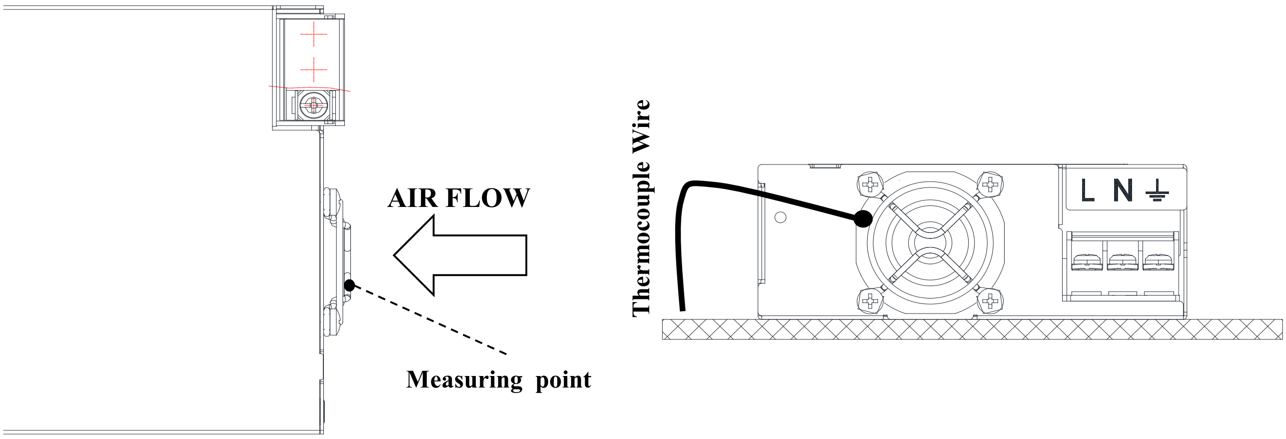


Fig.1 Measuring point of fan inlet temperature.