CUS1500M

RELIABILITY DATA

信頼性データ

INDEX

* 試験結果は、代表データでありますが、全ての製品はほぼ同等な特性を示します。
従いまして、以下の結果は参考値とお考え願います。
Test results are typical data. Nevertheless the following results are considered to be reference data because all units have nearly the same characteristics.

1. MTBF計算値 Calculated Values of MTBF

(1) 部品ストレス解析法MTBF Parts stress reliability prediction MTBF

MODEL : CUS1500M-24

算出方法 Calculating Method

Telcordiaの部品ストレス解析法(*1)で算出されています。
故障率λssは、それぞれの部品ごとに電気ストレスと動作温度によって決定されます。
Calculated based on parts stress reliability prediction of Telcordia (*1).
Individual failure rate λss 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)

<算出式>

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

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

λ_{equip} : 全機器故障率（FITs） Total equipment failure rate (FITs = Failures in10^9 hours)

λ_{Gi} : i 番目の部品に対する基礎故障率 Generic failure rate for the ith part

π_{Qi} : i 番目の部品に対する品質ファクタ Quality factor for the ith part

π_{Si} : i 番目の部品に対するストレスファクタ Stress factor for the ith part

π_{Ti} : i 番目の部品に対する温度ファクタ Temperature factor for the ith part

m : 異なる部品の数 Number of different part types

N_i : i 番目の部品の個数 Quantity of ith part type

π_E : 機器の環境ファクタ Equipment environmental factor

MTBF値 MTBF Values

条件 Conditions

- 入力電圧 : 230VAC
  Input voltage
- スタンバイ電圧、電流 : 5VDC, 1A(100%)
  Standby voltage & current
- 環境ファクタ : GB (Ground, Benign)
  Environmental factor
- 出力電圧、電流 : 24VDC, 63A(100%)
  Output voltage & current
- 取付方法 : 標準取付A
  Mounting method : Standard mounting A

SR-332, Issue3

MTBF(Ta=25℃) ≒ 769,670 時間 (Hours)
MTBF(Ta=40℃) ≒ 365,161 時間 (Hours)

(2) 部品点数法MTBF Part count reliability prediction MTBF

MODEL : CUS1500M-24

算出方法 Calculating Method

JEITA (RCR-9102B) の部品点数法で算出されています。
それぞれの部品ごとに、部品故障率λ_Gが与えられ、各々の点数によって決定されます。
Calculated based on part count reliability prediction of JEITA (RCR-9102B).
Individual failure rates λ_G is given to each part and MTBF is calculated by the count of each part.

<算出式>

$$MTBF = \frac{1}{\lambda_{equip}} \times 10^6 = \frac{1}{\sum_{i=1}^{n} n_i \left(\lambda_G \pi_Q\right)_i} \times 10^6 \text{ 時間 (Hours)}$$

λ_{equip} : 全機器故障率 (故障数 / 10^6時間)
Total equipment failure rate (Failure / 10^6Hours)

λ_G : i 番目の同属部品に対する故障率 (故障数 / 10^6時間)
Generic failure rate for the ith generic part (Failure / 10^6Hours)

n_i : i 番目の同属部品の個数
Quantity of ith generic part

n : 異なった同属部品のカテゴリーの数
Number of different generic part categories

π_Q : i 番目の同属部品に対する品質ファクタ (π_Q=1)
Generic quality factor for the ith generic part (π_Q=1)

MTBF値 MTBF Values

G_F : 地上、固定 (Ground, Fixed)

RCR-9102B

MTBF ≒ 40,323 時間 (Hours)

2. 部品ディレーティング Components Derating

MODEL : CUS1500M-12

(1) 算出方法 Calculating Method

(a) 測定方法 Measuring method

・取付方法 Mounting method	:標準取付 : A Standard mounting : A	・周囲温度 Ambient temperature	:50℃
・入力電圧 Input voltage	:100 , 200VAC	・出力電圧、電流 Output voltage & current	:12V, 125A(100%)
・スタンバイ電圧、電流 Standby voltage & current	:5V, 1A(100%)		

(b) 半導体 Semiconductors

ケース温度、消費電力、熱抵抗より使用状態の接合点温度を求め最大定格接合点温度との比較を求めました。
Compared with maximum junction temperature and actual one which is calculated based on case temperature, power dissipation and thermal impedance.

(c) IC、抵抗、コンデンサ等 IC, Resistors, Capacitors, etc.

周囲温度、使用状態、消費電力など、個々の値は設計基準内に入っています。
Ambient temperature, operating condition, power dissipation and so on are within derating criteria.

(d) 熱抵抗算出方法 Calculating method of thermal impedance

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

Tc : ディレーティングの始まるケース温度 一般に25°C
Case Temperature at Start Point of Derating;25°C in General

Tl : ディレーティングの始まるリード温度 一般に25°C
Lead Temperature at Start Point of Derating;25°C in General

Ta : ディレーティングの始まる周囲温度 一般に25°C
Ambient Temperature at Start Point of Derating;25°C in General

Pj(max) (Pch(max)) : 最大接合点（チャネル）損失
Maximum Junction (channel) Dissipation

Tj(max) (Tch(max)) : 最大接合点（チャネル）温度
Maximum Junction (channel) Temperature

θj-c (θch-c) : 接合点（チャネル）からケースまでの熱抵抗
Thermal Impedance between Junction (channel) and Case

θj-*l* (θch-*l*) : 接合点（チャネル）からリードまでの熱抵抗
Thermal Impedance between Junction (channel) and Lead

θj-a (θch-a) : 接合点（チャネル）から周囲までの熱抵抗
Thermal Impedance between Junction (channel) and Ambient

(2) 部品ディレーティング表 Components Derating List

部品番号 Location No.	Vin = 100VAC Load = 125A (100 %) Standby = 1A (100 %) Ta = 50°C		
Q1-Q4 IPP65R074C6 INFINEON	Tch (max) = 150 °C Pch = 16.9 W Tch = Tc + ((θch-c) × Pch) = 123.4 °C D.F. = 82.3 %	θch-c = 0.26 °C/W ΔTc = 69 °C	 Tc = 119 °C
Q5 R6047ENZ1C9 ROHM	Tch (max) = 150 °C Pch = 9.7 W Tch = Tc + ((θch-c) × Pch) = 122.1 °C D.F. = 81.4 %	θch-c = 1.04 °C/W ΔTc = 62 °C	 Tc = 112 °C
Q6 R6047ENZ1C9 ROHM	Tch (max) = 150 °C Pch = 10.7 W Tch = Tc + ((θch-c) × Pch) = 121.1 °C D.F. = 80.7 %	θch-c = 1.04 °C/W ΔTc = 60 °C	 Tc = 110 °C
Q401 STD2NK90ZT4 STMICRO	Tch (max) = 150 °C Pch= 1.23 W Tch = Tc + ((θch-c) × Pch) = 97.2 °C D.F. = 64.8 %	θch-c = 1.78 °C/W ΔTc = 45 °C	 Tc = 95 °C
Q1101 SSM3K7002F TOSHIBA	Tj (max) = 150 °C Pch = 0.0mW Tj = Ta + ((θj-a) × Pd) = 58.0 °C D.F. = 38.7 %	θj-a = 625.0 °C/W ΔTa = 8 °C	 Ta = 58 °C
D1,D2 D25XB60 SHINDENGEN	Tj (max) = 150 °C Pd = 14.5 W Tj = Tc + ((θj-c) × Pd) = 121.5 °C D.F. = 81.0 %	θj-c = 1.0 °C/W ΔTc = 57 °C	 Tc = 107 °C
D3 STPSC12H065 STMICRO	Tj (max) = 175 °C Pd = 8.9 W Tj = Tc + ((θj-c) × Pd) = 128.5 °C D.F. = 73.5 %	θj-c = 1.4 °C/W ΔTc = 66 °C	 Tc = 116 °C
D51-D53 S60JC10V SHINDENGEN	Tj (max) = 150 °C Pd = 13.5W Tj = Tc + ((θj-c) × Pd) = 131.8 °C D.F. = 87.9 %	θj-c = 0.5 °C/W ΔTc = 75 °C	 Tc = 125 °C
D54-D56 S60JC10V SHINDENGEN	Tj (max) = 150 °C Pd = 13.5W Tj = Tc + ((θj-c) × Pd) = 141.8 °C D.F. = 94.5 %	θj-c = 0.5 °C/W ΔTc = 85 °C	 Tc = 135 °C
D101 CRH01 TOSHIBA	Tj (max) = 150 °C Pd = 15 mW Tj = Tl + ((θj-l) × Pd) = 73.5 °C D.F. = 49.0 %	θj-l = 30.0 °C/W ΔTl = 23 °C	 Tl = 73 °C
D210 CRH01 TOSHIBA	Tj (max) = 150 °C Pd = 157 mW Tj = Tl + ((θj-l) × Pd) = 89.8 °C D.F. = 59.9 %	θj-l = 30.0 °C/W ΔTl = 35 °C	 Tl = 85 °C

部品番号 Location No.	Vin = 100VAC Load = 125A (100 %) Standby = 1A (100%) Ta = 50°C		
D401 CRF02 TOSHIBA	Tj (max) = 150 °C Pd = 0.70 W Tj = Tl + ((θj-l) × Pd) = 105.0 °C D.F. = 70.0 %	θj-l = 20.0 °C/W ΔTl = 41 °C	 Tl = 91 °C
D501-D504 CRH01 TOSHIBA	Tj (max) = 150 °C Pd = 233 mW Tj = Tl + ((θj-l) × Pd) = 88.0 °C D.F. = 58.7 %	θj-l = 30.0 °C/W ΔTl = 31 °C	 Tl = 81 °C
D1001 V8PA10-M3/I VISHAY	Tj (max) = 150 °C Pd = 0.33 W Tj = Tl + ((θj-l) × Pd) = 85.7 °C D.F. = 57.1 %	θj-l = 5.0 °C/W ΔTl = 34 °C	 Tl = 84 °C
SR1 VS-40TTS12 VISHAY	Tj (max) = 150 °C Pd = 8.3 W Tj = Tc + ((θj-c) × Pd) = 115.7 °C D.F. = 77.2 %	θj-c = 0.8 °C/W ΔTc = 59 °C	 Tc = 109 °C
A51 BA17812CP ROHM	Tj (max) = 150 °C Pd = 4.4 W Tj = Tc + ((θj-c) × Pd) = 98.2 °C D.F. = 65.5 %	θj-c = 3.0 °C/W ΔTc = 35 °C	 Tc = 85 °C
PC201 TLP385 (LED) TOSHIBA	Tj (max) = 125 °C Pd = 18 mW Tj = Tc + ((θj-c) × Pd) = 75.4 °C D.F. = 60.4 %	θj-c = 130.0 °C/W ΔTc = 23 °C	 Tc = 73 °C
PC1001 TLP385 (LED side) TOSHIBA	Tj (max) = 125 °C Pd = 4 mW Tj = Tc + ((θj-c) × Pd) = 64.5 °C D.F. = 51.6 %	θj-c = 130.0 °C/W ΔTc = 14 °C	 Tc = 64 °C
PD801 SML-A12M8T ROHM	 If = 4.5 mA Allowable If (max) = 25mA (at Ta=56°C) D.F. = 18.0%	 ΔTc = 6 °C	 Tc = 56 °C

部品番号 Location No.	Vin = 200VAC Load = 125A (100 %) Standby = 1A (100%) Ta = 50°C		
Q1-Q4 IPP65R074C6 INFINEON	Tch (max) = 150 °C Pch = 3.2 W Tch = Tc + ((θch-c) × Pch) = 88.9 °C D.F. = 59.3 %	θch-c = 0.26 °C/W ΔTc = 38 °C	 Tc = 88 °C
Q5 R6047ENZ1C9 ROHM	Tch (max) = 150 °C Pch = 9.7 W Tch = Tc + ((θch-c) × Pch) = 118.1 °C D.F. = 78.7 %	θch-c = 1.04 °C/W ΔTc = 58 °C	 Tc = 108 °C
Q6 R6047ENZ1C9 ROHM	Tch (max) = 150 °C Pch = 10.7 W Tch = Tc + ((θch-c) × Pch) = 117.1 °C D.F. = 78.1 %	θch-c = 1.04 °C/W ΔTc = 56 °C	 Tc = 106 °C
Q401 STD2NK90ZT4 STMICRO	Tch (max) = 150 °C Pch= 1.23 W Tch = Tc + ((θch-c) × Pch) = 95.2 °C D.F. = 63.5 %	θch-c = 1.78 °C/W ΔTc = 43 °C	 Tc = 93 °C
Q1101 SSM3K7002F TOSHIBA	Tch (max) = 150 °C Pch = 0.0mW Tch = Ta + ((θch-a) × Pch) = 58.0 °C D.F. = 38.7 %	θch-a = 625.0 °C/W ΔTa = 8 °C	 Ta = 58 °C
D1,D2 D25XB60 SHINDENGEN	Tj (max) = 150 °C Pd = 7.1 W Tj = Tc + ((θj-c) × Pd) = 84.1 °C D.F. = 56.1 %	θj-c = 1.0 °C/W ΔTc = 27 °C	 Tc = 77 °C
D3 STPSC12H065 STMicro	Tj (max) = 175 °C Pd = 8.6 W Tj = Tc + ((θj-c) × Pd) = 104.1 °C D.F. = 59.5 %	θj-c = 1.4 °C/W ΔTc = 42 °C	 Tc = 92 °C
D51-D53 S60JC10V SHINDENGEN	Tj (max) = 150 °C Pd = 13.5W Tj = Tc + ((θj-c) × Pd) = 131.8 °C D.F. = 87.9 %	θj-c = 0.5 °C/W ΔTc = 75 °C	 Tc = 125 °C
D54-D56 S60JC10V SHINDENGEN	Tj (max) = 150 °C Pd = 13.5W Tj = Tc + ((θj-c) × Pd) = 141.8 °C D.F. = 94.5 %	θj-c = 0.5 °C/W ΔTc = 85 °C	 Tc = 135 °C
D101 CRH01 TOSHIBA	Tj (max) = 150 °C Pd = 15 mW Tj = Tl + ((θj-l) × Pd) = 63.5 °C D.F. = 42.4 %	θj-l = 30.0 °C/W ΔTl = 13 °C	 Tl = 63 °C
D210 CRH01 TOSHIBA	Tj (max) = 150 °C Pd = 157 mW Tj = Tl + ((θj-l) × Pd) = 89.8 °C D.F. = 59.9 %	θj-l = 30.0 °C/W ΔTl = 35 °C	 Tl = 85 °C

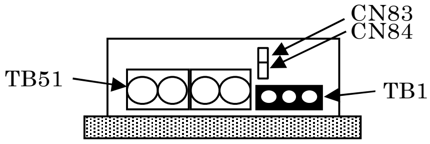
部品番号 Location No.	Vin = 200VAC Load = 125A (100 %) Standby = 1A (100%) Ta = 50°C		
D401 CRF02 TOSHIBA	Tj (max) = 150 °C Pd = 0.70 W Tj = Tl + ((θj-l) × Pd) = 105.0 °C D.F. = 70.0 %	θj-l = 20.0 °C/W ΔTl = 41 °C	 Tl = 91 °C
D501-D504 CRH01 TOSHIBA	Tj (max) = 150 °C Pd = 233 mW Tj = Tl + ((θj-l) × Pd) = 88.0 °C D.F. = 58.7 %	θj-l = 30.0 °C/W ΔTl = 31 °C	 Tl = 81 °C
D1001 V8PA10-M3/I VISHAY	Tj (max) = 150 °C Pd = 0.33 W Tj = Tl + ((θj-l) × Pd) = 84.7 °C D.F. = 56.4 %	θj-l = 5.0 °C/W ΔTl = 33 °C	 Tl = 83 °C
SR1 VS-40TTS12 VISHAY	Tj (max) = 150 °C Pd = 8.0 W Tj = Tc + ((θj-c) × Pd) = 96.4 °C D.F. = 64.3 %	θj-c = 0.8 °C/W ΔTc = 40 °C	 Tc = 90 °C
A51 BA17812CP ROHM	Tj (max) = 150 °C Pd = 4.4 W Tj = Tc + ((θj-c) × Pd) = 97.2 °C D.F. = 64.8 %	θj-c = 3.0 °C/W ΔTc = 34 °C	 Tc = 84 °C
PC201 TLP385 (LED) TOSHIBA	Tj (max) = 125 °C Pd = 18 mW Tj = Tc + ((θj-c) × Pd) = 74.4 °C D.F. = 59.6 %	θj-c = 130.0 °C/W ΔTc = 22 °C	 Tc = 72 °C
PC1001 TLP385 (LED side) TOSHIBA	Tj (max) = 125 °C Pd = 4 mW Tj = Tc + ((θj-c) × Pd) = 64.5 °C D.F. = 51.6 %	θj-c = 130.0 °C/W ΔTc = 14 °C	 Tc = 64 °C
PD801 SML-A12M8T ROHM	 If = 4.5 mA Allowable If (max) = 25mA (at Ta=56°C) D.F. = 18.0%	 ΔTc = 6°C	 Tc = 56 °C

3. 主要部品温度上昇値 Main Components Temperature Rise △T List

MODEL : CUS1500M-12

(1) 測定条件 Measuring Conditions

<table>
<tr><td rowspan="2">取付方法
Mounting Method

(標準取付 : A)
(Standard Mounting : A)</td><td colspan="2">Mounting A</td></tr>
<tr><td colspan="2">
</td></tr>
<tr><td>入力電圧
Input Voltage</td><td>100VAC</td><td>200VAC</td></tr>
<tr><td>出力電圧
Output Voltage</td><td colspan="2">12VDC</td></tr>
<tr><td>出力電流
Output Current</td><td colspan="2">125A(100%)</td></tr>
<tr><td>スタンバイ電圧、電流
Standby Voltage & Current</td><td colspan="2">5VDC , 1A(100%)</td></tr>
</table>

(2) 測定結果 Measuring Results

		ΔT Temperature Rise (°C)	
入力電圧 Vin Input Voltage		100VAC	200VAC
部品番号 Location No.	部品名 Part name	取付方向 Mounting A	
Q1	MOS FET	61	30
Q2	MOS FET	63	33
Q3	MOS FET	63	34
Q4	MOS FET	69	38
Q5	MOS FET	62	58
Q6	MOS FET	60	56
Q101	CHIP MOS FET	29	19
Q104	CHIP TRANSISTOR	23	16
Q105	CHIP TRANSISTOR	23	15
Q401	MOS FET	45	43
Q1101	MOS FET	8	8
D1	BRIDGE DIODE	57	27
D2	BRIDGE DIODE	52	25
D3	DIODE	66	42
D51	S.B.D.	56	56
D52	S.B.D.	66	66
D53	S.B.D.	75	75
D54	S.B.D.	73	73
D55	S.B.D.	81	81
D56	S.B.D.	85	85
D401	DIODE	41	41
D1001	S.B.D.	34	33
SR1	THYRISTOR	59	40

* 取付方向B、C、Dの値は取付方向Aと同様の値となります。
Value of mounting B, C and D are similar to mounting A.

入力電圧 Vin Input Voltage		ΔT Temperature Rise (°C) 100VAC	ΔT Temperature Rise (°C) 200VAC
部品番号 Location No.	部品名 Part name	取付方向 Mounting A	
A51	IC	35	34
A103	CHIP IC	23	13
A201	CHIP IC	34	33
A301	CHIP IC	31	29
A302	CHIP IC	39	37
A401	CHIP IC	27	26
A1001	CHIP IC	9	8
R4	RESISTOR	59	56
T2	CURRENT TRANS	59	59
T3	TRANS	79	78
T4	TRANS	28	27
T401	TRANS	25	24
L1	BALUN	39	9
L2	BALUN	32	8
L7	CHOKE COIL	24	15
L51	CHOKE COIL	60	59
C13	E.CAP.	9	9
C53	E.CAP.	23	24
C54	E.CAP.	11	11
C55	E.CAP.	27	27
C56	E.CAP.	14	14
C57	E.CAP.	14	15
C62	E.CAP.	11	10
C1003	CHIP E.CAP.	6	5
PC201	PHOTO COUPLER	23	22
PC1001	PHOTO COUPLER	14	14
PD801	LED	6	6

* 取付方向B、C、Dの値は取付方向Aと同様の値となります。
Value of mounting B, C and D are similar to mounting A.

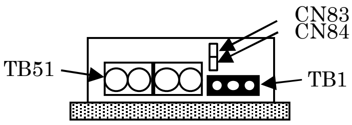
4. 電解コンデンサ推定寿命計算値 Electrolytic Capacitor Lifetime

MODEL ： CUS1500M

空冷条件： 強制空冷　**Cooling condition： Forced air cooling**

取付方向 **A**

Mounting A



Conditions　Ta　40°C ：
50°C ：
60°C ：

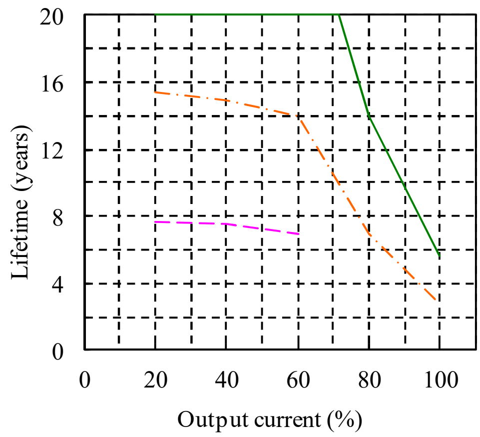
12V

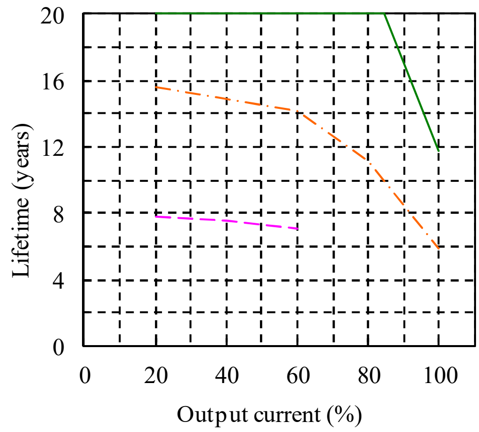
Vin = 100VAC

Ta / Load	Lifetime (years)		
	40°C	50°C	60°C
20%	20.0	15.4	7.7
40%	20.0	14.9	7.5
60%	20.0	14.0	7.0
80%	14.0	7.0	-
100%	5.7	2.8	-

Vin = 200VAC

Ta / Load	Lifetime (years)		
	40°C	50°C	60°C
20%	20.0	15.6	7.8
40%	20.0	14.9	7.5
60%	20.0	14.2	7.1
80%	20.0	11.1	-
100%	11.8	5.9	-





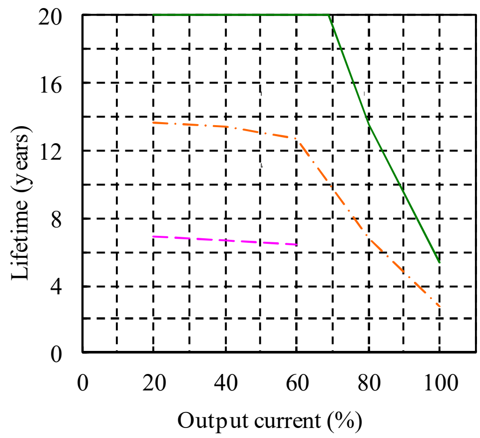
15V

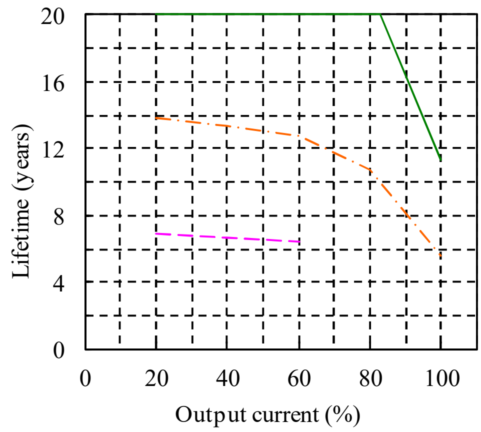
Vin = 100VAC

Ta / Load	Lifetime (years)		
	40°C	50°C	60°C
20%	20.0	13.7	6.9
40%	20.0	13.4	6.7
60%	20.0	12.7	6.4
80%	13.5	6.8	-
100%	5.4	2.7	-

Vin = 200VAC

Ta / Load	Lifetime (years)		
	40°C	50°C	60°C
20%	20.0	13.8	6.9
40%	20.0	13.4	6.7
60%	20.0	12.8	6.4
80%	20.0	10.7	-
100%	11.3	5.6	-





上記推定寿命は、弊社計算方法により算出した値であり、封口ｺﾞﾑの劣化等の影響を含めておりません。

The lifetime is calculated based on our method and doesn't include the seal rubber degradation effect etc.

取付方向B、C、Dの寿命は取付方向Aと同様の寿命となります。

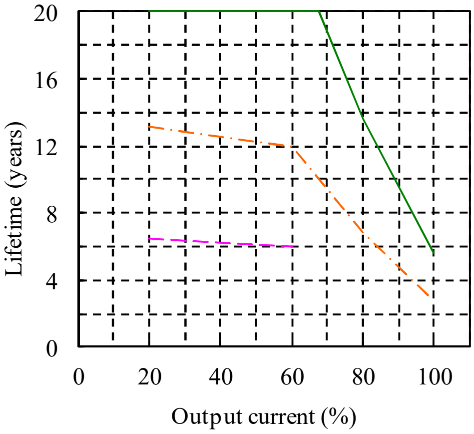
Lifetime of mounting B, C and D are similar to mounting A.

Conditions Ta 40°C :
50°C :
60°C :

24V

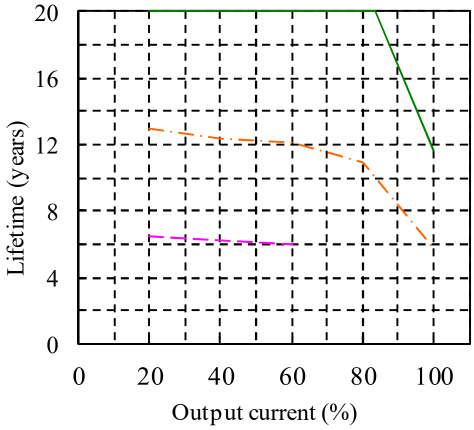
Vin = 100VAC

Load \ Ta	Lifetime (years) 40°C	50°C	60°C
20%	20.0	13.1	6.5
40%	20.0	12.6	6.3
60%	20.0	12.0	6.0
80%	13.6	6.8	-
100%	5.7	2.8	-



Vin = 200VAC

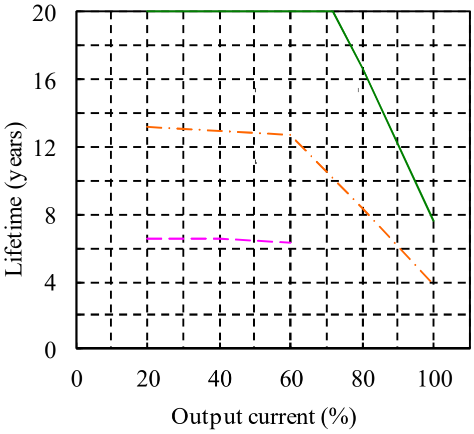
Load \ Ta	Lifetime (years) 40°C	50°C	60°C
20%	20.0	13.0	6.5
40%	20.0	12.4	6.2
60%	20.0	12.1	6.0
80%	20.0	10.9	-
100%	11.6	5.8	-



36V

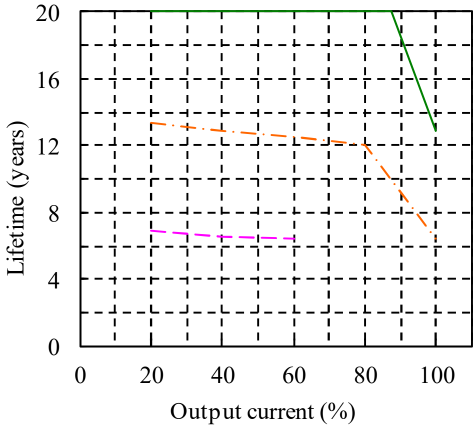
Vin = 100VAC

Load \ Ta	Lifetime (years) 40°C	50°C	60°C
20%	20.0	13.2	6.6
40%	20.0	13.0	6.5
60%	20.0	12.7	6.3
80%	16.6	8.3	-
100%	7.6	3.8	-



Vin = 200VAC

Load \ Ta	Lifetime (years) 40°C	50°C	60°C
20%	20.0	13.4	6.9
40%	20.0	12.9	6.5
60%	20.0	12.5	6.4
80%	20.0	12.0	-
100%	12.9	6.4	-



上記推定寿命は、弊社計算方法により算出した値であり、封口ゴムの劣化等の影響を含めておりません。
The lifetime is calculated based on our method and doesn't include the seal rubber degradation effect etc.
取付方向B、C、Dの寿命は取付方向Aと同様の寿命となります。
Lifetime of mounting B, C and D are similar to mounting A.

Conditions Ta 40°C :
50°C :
60°C :

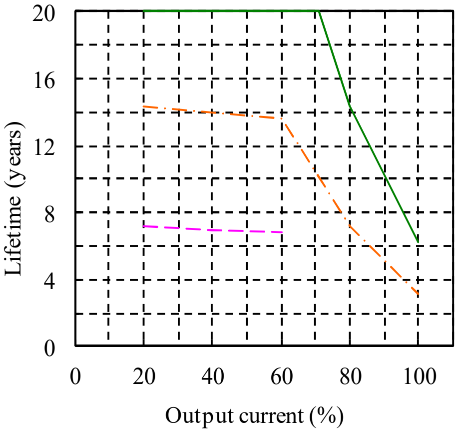
48V

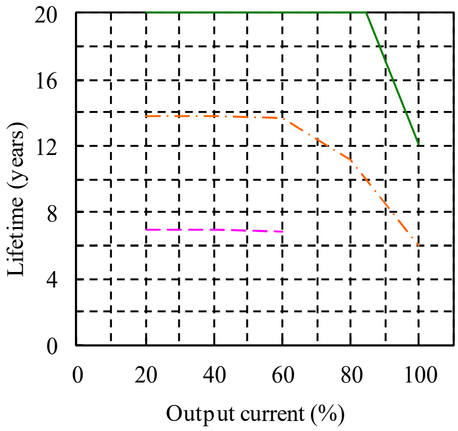
Vin = 100VAC

Load \ Ta	Lifetime (years)		
	40°C	50°C	60°C
20%	20.0	14.4	7.2
40%	20.0	14.0	7.0
60%	20.0	13.6	6.8
80%	14.4	7.2	-
100%	6.2	3.1	-

Vin = 200VAC

Load \ Ta	Lifetime (years)		
	40°C	50°C	60°C
20%	20.0	13.8	6.9
40%	20.0	13.8	6.9
60%	20.0	13.7	6.8
80%	20.0	11.2	-
100%	12.1	6.0	-





上記推定寿命は、弊社計算方法により算出した値であり、封口ゴムの劣化等の影響を含めておりません。

The lifetime is calculated based on our method and doesn't include the seal rubber degradation effect etc.

取付方向B、C、Dの寿命は取付方向Aと同様の寿命となります。

Lifetime of mounting B, C and D are similar to mounting A.

5. アブノーマル試験 Abnormal Test

MODEL : CUS1500M-12

(1) 試験条件 Test Conditions

Input : 265VAC Output : 12V, 125A (100%) Standby : 5V, 1A (100%) Ta : 25°C

(2) 試験結果 Test Results

(Da : Damaged)

No.	Test position		Test mode		Test result												
					a	b	c	d	e	f	g	h	i	j	k	l	
No.	部品No. Location No.	試験端子 Test point	ショート Short	オープン Open	発火 Fire	発煙 Smoke	破裂 Burst	異臭 Smell	赤熱 Red hot	破損 Damaged	ヒューズ断 Fuse blown	OVP	OCP	出力断 No output	変化なし No change	その他 Others	記事 Note
1	Q1	D-S	○								○			○			Fuse : F1
2		D-G	○							○	○			○			Fuse : F1 Da : Q1
3		G-S	○											○			
4		D		○												○	入力電力増加 Input power increase
5		S		○												○	入力電力増加 Input power increase
6		G		○						○	○			○			Fuse : F1 Da : Q1
7	Q5	D-S	○							○	○			○			Fuse : F2 Da : Q6
8		D-G	○							○	○			○			Fuse : F2 Da : A201, A301, A302, Q5, Q6, D309, D310
9		G-S	○											○			
10		D		○										○			
11		S		○										○			
12		G		○						○	○			○			Fuse : F2 Da : Q5, Q6
13	Q6	D-S	○							○	○			○			Fuse : F2 Da : Q5
14		D-G	○							○	○			○			Fuse : F2 Da : A302, Q5, Q6
15		G-S	○											○			
16		D		○										○			
17		S		○										○			
18		G		○						○	○			○			Fuse : F2 Da : Q5, Q6

(Da : Damaged)

No.	Test position		Test mode		Test result												
					a	b	c	d	e	f	g	h	i	j	k	l	
No.	部品No. Location No.	試験端子 Test point	ショート Short	オープン Open	発火 Fire	発煙 Smoke	破裂 Burst	異臭 Smell	赤熱 Red hot	破損 Damaged	ヒューズ断 Fuse blown	OVP	OCP	出力断 No output	変化なし No change	その他 Others	記事 Note
19	Q401	D-S	○								○			○			Fuse : F401
20		D-G	○								○			○			Fuse : F401
21		G-S	○											○			
22		D		○										○			
23		S		○										○			
24		G		○						○	○			○			Fuse : F401 Da : Q401
25	Q1101	D-S	○												○		
26		D-G	○											○		○	FAN速度低下後出力断 No output after fan speed down
27		G-S	○											○		○	FAN速度低下後出力断 No output after fan speed down
28		D		○										○		○	FAN速度低下後出力断 No output after fan speed down
29		S		○										○		○	FAN速度低下後出力断 No output after fan speed down
30		G		○										○		○	FAN速度低下後出力断 No output after fan speed down
31	D1	AC-AC	○								○			○			Fuse : F1
32		DC-DC	○								○			○			Fuse : F1
33		AC-DC	○								○			○			Fuse : F1
34		AC		○												○	入力電力増加 Input power increase
35		DC		○												○	入力電力増加 Input power increase
36	D3	A-K	○							○	○			○			Fuse : F1 Da : Q1-Q4, Q101, SR1
37		A/K		○						○	○			○			Fuse : F1 Da : Q1-Q4
38	D51	A-K	○										○	○			
39		A/K		○												○	入力電力増加 Input power increase
40	D54	A-K	○										○	○			
41		A/K		○												○	入力電力増加 Input power increase
42	D1001	A-K	○										○	○			STB OCP
43		A/K		○								○		○			STB OVP

(Da : Damaged)

No.	Test position		Test mode		Test result												
	部品No. Location No.	試験端子 Test point	ショート Short	オープン Open	a 発火 Fire	b 発煙 Smoke	c 破裂 Burst	d 異臭 Smell	e 赤熱 Red hot	f 破損 Damaged	g ヒューズ断 Fuse blown	h OVP	i OCP	j 出力断 No output	k 変化なし No change	l その他 Others	記事 Note
44	T2	1-2	○												○		
45		3-4	○												○		
46		1/2		○										○			
47		3/4		○											○		
48	T3	3-6	○											○			
49		9-11	○										○	○			
50		9-13	○										○	○			
51		11-13	○										○	○			
52		17-18	○							○				○		○	Da : T3 FAN停止後出力断 No output after fan stop
53		3,4/6,7		○										○			
54		9/10/19		○									○	○			
55		11/12/22		○									○	○			
56		13/15/20/21		○										○			
57		17/18		○										○		○	FAN停止後出力断 No output after fan stop
58	T4	1-2	○											○			
59		4-5	○											○			
60		7-8	○											○			
61		1/2		○										○			
62		4/5		○										○			
63		7/8		○										○			
64	T401	1-2	○								○			○			Fuse : F401
65		2-4	○										○	○			Hiccup
66		4-6	○								○			○			Fuse : F401
67		7-8	○										○	○			STB OCP
68		1-6	○								○			○			Fuse : F401
69		1		○										○			
70		2		○										○			Hiccup
71		4		○										○			Hiccup
72		6		○										○			
73		7		○										○			
74		8		○										○			

(Da : Damaged)

No.	Test position		Test mode		Test result												
					a	b	c	d	e	f	g	h	i	j	k	l	
	部品No. Location No.	試験端子 Test point	ショート Short	オープン Open	発火 Fire	発煙 Smoke	破裂 Burst	異臭 Smell	赤熱 Red hot	破損 Damaged	ヒューズ断 Fuse blown	OVP	OCP	出力断 No output	変化なし No change	その他 Others	記事 Note
75	SR1	A-K	○												○		
76		A-G	○												○		
77		K-G	○												○		
78		A/K		○						○	○			○			Fuse : F1 Da : Q1-Q4, TFR1, TFR2
79		G		○						○	○			○			Fuse : F1 Da : Q1-Q4, TFR1, TFR2
80	C12		○							○	○			○			Fuse : F1 Da : A103, Q1-Q4, Q101, SR1, D103-D105
81				○											○		
82	C53		○										○	○			
83				○												○	出力リプル増加 Output ripple increase
84	C1003		○										○	○			STB OCP
85				○												○	STB Vo 低下 STB Vo decrease

6. 振動試験 Vibration Test

MODEL ： CUS1500M-12

(1) 振動試験種類 Vibration Test Class

掃引振動数耐久試験 Frequency variable endurance test

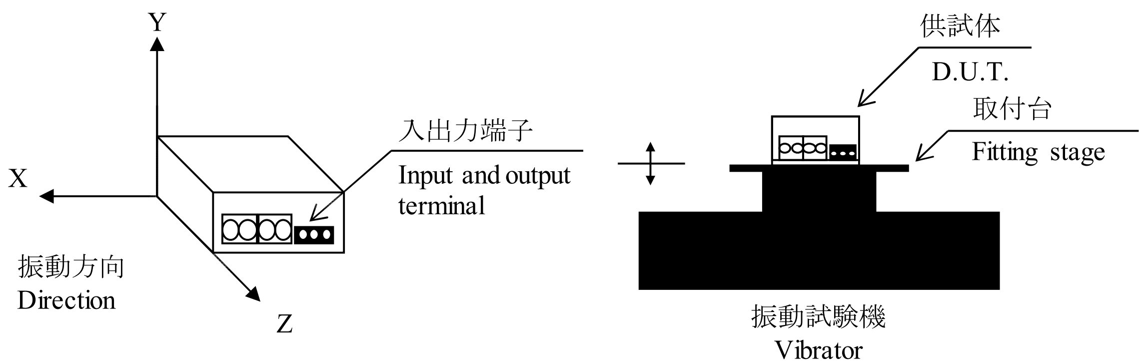
(2) 使用振動試験装置 Equipment Used

IMV CORP. EM2201

(3) 試験条件 Test Conditions

- 周波数範囲 Sweep frequency : 10 - 55Hz
- 掃引時間 Sweep time : 1.0分間 1.0min
- 加速度 Acceleration : 一定 19.6m/s^2 (2G) Constant
- 振動方向 Direction : X, Y, Z
- 試験時間 Sweep count : 各方向共 1時間 1 hour each

(4) 試験方法 Test Method



(5) 判定条件 Acceptable Conditions

1. 破損しない事
   Not to be broken.
2. 試験後の出力に異常がない事
   No abnormal output after test.

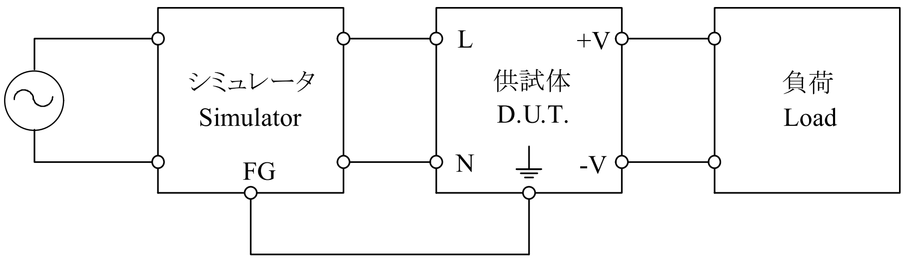
(6) 試験結果 Test Results

合格 **OK**

7. ノイズシミュレート試験 Noise Simulate Test

MODEL : CUS1500M-36

(1) 試験回路及び測定器 Test Circuit and Equipment



シミュレータ : INS-4320(A) （ノイズ研究所）
Simulator (Noise Laboratory Co.,LTD)

(2) 試験条件 Test Conditions

- 入力電圧 Input voltage : 100、230VAC
- 出力電圧 Output voltage : 定格 Rated
- 出力電流 Output current : 0%、100%
- 極性 Polarity : ＋、－
- パルス幅 Pulse width : 50 - 1000ns
- 周囲温度 Ambient temperature : 25°C
- ノイズ電圧 Noise level : 0 - 2kV
- 位相 Phase : 0 - 360 deg
- STB出力電流 STB Output current : 0%、100%
- 印加モード Mode : コモン、ノーマル Common, Normal
- トリガ選択 Trigger select : Line

(3) 判定条件 Acceptable Conditions

1. 試験中、5%を超える出力電圧の変動のない事
   The regulation of output voltage must not exceed 5% of initial value during test.
2. 試験後の出力電圧は初期値から変動していない事
   The output voltage must be within the regulation of specification after the test.
3. 発煙・発火のない事
   Smoke and fire are not allowed.

(4) 試験結果 Test Results

合格 **OK**

8. 熱衝撃試験 Thermal Shock Test

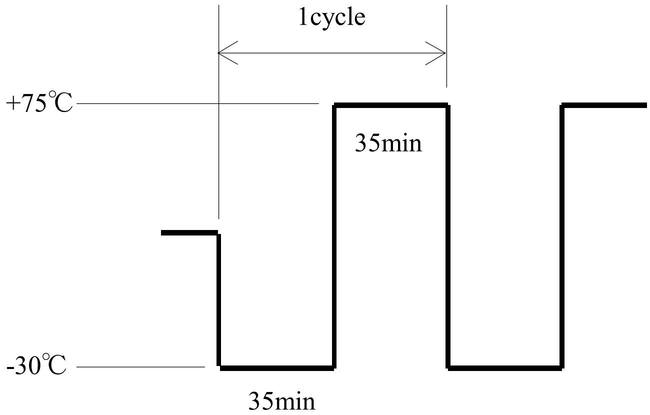
MODEL : CUS1500M-24

(1) 使用冷熱衝撃装置 **Equipment Used (Thermal Shock Chamber)**

ESPEC(株) 製　TSA-71H-W
ESPEC CORP.

(2) 試験条件 **Test Conditions**

- 電源周囲温度 Ambient Temperature : -30°C ⇔ 75°C
- 試験時間 Test Time : 図参照 Refer to Dwg.
- 試験サイクル Test Cycle : 100 サイクル 100 Cycles
- 非動作 Not Operating



(3) 試験方法 **Test Method**

初期測定の後、供試品を試験槽に入れ、上記サイクルで試験を行う。100サイクル後に、供試品を常温常湿下に1時間放置し、出力に異常がない事を確認する。
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. 100 cycles later, leave it for 1 hour at the room temperature, then check if there is no abnormal output.

(4) 判定条件 **Acceptable Conditions**
試験後の出力に異常がない事
No abnormal output after test.

(5) 試験結果 **Test Results**

合格 **OK**

9. FAN期待寿命　Fan Life Expectancy

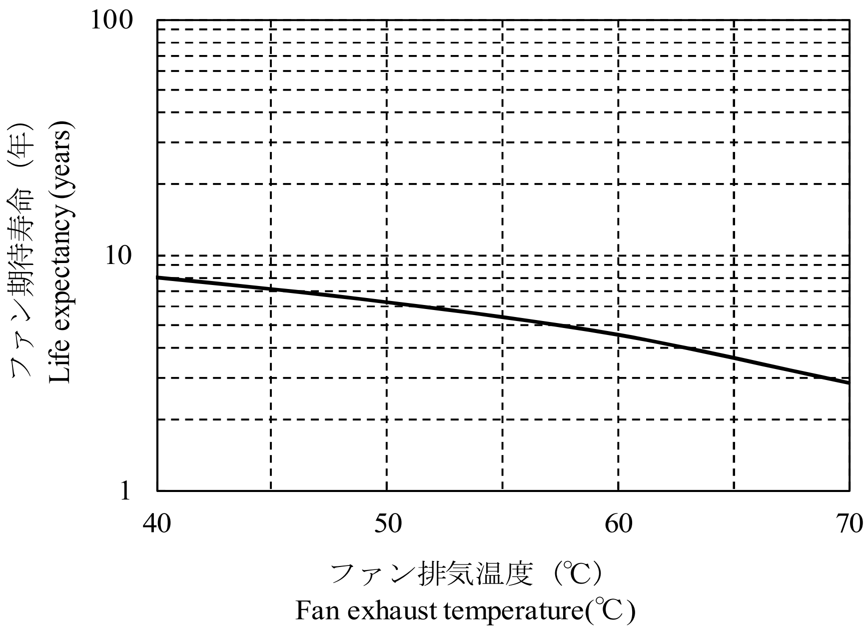
MODEL ： CUS1500M

(1) 使用製品名 Part Name

9G0612P4HD0031　(SANYO DENKI CORP.)

(2) 期待寿命 Life Expectancy

メーカーによるファン単体の期待寿命データを示す（残存率90%）。
また、ファン排気温度測定箇所は、Fig. 1に示す。
The data shows fan life expectancy for fan only by manufacture (90% survival rate).
Fig. 1 shows measuring point of fan exhaust temperature.



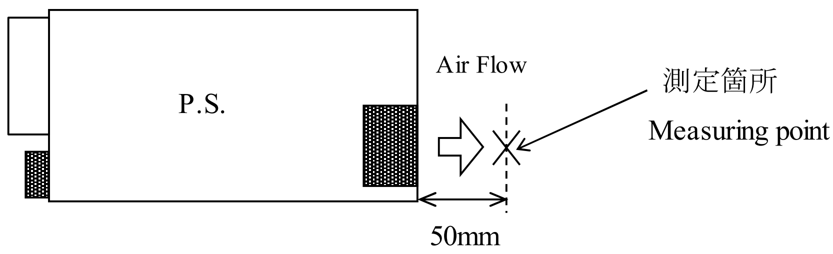


Fig. 1 ファン排気温度測定箇所
Measuring point of fan exhaust temperature.

* 電源の吸排気温度差はIo=100%で約16°Cです。
The difference between the intake temperature and the exhaust temperature of the power supply is about 16°C at Io=100%.

10. MTBF計算値 Calculated Values of MTBF

(1) 部品ストレス解析法MTBF Parts stress reliability prediction MTBF

MODEL : CUS1500M-24/RF

算出方法 Calculating Method

Telcordiaの部品ストレス解析法(*1)で算出されています。
故障率λssは、それぞれの部品ごとに電気ストレスと動作温度によって決定されます。
Calculated based on parts stress reliability prediction of Telcordia (*1).
Individual failure rate λss 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)

<算出式>

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

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

λ_{equip} : 全機器故障率(FITs) Total equipment failure rate (FITs = Failures in10^9 hours)

λ_{Gi} : i 番目の部品に対する基礎故障率 Generic failure rate for the ith part

π_{Qi} : i 番目の部品に対する品質ファクタ Quality factor for the ith part

π_{Si} : i 番目の部品に対するストレスファクタ Stress factor for the ith part

π_{Ti} : i 番目の部品に対する温度ファクタ Temperature factor for the ith part

m : 異なる部品の数 Number of different part types

N_i : i 番目の部品の個数 Quantity of ith part type

π_E : 機器の環境ファクタ Equipment environmental factor

MTBF値 MTBF Values

条件 Conditions

- 入力電圧 Input voltage : 230VAC
- 出力電圧、電流 Output voltage & current : 24VDC, 63A(100%)
- スタンバイ電圧、電流 Standby voltage & current : 5VDC, 1A(100%)
- 取付方法 Mounting method : 標準取付A Standard mounting A
- 環境ファクタ Environmental factor : GB (Ground, Benign)

SR-332, Issue3

MTBF(Ta=25℃) ≒ 1,019,764 時間 (Hours)
MTBF(Ta=40℃) ≒ 508,957 時間 (Hours)

(2) 部品点数法MTBF Part count reliability prediction MTBF

MODEL : CUS1500M-24/RF

算出方法 Calculating Method

JEITA (RCR-9102B) の部品点数法で算出されています。
それぞれの部品ごとに、部品故障率λ_Gが与えられ、各々の点数によって決定されます。
Calculated based on part count reliability prediction of JEITA (RCR-9102B).
Individual failure rates λ_G is given to each part and MTBF is calculated by the count of each part.

<算出式>

$$MTBF = \frac{1}{\lambda_{equip}} \times 10^6 = \frac{1}{\sum_{i=1}^{n} n_i \left(\lambda_G \pi_Q\right)_i} \times 10^6 \text{ 時間 (Hours)}$$

λ_{equip} : 全機器故障率 (故障数 / 10^6時間)
Total equipment failure rate (Failure / 10^6Hours)

λ_G : i 番目の同属部品に対する故障率 (故障数 / 10^6時間)
Generic failure rate for the ith generic part (Failure / 10^6Hours)

n_i : i 番目の同属部品の個数
Quantity of ith generic part

n : 異なった同属部品のカテゴリーの数
Number of different generic part categories

π_Q : i 番目の同属部品に対する品質ファクタ (π_Q=1)
Generic quality factor for the ith generic part (π_Q=1)

MTBF値 MTBF Values

G_F : 地上、固定 (Ground, Fixed)

RCR-9102B

MTBF ≒ 40,323 時間 (Hours)

11. 部品ディレーティング Components Derating

MODEL : CUS1500M-12/RF

(1) 算出方法 Calculating Method

(a) 測定方法 Measuring method

・取付方法 Mounting method :標準取付 : A Standard mounting : A	・周囲温度 Ambient temperature :50℃
・入力電圧 Input voltage :100 , 200VAC	・出力電圧、電流 Output voltage & current :12V, 125A(100%)
・スタンバイ電圧、電流 Standby voltage & current :5V, 1A(100%)	

(b) 半導体 Semiconductors

ケース温度、消費電力、熱抵抗より使用状態の接合点温度を求め最大定格接合点温度との比較を求めました。
Compared with maximum junction temperature and actual one which is calculated based on case temperature, power dissipation and thermal impedance.

(c) IC、抵抗、コンデンサ等 IC, Resistors, Capacitors, etc.

周囲温度、使用状態、消費電力など、個々の値は設計基準内に入っています。
Ambient temperature, operating condition, power dissipation and so on are within derating criteria.

(d) 熱抵抗算出方法 Calculating method of thermal impedance

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

Tc : ディレーティングの始まるケース温度 一般に25°C
Case Temperature at Start Point of Derating;25°C in General

Tl : ディレーティングの始まるリード温度 一般に25°C
Lead Temperature at Start Point of Derating;25°C in General

Ta : ディレーティングの始まる周囲温度 一般に25°C
Ambient Temperature at Start Point of Derating;25°C in General

Pj(max) (Pch(max)) : 最大接合点(チャネル)損失
Maximum Junction (channel) Dissipation

Tj(max) (Tch(max)) : 最大接合点(チャネル)温度
Maximum Junction (channel) Temperature

θj-c (θch-c) : 接合点(チャネル)からケースまでの熱抵抗
Thermal Impedance between Junction (channel) and Case

θj-*l* (θch-*l*) : 接合点(チャネル)からリードまでの熱抵抗
Thermal Impedance between Junction (channel) and Lead

θj-a (θch-a) : 接合点(チャネル)から周囲までの熱抵抗
Thermal Impedance between Junction (channel) and Ambient

(2) 部品ディレーティング表 Components Derating List

部品番号 Location No.	Vin = 100VAC Load = 125A (100 %) Standby = 1A (100 %) Ta = 50°C		
Q1-Q4 IPP65R074C6 INFINEON	Tch (max) = 150 °C Pch = 16.9 W Tch = Tc + ((θch-c) × Pch) = 117.4 °C D.F. = 78.3 %	θch-c = 0.26 °C/W ΔTc = 63 °C	 Tc = 113 °C
Q5 R6047ENZ1C9 ROHM	Tch (max) = 150 °C Pch = 9.7 W Tch = Tc + ((θch-c) × Pch) = 99.1 °C D.F. = 66.1 %	θch-c = 1.04 °C/W ΔTc = 39 °C	 Tc = 89 °C
Q6 R6047ENZ1C9 ROHM	Tch (max) = 150 °C Pch = 10.7 W Tch = Tc + ((θch-c) × Pch) = 98.2 °C D.F. = 65.5 %	θch-c = 1.04 °C/W ΔTc = 37 °C	 Tc = 87 °C
Q401 STD2NK90ZT4 STMICRO	Tch (max) = 150 °C Pch= 1.23 W Tch = Tc + ((θch-c) × Pch) = 107.2 °C D.F. = 71.5 %	θch-c = 1.78 °C/W ΔTc = 55 °C	 Tc = 105 °C
Q1101 SSM3K7002F TOSHIBA	Tj (max) = 150 °C Pch = 0.0mW Tj = Ta + ((θj-a) × Pd) = 72.0 °C D.F. = 48.0 %	θj-a = 625.0 °C/W ΔTa = 22 °C	 Ta = 72 °C
D1,D2 D25XB60 SHINDENGEN	Tj (max) = 150 °C Pd = 14.5 W Tj = Tc + ((θj-c) × Pd) = 96.5 °C D.F. = 64.4 %	θj-c = 1.0 °C/W ΔTc = 32 °C	 Tc = 82 °C
D3 STPSC12H065 STMICRO	Tj (max) = 175 °C Pd = 8.9 W Tj = Tc + ((θj-c) × Pd) = 118.5 °C D.F. = 67.8 %	θj-c = 1.4 °C/W ΔTc = 56 °C	 Tc = 106 °C
D51-D53 STPS61H100CW STMICRO	Tj (max) = 175 °C Pd = 14.0W Tj = Tc + ((θj-c) × Pd) = 133.8 °C D.F. = 76.5 %	θj-c = 1.2 °C/W ΔTc = 67 °C	 Tc = 117 °C
D54-D56 STPS61H100CW STMICRO	Tj (max) = 175 °C Pd = 14.0W Tj = Tc + ((θj-c) × Pd) = 148.8 °C D.F. = 85.1 %	θj-c = 1.2 °C/W ΔTc = 82 °C	 Tc = 132 °C
D101 CRH01 TOSHIBA	Tj (max) = 150 °C Pd = 15 mW Tj = Tl + ((θj-l) × Pd) = 57.5 °C D.F. = 38.4 %	θj-l = 30.0 °C/W ΔTl = 7 °C	 Tl = 57 °C
D210 CRH01 TOSHIBA	Tj (max) = 150 °C Pd = 157 mW Tj = Tl + ((θj-l) × Pd) = 65.8 °C D.F. = 43.9 %	θj-l = 30.0 °C/W ΔTl = 11 °C	 Tl = 61 °C

部品番号 Location No.	Vin = 100VAC Load = 125A (100 %) Standby = 1A (100 %) Ta = 50°C		
D401 CRF02 TOSHIBA	Tj (max) = 150 °C Pd = 0.70 W Tj = Tl + ((θj-l) × Pd) = 119.0 °C D.F. = 79.4 %	θj-l = 20.0 °C/W ΔTl = 55 °C	 Tl = 105 °C
D501-D504 CRH01 TOSHIBA	Tj (max) = 150 °C Pd = 233 mW Tj = Tl + ((θj-l) × Pd) = 90.0 °C D.F. = 60.0 %	θj-l = 30.0 °C/W ΔTl = 33 °C	 Tl = 83 °C
D1001 V8PA10-M3/I VISHAY	Tj (max) = 150 °C Pd = 0.33 W Tj = Tl + ((θj-l) × Pd) = 91.7 °C D.F. = 61.2 %	θj-l = 5.0 °C/W ΔTl = 40 °C	 Tl = 90 °C
SR1 VS-40TTS12 VISHAY	Tj (max) = 150 °C Pd = 8.3 W Tj = Tc + ((θj-c) × Pd) = 99.7 °C D.F. = 66.5 %	θj-c = 0.8 °C/W ΔTc = 43 °C	 Tc = 93 °C
A51 BA17812CP ROHM	Tj (max) = 150 °C Pd = 4.4 W Tj = Tc + ((θj-c) × Pd) = 101.2 °C D.F. = 67.5 %	θj-c = 3.0 °C/W ΔTc = 38 °C	 Tc = 88 °C
PC201 TLP385 (LED) TOSHIBA	Tj (max) = 125 °C Pd = 18 mW Tj = Tc + ((θj-c) × Pd) = 66.4 °C D.F. = 53.2 %	θj-c = 130.0 °C/W ΔTc = 14 °C	 Tc = 64 °C
PC1001 TLP385 (LED side) TOSHIBA	Tj (max) = 125 °C Pd = 4 mW Tj = Tc + ((θj-c) × Pd) = 69.6 °C D.F. = 55.7 %	θj-c = 130.0 °C/W ΔTc = 19 °C	 Tc = 69 °C
PD801 SML-A12M8T ROHM	 If = 4.5 mA Allowable If (max) = 19.4mA (at Ta=74°C) D.F. = 23.2%	 ΔTc = 24 °C	 Tc = 74 °C

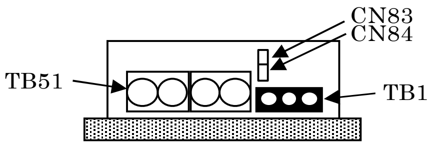
部品番号 Location No.	Vin = 200VAC　Load = 125A (100 %)　Standby = 1A (100 %)　Ta = 50°C		
Q1-Q4 IPP65R074C6 INFINEON	Tch (max) = 150 °C Pch = 3.2 W Tch = Tc + ((θch-c) × Pch) = 83.9 °C D.F. = 56.0 %	θch-c = 0.26 °C/W ΔTc = 33 °C	 Tc = 83 °C
Q5 R6047ENZ1C9 ROHM	Tch (max) = 150 °C Pch = 9.7 W Tch = Tc + ((θch-c) × Pch) = 95.1 °C D.F. = 63.4 %	θch-c = 1.04 °C/W ΔTc = 35 °C	 Tc = 85 °C
Q6 R6047ENZ1C9 ROHM	Tch (max) = 150 °C Pch = 10.7 W Tch = Tc + ((θch-c) × Pch) = 94.2 °C D.F. = 62.8 %	θch-c = 1.04 °C/W ΔTc = 33 °C	 Tc = 83 °C
Q401 STD2NK90ZT4 STMICRO	Tch (max) = 150 °C Pch= 1.23 W Tch = Tc + ((θch-c) × Pch) = 102.2 °C D.F. = 68.2 %	θch-c = 1.78 °C/W ΔTc = 50 °C	 Tc = 100 °C
Q1101 SSM3K7002F TOSHIBA	Tj (max) = 150 °C Pd = 0.0mW Tj = Ta + ((θj-a) × Pd) = 67.0 °C D.F. = 44.7 %	θj-a = 625.0 °C/W ΔTa = 17 °C	 Ta = 67 °C
D1,D2 D25XB60 SHINDENGEN	Tj (max) = 150 °C Pd = 7.1 W Tj = Tc + ((θj-c) × Pd) = 74.1 °C D.F. = 49.4 %	θj-c = 1.0 °C/W ΔTc = 17 °C	 Tc = 67 °C
D3 STPSC12H065 STMicro	Tj (max) = 175 °C Pd = 8.6 W Tj = Tc + ((θj-c) × Pd) = 97.1 °C D.F. = 55.5 %	θj-c = 1.4 °C/W ΔTc = 35 °C	 Tc = 85 °C
D51-D53 STPS61H100CW STMICRO	Tj (max) = 175 °C Pd = 14.0W Tj = Tc + ((θj-c) × Pd) = 132.8 °C D.F. = 75.9 %	θj-c = 1.2 °C/W ΔTc = 66 °C	 Tc = 116 °C
D54-D56 STPS61H100CW STMICRO	Tj (max) = 175 °C Pd = 14.0W Tj = Tc + ((θj-c) × Pd) = 147.8 °C D.F. = 84.5 %	θj-c = 1.2 °C/W ΔTc = 81 °C	 Tc = 131 °C
D101 CRH01 TOSHIBA	Tj (max) = 150 °C Pd = 15 mW Tj = Tl + ((θj-l) × Pd) = 57.5 °C D.F. = 38.4 %	θj-l = 30.0 °C/W ΔTl = 7 °C	 Tl = 57 °C
D210 CRH01 TOSHIBA	Tj (max) = 150 °C Pd = 157 mW Tj = Tl + ((θj-l) × Pd) = 65.8 °C D.F. = 43.9 %	θj-l = 30.0 °C/W ΔTl = 11 °C	 Tl = 61 °C

部品番号 Location No.	Vin = 200VAC Load = 125A (100 %) Standby = 1A (100 %) Ta = 50°C
D401 CRF02 TOSHIBA	Tj (max) = 150 °C θj-l = 20.0 °C/W Pd = 0.70 W ΔTl = 50 °C Tl = 100 °C Tj = Tl + ((θj-l) × Pd) = 114.0 °C D.F. = 76.0 %
D501-D504 CRH01 TOSHIBA	Tj (max) = 150 °C θj-l = 30.0 °C/W Pd = 233 mW ΔTl = 30 °C Tl = 80 °C Tj = Tl + ((θj-l) × Pd) = 87.0 °C D.F. = 58.0 %
D1001 V8PA10-M3/I VISHAY	Tj (max) = 150 °C θj-l = 5.0 °C/W Pd = 0.33 W ΔTl = 35 °C Tl = 85 °C Tj = Tl + ((θj-l) × Pd) = 86.7 °C D.F. = 57.8 %
SR1 VS-40TTS12 VISHAY	Tj (max) = 150 °C θj-c = 0.8 °C/W Pd = 8.0 W ΔTc = 28 °C Tc = 78 °C Tj = Tc + ((θj-c) × Pd) = 84.4 °C D.F. = 56.3 %
A51 BA17812CP ROHM	Tj (max) = 150 °C θj-c = 3.0 °C/W Pd = 4.4 W ΔTc = 33 °C Tc = 83 °C Tj = Tc + ((θj-c) × Pd) = 96.2 °C D.F. = 64.2 %
PC201 TLP385 (LED) TOSHIBA	Tj (max) = 125 °C θj-c = 130.0 °C/W Pd = 18 mW ΔTc = 9 °C Tc = 59 °C Tj = Tc + ((θj-c) × Pd) = 61.4 °C D.F. = 49.2 %
PC1001 TLP385 (LED side) TOSHIBA	Tj (max) = 125 °C θj-c = 130.0 °C/W Pd = 4 mW ΔTc = 14 °C Tc = 64 °C Tj = Tc + ((θj-c) × Pd) = 64.6 °C D.F. = 51.7 %
PD801 SML-A12M8T ROHM	If = 4.5 mA ΔTc = 19°C Tc = 69 °C Allowable If (max) = 21.4mA (at Ta=69°C) D.F. = 21.1%

12. 主要部品温度上昇値 Main Components Temperature Rise △T List

MODEL ： CUS1500M-12/RF

(1) 測定条件 Measuring Conditions

取付方法 Mounting Method (標準取付 : A) (Standard Mounting : A)	Mounting A 	
入力電圧 Input Voltage	100VAC	200VAC
出力電圧 Output Voltage	12VDC	
出力電流 Output Current	125A(100%)	
スタンバイ電圧、電流 Standby Voltage & Current	5VDC , 1A(100%)	

(2) 測定結果 Measuring Results

		ΔT Temperature Rise (°C)	
入力電圧 Vin Input Voltage		100VAC	200VAC
部品番号 Location No.	部品名 Part name	取付方向 Mounting A	
Q1	MOS FET	56	28
Q2	MOS FET	56	28
Q3	MOS FET	63	33
Q4	MOS FET	56	30
Q5	MOS FET	39	35
Q6	MOS FET	37	33
Q101	CHIP MOS FET	5	4
Q104	CHIP TRANSISTOR	13	14
Q105	CHIP TRANSISTOR	8	8
Q401	MOS FET	55	50
Q1101	MOS FET	22	17
D1	BRIDGE DIODE	32	17
D2	BRIDGE DIODE	27	14
D3	DIODE	56	35
D51	S.B.D.	62	61
D52	S.B.D.	65	64
D53	S.B.D.	67	66
D54	S.B.D.	81	79
D55	S.B.D.	82	81
D56	S.B.D.	80	79
D401	DIODE	55	50
D1001	S.B.D.	40	35
SR1	THYRISTOR	43	28

* 取付方向B、C、Dの値は取付方向Aと同様の値となります。
Value of mounting B, C and D are similar to mounting A.

		ΔT Temperature Rise (°C)	
入力電圧 Vin Input Voltage		100VAC	200VAC
部品番号 Location No.	部品名 Part name	取付方向 Mounting A	
A51	IC	38	33
A103	CHIP IC	7	7
A201	CHIP IC	11	11
A301	CHIP IC	17	15
A302	CHIP IC	21	20
A401	CHIP IC	21	16
A1001	CHIP IC	24	18
R4	RESISTOR	59	56
T2	CURRENT TRANS	21	20
T3	TRANS	73	71
T4	TRANS	8	7
T401	TRANS	28	24
L1	BALUN	35	14
L2	BALUN	42	17
L7	CHOKE COIL	18	12
L51	CHOKE COIL	57	55
C13	E.CAP.	6	5
C53	E.CAP.	42	38
C54	E.CAP.	29	25
C55	E.CAP.	46	43
C56	E.CAP.	45	42
C57	E.CAP.	44	41
C62	E.CAP.	22	17
C1003	CHIP E.CAP.	22	17
PC201	PHOTO COUPLER	14	9
PC1001	PHOTO COUPLER	19	14
PD801	LED	24	19

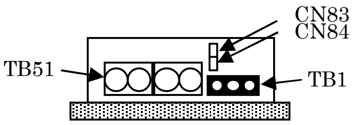
* 取付方向B、C、Dの値は取付方向Aと同様の値となります。
Value of mounting B, C and D are similar to mounting A.

13. 電解コンデンサ推定寿命計算値 Electrolytic Capacitor Lifetime

MODEL : CUS1500M/RF

空冷条件 : 強制空冷 **Cooling condition: Forced air cooling**

取付方向 A
Mounting A



Conditions Ta 40°C :
50°C :
60°C :

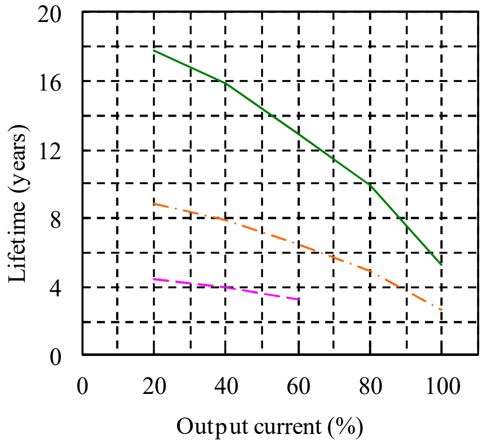
12V

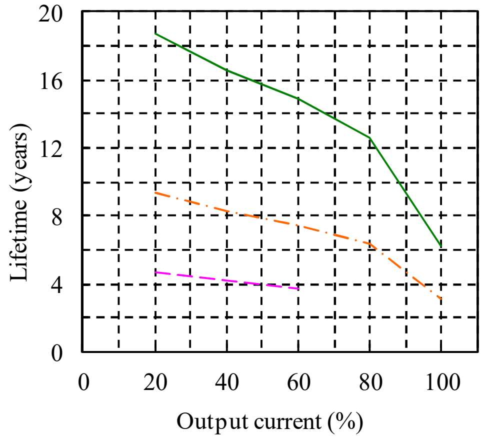
Vin = 100VAC

Load \ Ta	Lifetime (years) 40°C	50°C	60°C
20%	17.8	8.9	4.5
40%	15.9	8.0	4.0
60%	12.9	6.5	3.2
80%	9.9	5.0	-
100%	5.3	2.7	-

Vin = 200VAC

Load \ Ta	Lifetime (years) 40°C	50°C	60°C
20%	18.7	9.3	4.7
40%	16.6	8.3	4.2
60%	14.9	7.4	3.7
80%	12.6	6.3	-
100%	6.3	3.1	-





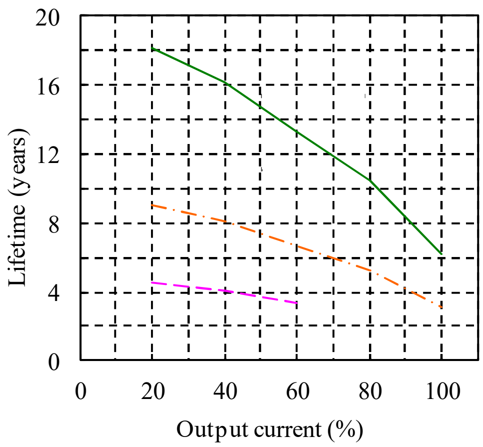
15V

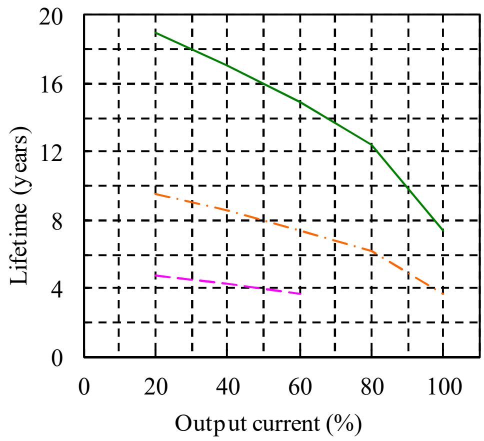
Vin = 100VAC

Load \ Ta	Lifetime (years) 40°C	50°C	60°C
20%	18.2	9.1	4.5
40%	16.2	8.1	4.0
60%	13.3	6.7	3.3
80%	10.4	5.2	-
100%	6.2	3.1	-

Vin = 200VAC

Load \ Ta	Lifetime (years) 40°C	50°C	60°C
20%	18.9	9.5	4.7
40%	17.1	8.5	4.3
60%	14.9	7.4	3.7
80%	12.4	6.2	-
100%	7.4	3.7	-





上記推定寿命は、弊社計算方法により算出した値であり、封口ゴムの劣化等の影響を含めておりません。

The lifetime is calculated based on our method and doesn't include the seal rubber degradation effect etc.

取付方向B、C、Dの寿命は取付方向Aと同様の寿命となります。

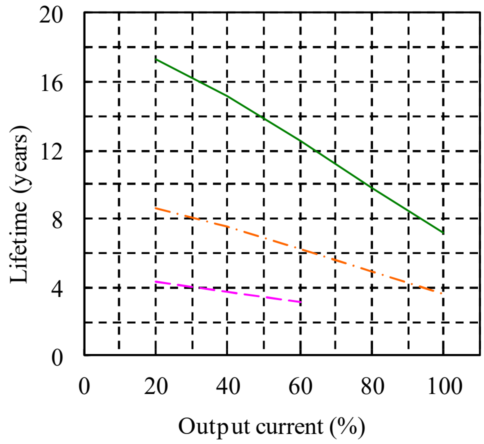
Lifetime of mounting B, C and D are similar to mounting A.

Conditions Ta 40°C : (solid line)
50°C : (dash-dot line)
60°C : (dashed line)

24V

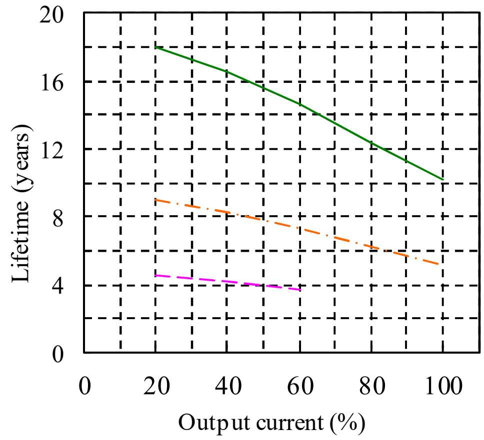
Vin = 100VAC

Load \ Ta	Lifetime (years)		
	40°C	50°C	60°C
20%	17.3	8.7	4.3
40%	15.2	7.6	3.8
60%	12.6	6.3	3.1
80%	9.8	4.9	-
100%	7.2	3.6	-



Vin = 200VAC

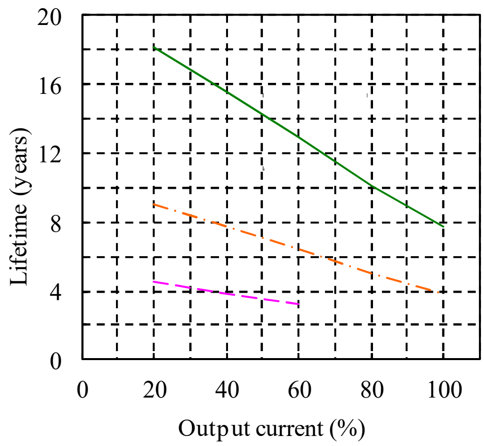
Load \ Ta	Lifetime (years)		
	40°C	50°C	60°C
20%	18.1	9.0	4.5
40%	16.6	8.3	4.2
60%	14.7	7.3	3.7
80%	12.4	6.2	-
100%	10.2	5.1	-



36V

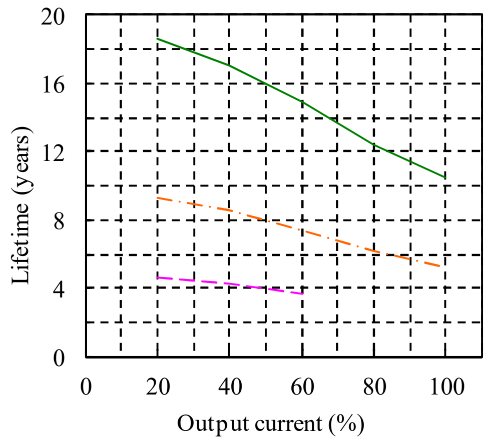
Vin = 100VAC

Load \ Ta	Lifetime (years)		
	40°C	50°C	60°C
20%	18.2	9.1	4.5
40%	15.5	7.7	3.9
60%	12.9	6.5	3.2
80%	10.1	5.0	-
100%	7.7	3.8	-



Vin = 200VAC

Load \ Ta	Lifetime (years)		
	40°C	50°C	60°C
20%	18.6	9.3	4.6
40%	17.1	8.5	4.3
60%	14.9	7.4	3.7
80%	12.4	6.2	-
100%	10.4	5.2	-



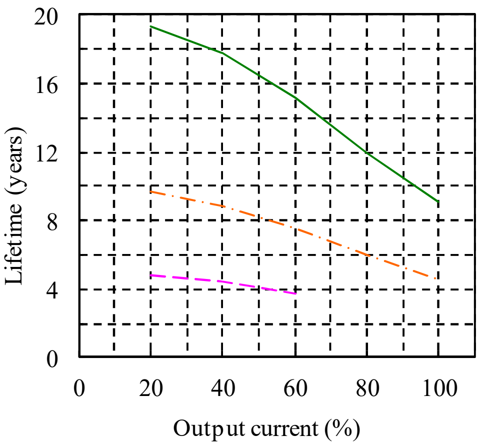
上記推定寿命は、弊社計算方法により算出した値であり、封口ｺﾞﾑの劣化等の影響を含めておりません。
The lifetime is calculated based on our method and doesn't include the seal rubber degradation effect etc.
取付方向B、C、Dの寿命は取付方向Aと同様の寿命となります。
Lifetime of mounting B, C and D are similar to mounting A.

Conditions Ta 40°C :
50°C :
60°C :

48V

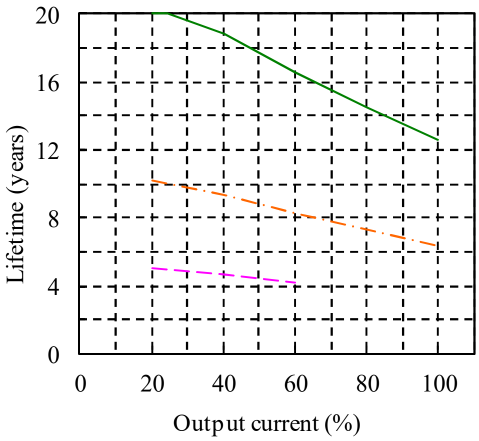
Vin = 100VAC

Load \ Ta	Lifetime (years)		
	40°C	50°C	60°C
20%	19.3	9.7	4.8
40%	17.8	8.9	4.5
60%	15.2	7.6	3.8
80%	11.9	6.0	-
100%	9.2	4.6	-



Vin = 200VAC

Load \ Ta	Lifetime (years)		
	40°C	50°C	60°C
20%	20.0	10.2	5.1
40%	18.8	9.4	4.7
60%	16.6	8.3	4.2
80%	14.6	7.3	-
100%	12.6	6.3	-



上記推定寿命は、弊社計算方法により算出した値であり、封口ゴムの劣化等の影響を含めておりません。
The lifetime is calculated based on our method and doesn't include the seal rubber degradation effect etc.
取付方向B、C、Dの寿命は取付方向Aと同様の寿命となります。
Lifetime of mounting B, C and D are similar to mounting A.

14. FAN期待寿命　Fan Life Expectancy

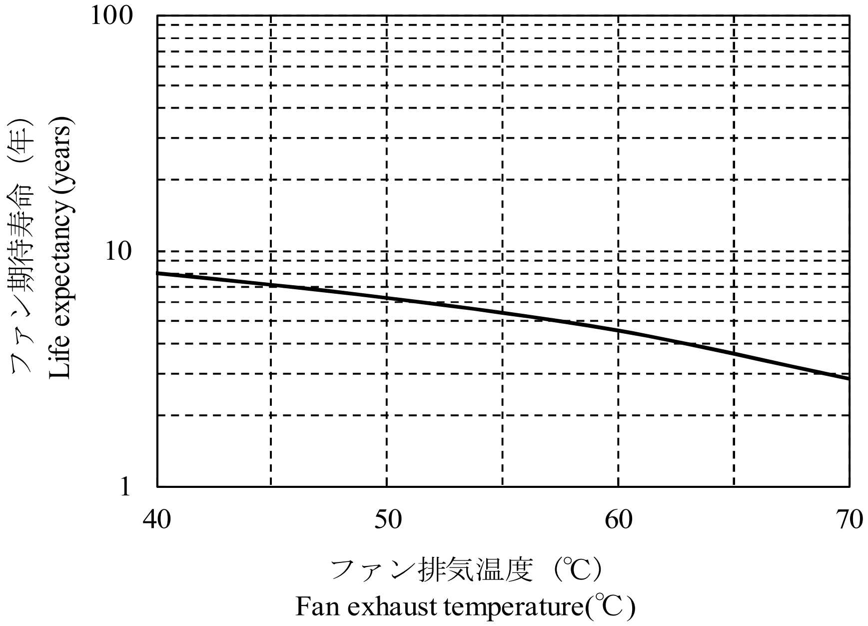
MODEL ： CUS1500M/RF

(1) 使用製品名 Part Name

9G0612P4HD0031　(SANYO DENKI CORP.)

(2) 期待寿命 Life Expectancy

メーカーによるファン単体の期待寿命データを示す(残存率90%)。
また、ファン吸気温度測定箇所は、Fig. 1に示す。
The data shows fan life expectancy for fan only by manufacture (90% survival rate).
Fig. 1 shows measuring point of fan intake temperature.



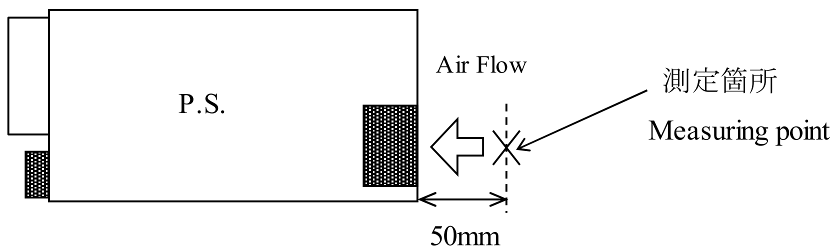


Fig. 1 ファン吸気温度測定箇所
Measuring point of fan intake temperature.