

HWS100A

RELIABILITY DATA

信頼性データ

I N D E X

	PAGE
1. MTBF 計算値 Calculated Values of MTBF	R-1～2
2. 部品ディレーティング Components Derating	R-3～7
3. 主要部品温度上昇値 Main Components Temperature Rise ΔT List	R-8～9
4. 電解コンデンサ推定寿命計算値 Electrolytic Capacitor Lifetime	R-10～13
カバー付きタイプ (オプション)	R-14～17
With cover type (Option model)	
5. アブノーマル試験 Abnormal Test	R-18～19
6. 振動試験 Vibration Test	R-20
7. ノイズシミュレート試験 Noise Simulate Test	R-21
8. 熱衝撃試験 Thermal Shock Test	R-22

※ 試験結果は、代表データであります。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 projection MTBF

MODEL : HWS100A-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 λ_{SS} 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 projection 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)

<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 in 10^9 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	・出力電圧、電流 : 24VDC, 4.5A (100%)
Input voltage	Output voltage & current
・環境ファクタ : GB (Ground, Benign)	・取付方法 : 標準取付 A
Environmental factor	Mounting method : Standard mounting A

SR-332, Issue3

MTBF(Ta=25°C) ≒ 2,963,512 時間 (Hours)

MTBF(Ta=40°C) ≒ 1,377,331 時間 (Hours)

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

MODEL : HWS100A-5

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 projection 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>

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

 λ_{equip} : 全機器故障率 (故障数/10⁶時間)Total equipment failure rate (Failure/10⁶Hours) λ_G : i 番目の同属部品に対する故障率 (故障数/10⁶時間)Generic failure rate for the ith generic part (Failure/10⁶Hours) 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 ($\pi_Q=1$)Generic quality factor for the ith generic part ($\pi_Q=1$)

MTBF値 MTBF Values

 G_F : 地上固定 (Ground, Fixed)

RCR-9102B

MTBF ≒ 212,964 時間 (Hours)

2. 部品ディレーティング Components Derating

MODEL : HWS100A-5

(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°C
・入力電圧 Input voltage	:100 , 200VAC	・出力電圧、電流 Output voltage & current	:5V, 20A(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

$$\theta_{j-c} = \frac{T_j(\max) - T_c}{P_{ch}(\max)} \qquad \theta_{j-l} = \frac{T_j(\max) - T_l}{P_{ch}(\max)}$$

T_c :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

T_l :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

$P_{ch}(\max)$:最大チャネル損失
Maximum Channel Dissipation

$T_j(\max)$:最大接合点(チャネル)温度
($T_{ch}(\max)$) Maximum Junction (channel) Temperature

θ_{j-c} :接合点(チャネル)からケースまでの熱抵抗
(θ_{ch-c}) Thermal Impedance between Junction (channel) and Case

θ_{j-l} :接合点(チャネル)からリードまでの熱抵抗
(θ_{ch-l}) Thermal Impedance between Junction (channel) and Lead

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

部品番号 Location No.	$V_{in} = 100VAC$	Load = 100%	$T_a = 50^{\circ}C$
Q1 IPA60R199CP INFINEON	$T_j(\max) = 150^{\circ}C$ Pch = 1.90 W $T_{ch} = T_c + ((\theta_j-c) \times Pch) = 111.8^{\circ}C$ D.F. = 74.5 %	$\theta_j-c = 3.7^{\circ}C/W$ $\Delta T_c = 54.8^{\circ}C$	$T_c = 104.8^{\circ}C$
Q2 TK8A50D TOSHIBA	$T_j(\max) = 150^{\circ}C$ Pch = 0.89 W $T_{ch} = T_c + ((\theta_j-c) \times Pch) = 110.2^{\circ}C$ D.F. = 73.5 %	$\theta_j-c = 3.125^{\circ}C/W$ $\Delta T_c = 57.4^{\circ}C$	$T_c = 107.4^{\circ}C$
Q3 TK8A50D TOSHIBA	$T_j(\max) = 150^{\circ}C$ Pch = 1.02 W $T_{ch} = T_c + ((\theta_j-c) \times Pch) = 109.3^{\circ}C$ D.F. = 72.9 %	$\theta_j-c = 3.125^{\circ}C/W$ $\Delta T_c = 56.1^{\circ}C$	$T_c = 106.1^{\circ}C$
Q51 IPA057N08N3 G INFINEON	$T_j(\max) = 175^{\circ}C$ Pch = 0.83 W $T_{ch} = T_c + ((\theta_j-c) \times Pch) = 104.8^{\circ}C$ D.F. = 59.9 %	$\theta_j-c = 3.8^{\circ}C/W$ $\Delta T_c = 51.6^{\circ}C$	$T_c = 101.6^{\circ}C$
Q52 IPA057N08N3 G INFINEON	$T_j(\max) = 175^{\circ}C$ Pch = 1.61 W $T_{ch} = T_c + ((\theta_j-c) \times Pch) = 114.3^{\circ}C$ D.F. = 65.3 %	$\theta_j-c = 3.8^{\circ}C/W$ $\Delta T_c = 58.2^{\circ}C$	$T_c = 108.2^{\circ}C$
Q101 2SC3928A ISAHAYA	$T_j(\max) = 150^{\circ}C$ Pc = 0.1 mW $T_{ch} = T_c + ((\theta_j-c) \times Pc) = 94.2^{\circ}C$ D.F. = 62.8 %	$\theta_j-c = 625.0^{\circ}C/W$ $\Delta T_c = 44.1^{\circ}C$	$T_c = 94.1^{\circ}C$
Q104 2SA2167 ISAHAYA	$T_j(\max) = 150^{\circ}C$ Pc = 13.2 mW $T_{ch} = T_c + ((\theta_j-c) \times Pc) = 100.3^{\circ}C$ D.F. = 66.9 %	$\theta_j-c = 250.0^{\circ}C/W$ $\Delta T_c = 47.0^{\circ}C$	$T_c = 97.0^{\circ}C$
Q201 RQK0603CGDQSTL RENESAS	$T_j(\max) = 150^{\circ}C$ Pc = 0.13 W $T_{ch} = T_c + ((\theta_j-c) \times Pc) = 108.2^{\circ}C$ D.F. = 72.1 %	$\theta_j-c = 83.3^{\circ}C/W$ $\Delta T_c = 47.4^{\circ}C$	$T_c = 97.4^{\circ}C$
D1 KBJ1006G LITE-ON	$T_j(\max) = 150^{\circ}C$ Pd = 2.60 W $T_{ch} = T_c + ((\theta_j-c) \times Pd) = 123.5^{\circ}C$ D.F. = 82.3 %	$\theta_j-c = 2.0^{\circ}C/W$ $\Delta T_c = 68.3^{\circ}C$	$T_c = 118.3^{\circ}C$
D2 RFU5TF6S ROHM	$T_j(\max) = 150^{\circ}C$ Pd = 0.62 W $T_{ch} = T_c + ((\theta_j-c) \times Pd) = 106.4^{\circ}C$ D.F. = 70.9 %	$\theta_j-c = 4.0^{\circ}C/W$ $\Delta T_c = 53.9^{\circ}C$	$T_c = 103.9^{\circ}C$
D104 CRH01 TOSHIBA	$T_j(\max) = 150^{\circ}C$ Pd = 2.8 mW $T_{ch} = T_l + ((\theta_j-l) \times Pd) = 94.2^{\circ}C$ D.F. = 62.8 %	$\theta_j-l = 30.0^{\circ}C/W$ $\Delta T_l = 44.1^{\circ}C$	$T_l = 94.1^{\circ}C$
D105 CRH01 TOSHIBA	$T_j(\max) = 150^{\circ}C$ Pd = 2.8 mW $T_{ch} = T_l + ((\theta_j-l) \times Pd) = 93.5^{\circ}C$ D.F. = 62.3 %	$\theta_j-l = 30.0^{\circ}C/W$ $\Delta T_l = 43.4^{\circ}C$	$T_l = 93.4^{\circ}C$

部品番号 Location No.	$V_{in} = 100VAC$	Load = 100%	$T_a = 50^{\circ}C$
D106 CRS04 TOSHIBA	$T_j(\max) = 150^{\circ}C$ $P_d = 19.2\text{ mW}$ $T_{ch} = T_l + ((\theta_{j-l}) \times P_d) = 97.8^{\circ}C$ D.F. = 65.2 %	$\theta_{j-l} = 20.0^{\circ}C/W$ $\Delta T_l = 47.4^{\circ}C$	$T_l = 97.4^{\circ}C$
D107・D109 LN1F60 SHINDENGEN	$T_j(\max) = 150^{\circ}C$ $P_d = 9.6\text{ mW}$ $T_{ch} = T_l + ((\theta_{j-l}) \times P_d) = 101.2^{\circ}C$ D.F. = 67.5 %	$\theta_{j-l} = 23.0^{\circ}C/W$ $\Delta T_l = 51.0^{\circ}C$	$T_l = 101.0^{\circ}C$
D112・D113 CRH01 TOSHIBA	$T_j(\max) = 150^{\circ}C$ $P_d = 2.8\text{ mW}$ $T_{ch} = T_l + ((\theta_{j-l}) \times P_d) = 96.0^{\circ}C$ D.F. = 64.0 %	$\theta_{j-l} = 30.0^{\circ}C/W$ $\Delta T_l = 45.9^{\circ}C$	$T_l = 95.9^{\circ}C$
D114 CRH01 TOSHIBA	$T_j(\max) = 150^{\circ}C$ $P_d = 2.1\text{ mW}$ $T_{ch} = T_l + ((\theta_{j-l}) \times P_d) = 96.0^{\circ}C$ D.F. = 64.0 %	$\theta_{j-l} = 30.0^{\circ}C/W$ $\Delta T_l = 45.9^{\circ}C$	$T_l = 95.9^{\circ}C$
Z101 UDZV TE-17 16B ROHM	$T_j(\max) = 150^{\circ}C$ $P_d = 0.8\text{ mW}$ $T_{ch} = T_c + ((\theta_{j-c}) \times P_d) = 94.6^{\circ}C$ D.F. = 63.1 %	$\theta_{j-c} = 625.0^{\circ}C/W$ $\Delta T_c = 44.1^{\circ}C$	$T_c = 94.1^{\circ}C$
PC2 PS2561DL1 (LED) RENESAS	$T_j(\max) = 125^{\circ}C$ $P_d = 1.2\text{ mW}$ $T_{ch} = T_c + ((\theta_{j-c}) \times P_d) = 86.5^{\circ}C$ D.F. = 69.2 %	$\theta_{j-c} = 150.0^{\circ}C/W$ $\Delta T_c = 36.3^{\circ}C$	$T_c = 86.3^{\circ}C$
PC2 PS2561DL1 (TRANSISTOR) RENESAS	$T_j(\max) = 125^{\circ}C$ $P_c = 2.1\text{ mW}$ $T_{ch} = T_c + ((\theta_{j-c}) \times P_c) = 86.6^{\circ}C$ D.F. = 69.3 %	$\theta_{j-c} = 150.0^{\circ}C/W$ $\Delta T_c = 36.3^{\circ}C$	$T_c = 86.3^{\circ}C$
PD51 SEL2410G SANKEN	$I_f = 3.0\text{ mA}$ Allowable $I_f(\max) = 9.6\text{ mA}$ (at $T_a = 70.3^{\circ}C$) D.F. = 31.3 %	$\Delta T_a = 20.3^{\circ}C$	$T_a = 70.3^{\circ}C$

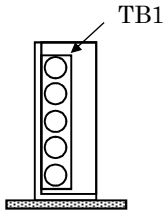
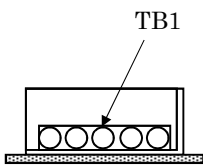
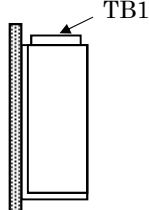
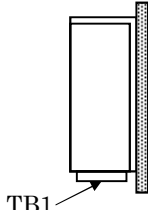
部品番号 Location No.	$V_{in} = 200VAC$	Load = 100%	$T_a = 50^{\circ}C$
Q1 IPA60R199CP INFINEON	$T_j(\max) = 150^{\circ}C$ Pch = 1.90 W $T_{ch} = T_c + ((\theta_j-c) \times Pch) = 101.5^{\circ}C$ D.F. = 67.7 %	$\theta_j-c = 3.7^{\circ}C/W$ $\Delta T_c = 44.5^{\circ}C$	$T_c = 94.5^{\circ}C$
Q2 TK8A50D TOSHIBA	$T_j(\max) = 150^{\circ}C$ Pch = 0.89 W $T_{ch} = T_c + ((\theta_j-c) \times Pch) = 102.2^{\circ}C$ D.F. = 68.1 %	$\theta_j-c = 3.125^{\circ}C/W$ $\Delta T_c = 49.4^{\circ}C$	$T_c = 99.4^{\circ}C$
Q3 TK8A50D TOSHIBA	$T_j(\max) = 150^{\circ}C$ Pch = 1.02 W $T_{ch} = T_c + ((\theta_j-c) \times Pch) = 101.6^{\circ}C$ D.F. = 67.7 %	$\theta_j-c = 3.125^{\circ}C/W$ $\Delta T_c = 48.4^{\circ}C$	$T_c = 98.4^{\circ}C$
Q51 IPA057N08N3 G INFINEON	$T_j(\max) = 175^{\circ}C$ Pch = 0.83 W $T_{ch} = T_c + ((\theta_j-c) \times Pch) = 101.2^{\circ}C$ D.F. = 57.8 %	$\theta_j-c = 3.8^{\circ}C/W$ $\Delta T_c = 48.0^{\circ}C$	$T_c = 98.0^{\circ}C$
Q52 IPA057N08N3 G INFINEON	$T_j(\max) = 175^{\circ}C$ Pch = 1.61 W $T_{ch} = T_c + ((\theta_j-c) \times Pch) = 110.8^{\circ}C$ D.F. = 63.3 %	$\theta_j-c = 3.8^{\circ}C/W$ $\Delta T_c = 54.7^{\circ}C$	$T_c = 104.7^{\circ}C$
Q101 2SC3928A ISAHAYA	$T_j(\max) = 150^{\circ}C$ Pc = 0.1 mW $T_{ch} = T_c + ((\theta_j-c) \times Pc) = 86.6^{\circ}C$ D.F. = 57.7 %	$\theta_j-c = 625.0^{\circ}C/W$ $\Delta T_c = 36.5^{\circ}C$	$T_c = 86.5^{\circ}C$
Q104 2SA2167 ISAHAYA	$T_j(\max) = 150^{\circ}C$ Pc = 13.2 mW $T_{ch} = T_c + ((\theta_j-c) \times Pc) = 94.6^{\circ}C$ D.F. = 63.1 %	$\theta_j-c = 250.0^{\circ}C/W$ $\Delta T_c = 41.3^{\circ}C$	$T_c = 91.3^{\circ}C$
Q201 RQK0603CGDQSTL RENESAS	$T_j(\max) = 150^{\circ}C$ Pc = 0.13 W $T_{ch} = T_c + ((\theta_j-c) \times Pc) = 104.2^{\circ}C$ D.F. = 69.5 %	$\theta_j-c = 83.3^{\circ}C/W$ $\Delta T_c = 43.4^{\circ}C$	$T_c = 93.4^{\circ}C$
D1 KBJ1006G LITE-ON	$T_j(\max) = 150^{\circ}C$ Pd = 1.35 W $T_{ch} = T_c + ((\theta_j-c) \times Pd) = 93.4^{\circ}C$ D.F. = 62.3 %	$\theta_j-c = 2.0^{\circ}C/W$ $\Delta T_c = 40.7^{\circ}C$	$T_c = 90.7^{\circ}C$
D2 RFU5TF6S ROHM	$T_j(\max) = 150^{\circ}C$ Pd = 0.62 W $T_{ch} = T_c + ((\theta_j-c) \times Pd) = 97.6^{\circ}C$ D.F. = 65.1 %	$\theta_j-c = 4.0^{\circ}C/W$ $\Delta T_c = 45.1^{\circ}C$	$T_c = 95.1^{\circ}C$
D104 CRH01 TOSHIBA	$T_j(\max) = 150^{\circ}C$ Pd = 2.8 mW $T_{ch} = T_l + ((\theta_j-l) \times Pd) = 86.6^{\circ}C$ D.F. = 57.7 %	$\theta_j-l = 30.0^{\circ}C/W$ $\Delta T_l = 36.5^{\circ}C$	$T_l = 86.5^{\circ}C$
D105 CRH01 TOSHIBA	$T_j(\max) = 150^{\circ}C$ Pd = 2.8 mW $T_{ch} = T_l + ((\theta_j-l) \times Pd) = 85.8^{\circ}C$ D.F. = 57.2 %	$\theta_j-l = 30.0^{\circ}C/W$ $\Delta T_l = 35.7^{\circ}C$	$T_l = 85.7^{\circ}C$

部品番号 Location No.	$V_{in} = 200VAC$	Load = 100%	$T_a = 50^{\circ}C$
D106 CRS04 TOSHIBA	$T_j(\max) = 150^{\circ}C$ $P_d = 19.2\text{ mW}$ $T_{ch} = T_l + ((\theta_{j-l}) \times P_d) = 92.2^{\circ}C$ D.F. = 61.5 %	$\theta_{j-l} = 20.0^{\circ}C/W$ $\Delta T_l = 41.8^{\circ}C$	$T_l = 91.8^{\circ}C$
D107・D109 LN1F60 SHINDENGEN	$T_j(\max) = 150^{\circ}C$ $P_d = 9.6\text{ mW}$ $T_{ch} = T_l + ((\theta_{j-l}) \times P_d) = 95.1^{\circ}C$ D.F. = 63.4 %	$\theta_{j-l} = 23.0^{\circ}C/W$ $\Delta T_l = 44.9^{\circ}C$	$T_l = 94.9^{\circ}C$
D112・D113 CRH01 TOSHIBA	$T_j(\max) = 150^{\circ}C$ $P_d = 2.8\text{ mW}$ $T_{ch} = T_l + ((\theta_{j-l}) \times P_d) = 90.2^{\circ}C$ D.F. = 60.1 %	$\theta_{j-l} = 30.0^{\circ}C/W$ $\Delta T_l = 40.1^{\circ}C$	$T_l = 90.1^{\circ}C$
D114 CRH01 TOSHIBA	$T_j(\max) = 150^{\circ}C$ $P_d = 2.1\text{ mW}$ $T_{ch} = T_l + ((\theta_{j-l}) \times P_d) = 90.2^{\circ}C$ D.F. = 60.1 %	$\theta_{j-l} = 30.0^{\circ}C/W$ $\Delta T_l = 40.1^{\circ}C$	$T_l = 90.1^{\circ}C$
Z101 UDZV TE-17 16B ROHM	$T_j(\max) = 150^{\circ}C$ $P_d = 4.6\text{ mW}$ $T_{ch} = T_c + ((\theta_{j-c}) \times P_d) = 89.4^{\circ}C$ D.F. = 59.6 %	$\theta_{j-c} = 625.0^{\circ}C/W$ $\Delta T_c = 36.5^{\circ}C$	$T_c = 86.5^{\circ}C$
PC2 PS2561DL1 (LED) RENESAS	$T_j(\max) = 125^{\circ}C$ $P_d = 1.2\text{ mW}$ $T_{ch} = T_c + ((\theta_{j-c}) \times P_d) = 79.2^{\circ}C$ D.F. = 63.4 %	$\theta_{j-c} = 150.0^{\circ}C/W$ $\Delta T_c = 29.0^{\circ}C$	$T_c = 79.0^{\circ}C$
PC2 PS2561DL1 (TRANSISTOR) RENESAS	$T_j(\max) = 125^{\circ}C$ $P_c = 2.1\text{ mW}$ $T_{ch} = T_c + ((\theta_{j-c}) \times P_c) = 79.3^{\circ}C$ D.F. = 63.4 %	$\theta_{j-c} = 150.0^{\circ}C/W$ $\Delta T_c = 29.0^{\circ}C$	$T_c = 79.0^{\circ}C$
PD51 SEL2410G SANKEN	$I_f = 3.0\text{ mA}$ Allowable $I_f(\max) = 10.5\text{ mA}$ (at $T_a=68.4^{\circ}C$) D.F. = 28.6 %	$\Delta T_a = 18.4^{\circ}C$	$T_a = 68.4^{\circ}C$

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

MODEL : HWS100A-5

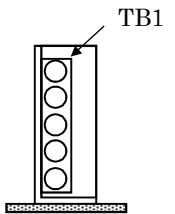
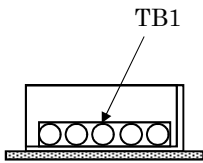
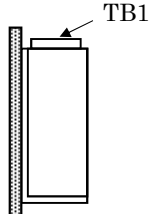
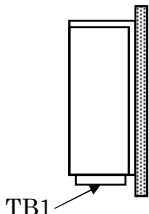
(1) 測定条件 Measuring Conditions

取付方法 Mounting Method (標準取付 : A) (Standard Mounting : A)	Mounting A	Mounting B	Mounting C	Mounting D
				
入力電圧 V_{in} Input Voltage	100VAC			
出力電圧 V_o Output Voltage	5VDC			
出力電流 I_o Output Current	20A(100%)			

(2) 測定結果 Measuring Results

出力デレーティング Output Derating		ΔT Temperature Rise ($^{\circ}C$)			
		$I_o=100\%$			
		$T_a=50^{\circ}C$	$T_a=40^{\circ}C$	$T_a=40^{\circ}C$	$T_a=40^{\circ}C$
部品番号 Location No.	部品名 Part name	取付方向	取付方向	取付方向	取付方向
		Mounting A	Mounting B	Mounting C	Mounting D
Q1	MOS FET	54.8	56.7	60.6	65.9
Q2	MOS FET	57.4	53.5	58.2	64.6
Q3	MOS FET	56.1	50.9	57.2	62.6
Q51	MOS FET	51.6	50.4	53.1	50.8
Q52	MOS FET	58.2	57.4	62.1	56.9
D1	BRIDGE DIODE	68.3	72.9	73.4	67.9
D2	DIODE	53.9	54.4	58.6	62.6
A101	CHIP IC	46.0	46.9	49.8	51.8
A102	CHIP IC	43.8	43.5	47.0	47.1
A201	CHIP IC	49.2	47.8	51.4	47.1
T1	DRIVE TRANS	40.7	40.2	40.4	45.8
T2	TRANS	58.7	55.0	59.8	59.4
L1	BALUN	43.0	50.2	55.8	42.5
L2	BALUN	43.0	50.8	51.7	50.7
L3	CHOKE COIL	49.0	55.7	57.0	58.2
L51	CHOKE COIL	54.4	52.6	55.4	47.8
C6	E.CAP.	35.0	34.7	22.8	40.7
C7	E.CAP.	34.0	28.0	34.4	44.1
C51	E.CAP.	30.5	30.8	41.5	29.4
C52	E.CAP.	33.0	32.3	43.0	31.5
C53	E.CAP.	31.2	27.1	39.6	27.0
PC2	PHOTO COUPLER	36.3	36.5	39.3	38.2
PD51	LED	20.3	17.3	34.2	15.1

(1) 測定条件 Measuring Conditions

取付方法 Mounting Method (標準取付 : A) (Standard Mounting : A)	Mounting A	Mounting B	Mounting C	Mounting D
				
入力電圧 V_{in} Input Voltage	200VAC			
出力電圧 V_o Output Voltage	5VDC			
出力電流 I_o Output Current	20A(100%)			

(2) 測定結果 Measuring Results

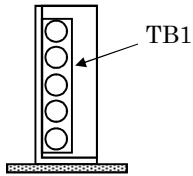
出力デレーティング Output Derating		ΔT Temperature Rise ($^{\circ}C$)			
		$I_o=100\%$			
		$T_a=50^{\circ}C$	$T_a=40^{\circ}C$	$T_a=40^{\circ}C$	$T_a=40^{\circ}C$
部品番号 Location No.	部品名 Part name	取付方向 Mounting A	取付方向 Mounting B	取付方向 Mounting C	取付方向 Mounting D
Q1	MOS FET	44.5	45.8	49.1	52.7
Q2	MOS FET	49.4	46.4	50.5	55.6
Q3	MOS FET	48.4	44.2	49.6	54.1
Q51	MOS FET	48.0	47.0	49.4	47.7
Q52	MOS FET	54.7	53.8	58.3	53.9
D1	BRIDGE DIODE	40.7	44.7	45.7	41.3
D2	DIODE	45.1	45.9	49.1	52.0
A101	CHIP IC	38.2	39.3	41.2	42.7
A102	CHIP IC	37.7	38.5	41.0	41.4
A201	CHIP IC	44.6	44.8	47.7	44.5
T1	DRIVE TRANS	34.9	36.6	35.4	41.0
T2	TRANS	54.8	52.5	56.5	56.6
L1	BALUN	24.0	29.1	33.3	25.0
L2	BALUN	25.1	30.9	32.8	29.9
L3	CHOKE COIL	36.3	41.0	42.3	42.2
L51	CHOKE COIL	48.0	49.0	51.4	45.4
C6	E.CAP.	29.1	30.0	19.9	35.4
C7	E.CAP.	28.3	24.6	30.4	38.1
C51	E.CAP.	28.4	29.6	37.8	27.4
C52	E.CAP.	30.8	30.6	40.1	31.1
C53	E.CAP.	29.3	25.8	36.7	25.5
PC2	PHOTO COUPLER	29.0	32.1	33.7	33.0
PD51	LED	18.4	16.5	31.2	14.1

MODEL : HWS100A

空冷条件 : 自然空冷

Cooling condition : Convection cooling

取付方向 A
Mounting A

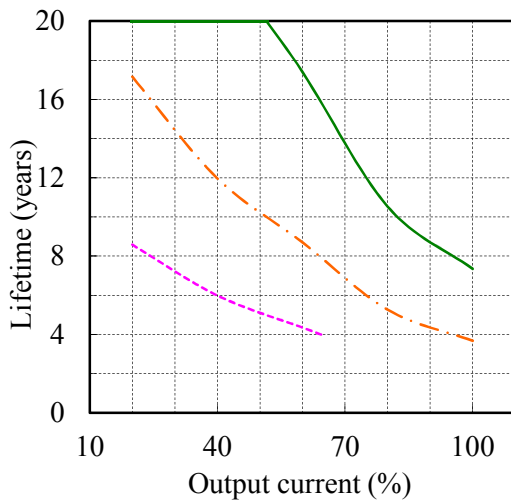


Conditions Ta 40°C : —
50°C : - - -
60°C : ·····

5V

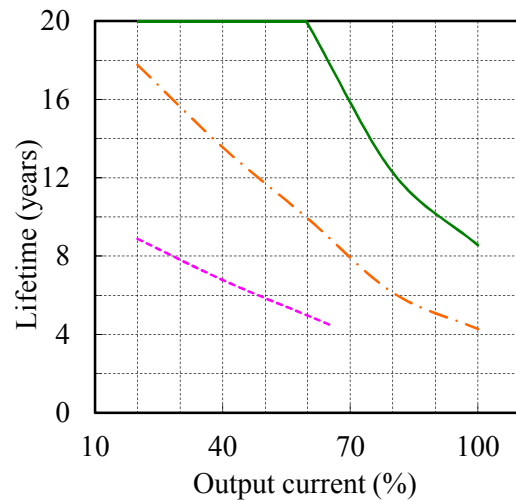
V_{in} = 100VAC

Load	Ta	Lifetime (years)		
		40°C	50°C	60°C
20%		20.0	17.2	8.6
40%		20.0	12.0	6.0
60%		17.4	8.7	4.3
80%		10.5	5.3	-
100%		7.3	3.7	-



V_{in} = 200VAC

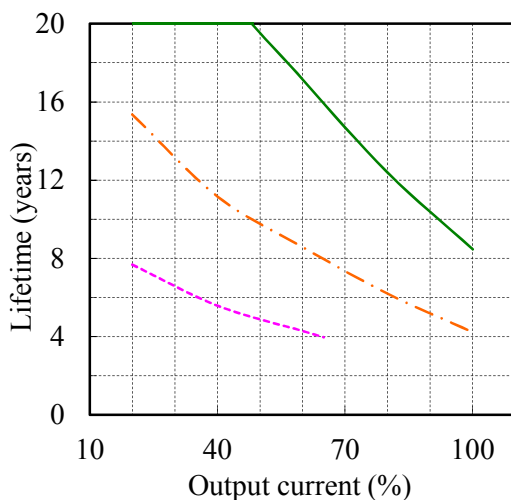
Load	Ta	Lifetime (years)		
		40°C	50°C	60°C
20%		20.0	17.8	8.9
40%		20.0	13.6	6.8
60%		19.8	9.9	5.0
80%		12.3	6.1	-
100%		8.6	4.3	-



24V

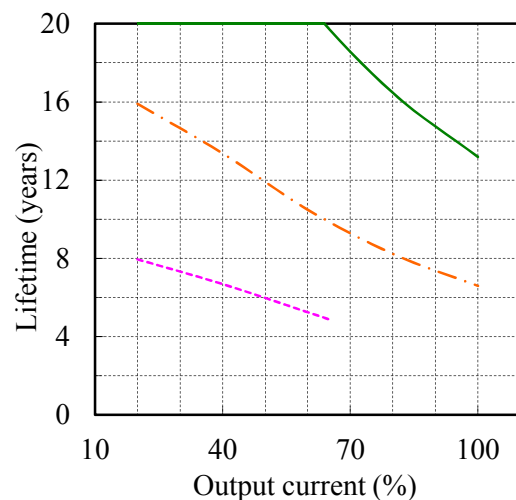
V_{in} = 100VAC

Load	Ta	Lifetime (years)		
		40°C	50°C	60°C
20%		20.0	15.4	7.7
40%		20.0	11.2	5.6
60%		17.2	8.6	4.3
80%		12.4	6.2	-
100%		8.5	4.2	-



V_{in} = 200VAC

Load	Ta	Lifetime (years)		
		40°C	50°C	60°C
20%		20.0	15.9	8.0
40%		20.0	13.4	6.7
60%		20.0	10.5	5.2
80%		16.5	8.2	-
100%		13.2	6.6	-

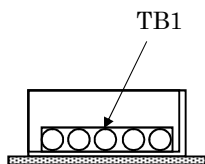


上記推定寿命は、弊社計算方法により算出した値であり、封口ゴムの劣化等の影響を含めておりません。
The lifetime is calculated based on our method and doesn't include the seal rubber degradation effect etc.

MODEL : HWS100A

空冷条件 : 自然空冷 Cooling condition : Convection cooling

取付方向 B
Mounting B

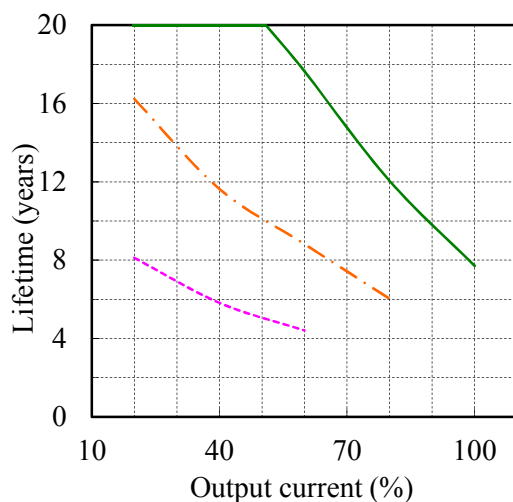


Conditions Ta 40°C : ———
 50°C : - - - -
 60°C : ······

5V

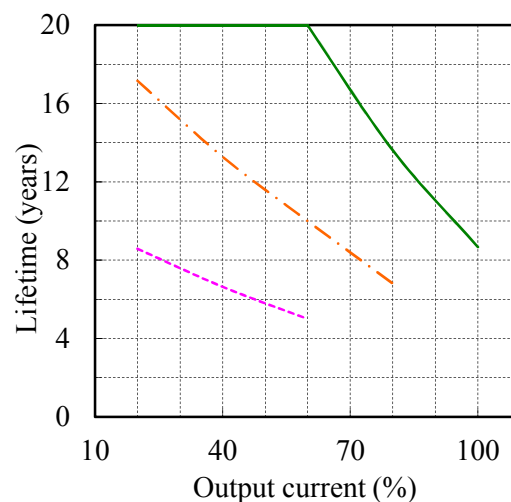
V_{in} = 100VAC

Load	Ta	Lifetime (years)		
		40°C	50°C	60°C
20%		20.0	16.2	8.1
40%		20.0	11.6	5.8
60%		17.6	8.8	4.4
80%		12.1	6.0	-
100%		7.7	-	-



V_{in} = 200VAC

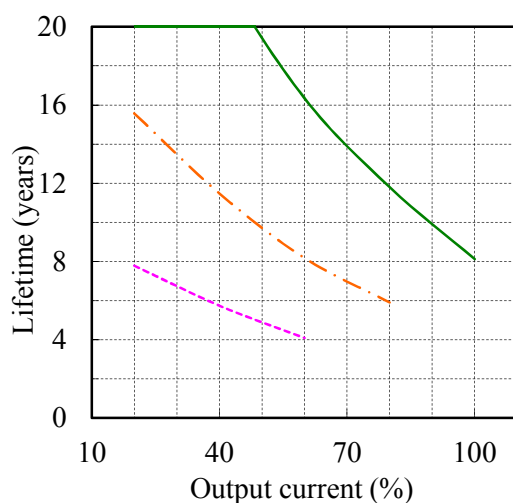
Load	Ta	Lifetime (years)		
		40°C	50°C	60°C
20%		20.0	17.2	8.6
40%		20.0	13.3	6.6
60%		20.0	10.0	5.0
80%		13.6	6.8	-
100%		8.7	-	-



24V

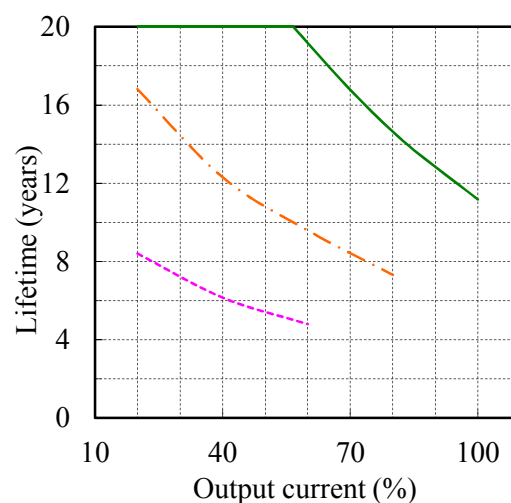
V_{in} = 100VAC

Load	Ta	Lifetime (years)		
		40°C	50°C	60°C
20%		20.0	15.6	7.8
40%		20.0	11.5	5.7
60%		16.3	8.2	4.1
80%		11.8	5.9	-
100%		8.1	-	-



V_{in} = 200VAC

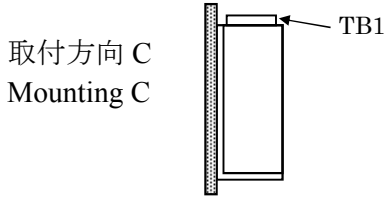
Load	Ta	Lifetime (years)		
		40°C	50°C	60°C
20%		20.0	16.8	8.4
40%		20.0	12.3	6.2
60%		19.2	9.6	4.8
80%		14.6	7.3	-
100%		11.2	-	-



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.

MODEL : HWS100A

空冷条件 : 自然空冷 Cooling condition : Convection cooling

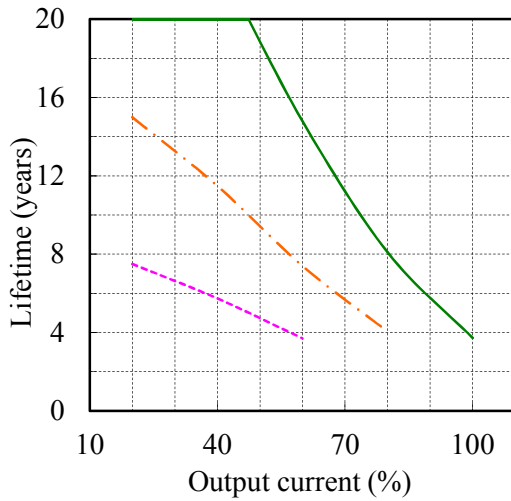


Conditions Ta 40°C : ———
50°C : - - - -
60°C : ······

5V

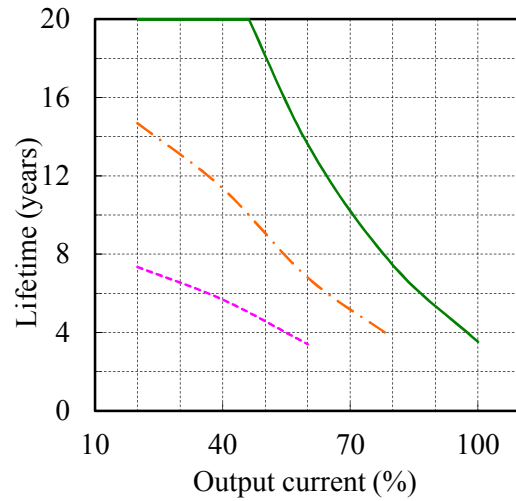
V_{in} = 100VAC

Load	Ta	Lifetime (years)		
		40°C	50°C	60°C
20%		20.0	15.0	7.5
40%		20.0	11.5	5.7
60%		14.8	7.4	3.7
80%		8.1	4.0	-
100%		3.7	-	-



V_{in} = 200VAC

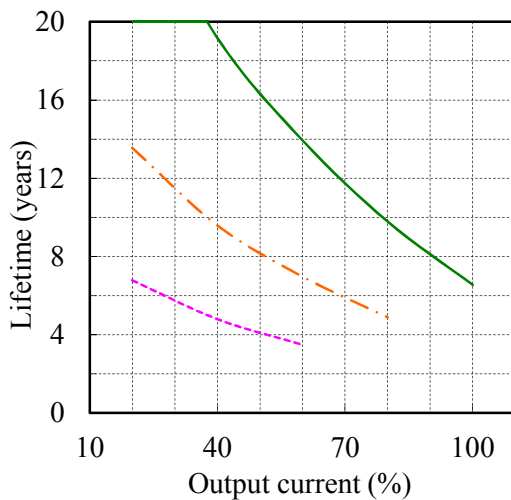
Load	Ta	Lifetime (years)		
		40°C	50°C	60°C
20%		20.0	14.7	7.3
40%		20.0	11.4	5.7
60%		13.6	6.8	3.4
80%		7.4	3.7	-
100%		3.5	-	-



24V

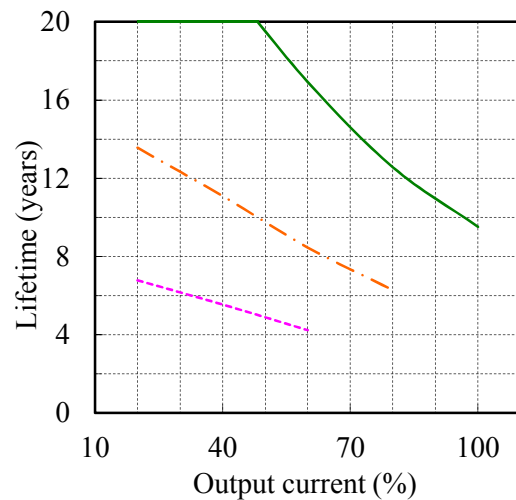
V_{in} = 100VAC

Load	Ta	Lifetime (years)		
		40°C	50°C	60°C
20%		20.0	13.6	6.8
40%		19.2	9.6	4.8
60%		13.9	7.0	3.5
80%		9.8	4.9	-
100%		6.5	-	-



V_{in} = 200VAC

Load	Ta	Lifetime (years)		
		40°C	50°C	60°C
20%		20.0	13.6	6.8
40%		20.0	11.1	5.5
60%		16.9	8.5	4.2
80%		12.6	6.3	-
100%		9.5	-	-



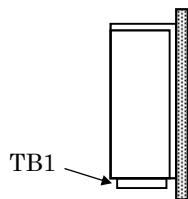
上記推定寿命は、弊社計算方法により算出した値であり、封口ゴムの劣化等の影響を含めておりません。
The lifetime is calculated based on our method and doesn't include the seal rubber degradation effect etc.

MODEL : HWS100A

空冷条件 : 自然空冷

Cooling condition : Convection cooling

取付方向 D
Mounting D

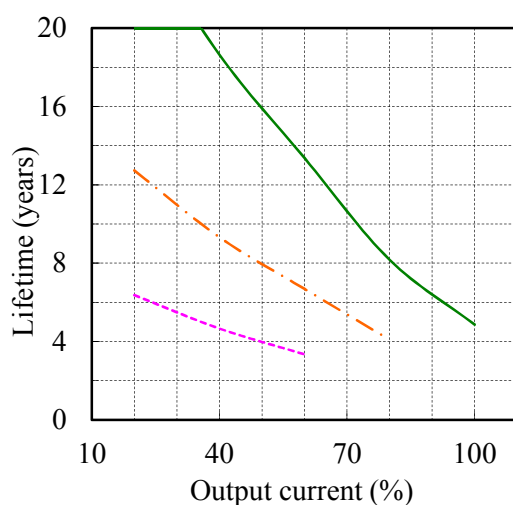


Conditions Ta 40°C : —
50°C : - - -
60°C : ·····

5V

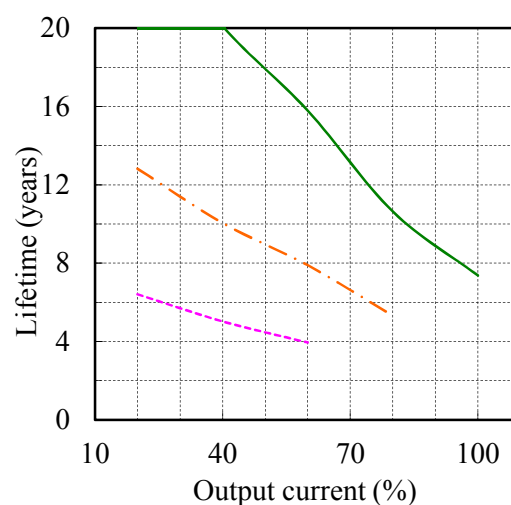
V_{in} = 100VAC

Load	Ta	Lifetime (years)		
		40°C	50°C	60°C
20%		20.0	12.7	6.4
40%		18.6	9.3	4.7
60%		13.4	6.7	3.3
80%		8.2	4.1	-
100%		4.9	-	-



V_{in} = 200VAC

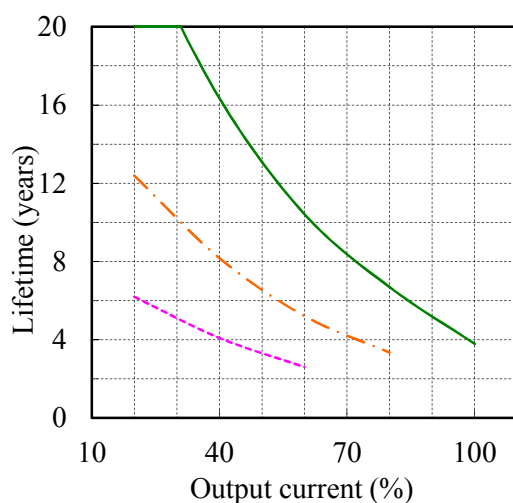
Load	Ta	Lifetime (years)		
		40°C	50°C	60°C
20%		20.0	12.8	6.4
40%		20.0	10.1	5.0
60%		15.8	7.9	3.9
80%		10.6	5.3	-
100%		7.4	-	-



24V

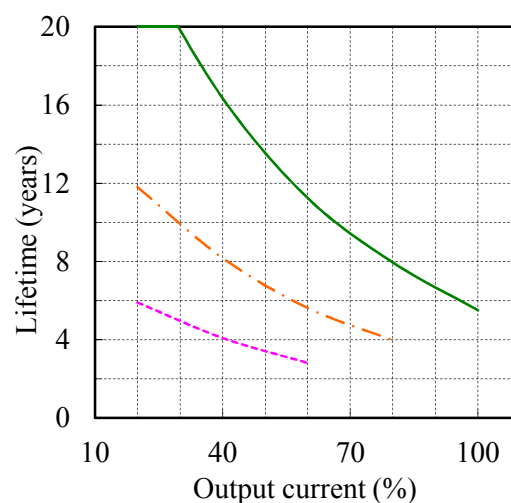
V_{in} = 100VAC

Load	Ta	Lifetime (years)		
		40°C	50°C	60°C
20%		20.0	12.4	6.2
40%		16.3	8.2	4.1
60%		10.4	5.2	2.6
80%		6.7	3.3	-
100%		3.8	-	-



V_{in} = 200VAC

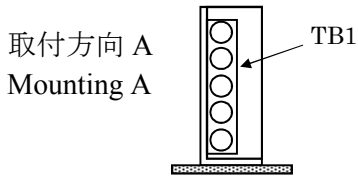
Load	Ta	Lifetime (years)		
		40°C	50°C	60°C
20%		20.0	11.8	5.9
40%		16.3	8.2	4.1
60%		11.2	5.6	2.8
80%		8.0	4.0	-
100%		5.5	-	-



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.

カバー付きタイプ (オプション) With cover type (Option model)

空冷条件 : 自然空冷 Cooling condition : Convection cooling

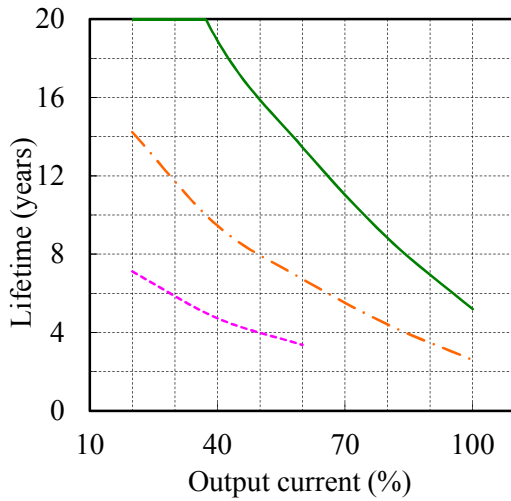


Conditions Ta 40°C : —
50°C : - - -
60°C : ·····

5V

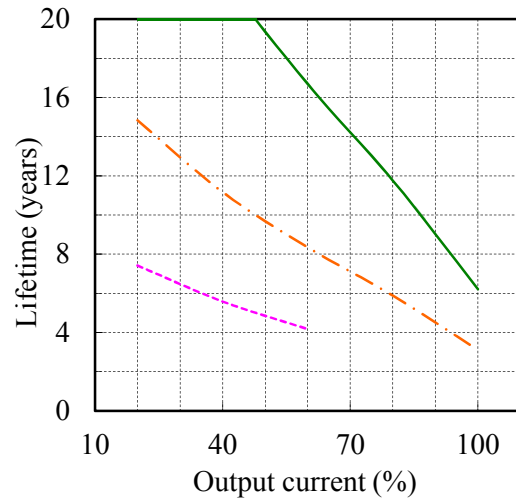
V_{in} = 100VAC

Load	Ta	Lifetime (years)		
		40°C	50°C	60°C
20%		20.0	14.2	7.1
40%		18.9	9.5	4.7
60%		13.5	6.7	3.4
80%		8.8	4.4	-
100%		5.2	2.6	-



V_{in} = 200VAC

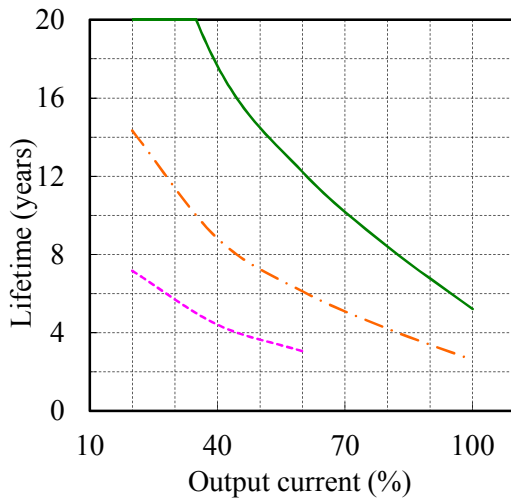
Load	Ta	Lifetime (years)		
		40°C	50°C	60°C
20%		20.0	14.8	7.4
40%		20.0	11.2	5.6
60%		16.7	8.3	4.2
80%		11.8	5.9	-
100%		6.2	3.1	-



24V

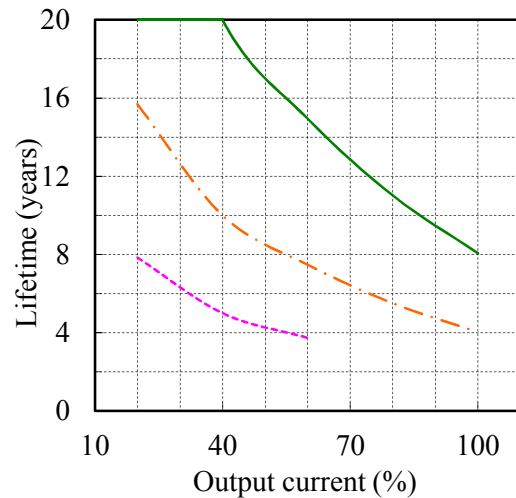
V_{in} = 100VAC

Load	Ta	Lifetime (years)		
		40°C	50°C	60°C
20%		20.0	14.3	7.2
40%		17.6	8.8	4.4
60%		12.2	6.1	3.1
80%		8.4	4.2	-
100%		5.2	2.6	-



V_{in} = 200VAC

Load	Ta	Lifetime (years)		
		40°C	50°C	60°C
20%		20.0	15.7	7.8
40%		20.0	10.0	5.0
60%		14.9	7.5	3.7
80%		11.0	5.5	-
100%		8.1	4.0	-

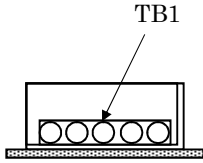


上記推定寿命は、弊社計算方法により算出した値であり、封口ゴムの劣化等の影響を含めておりません。
The lifetime is calculated based on our method and doesn't include the seal rubber degradation effect etc.

カバー付きタイプ (オプション) With cover type (Option model)

空冷条件 : 自然空冷 Cooling condition : Convection cooling

取付方向 B
Mounting B



Conditions Ta 35°C : - - - -
40°C : — — — —
50°C : - · - · -

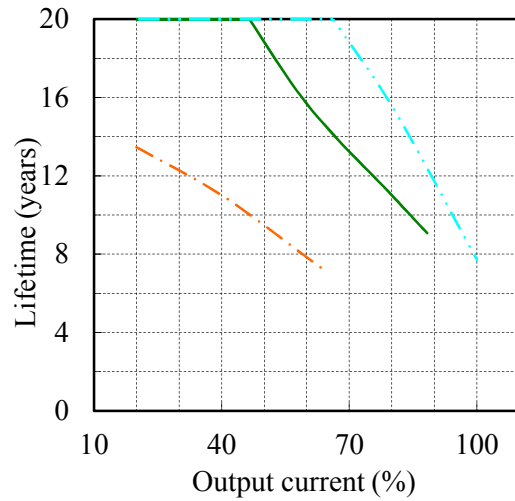
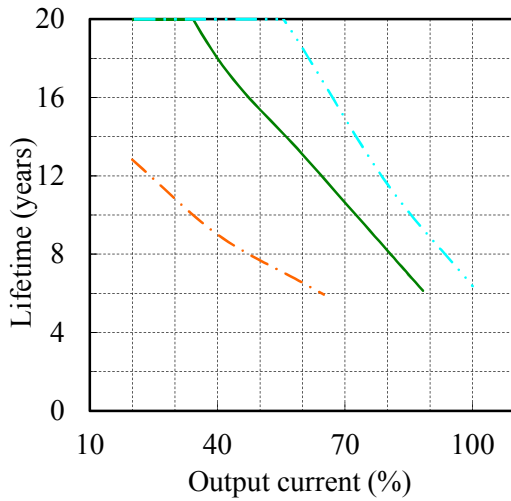
5V

V_{in} = 100VAC

Load	Ta	Lifetime (years)		
		35°C	40°C	50°C
20%		20.0	20.0	12.8
40%		20.0	18.0	9.0
60%		18.5	13.1	6.5
80%		11.6	8.2	-
100%		6.4	-	-

V_{in} = 200VAC

Load	Ta	Lifetime (years)		
		35°C	40°C	50°C
20%		20.0	20.0	13.5
40%		20.0	20.0	11.0
60%		20.0	15.7	7.8
80%		15.6	11.0	-
100%		7.7	-	-



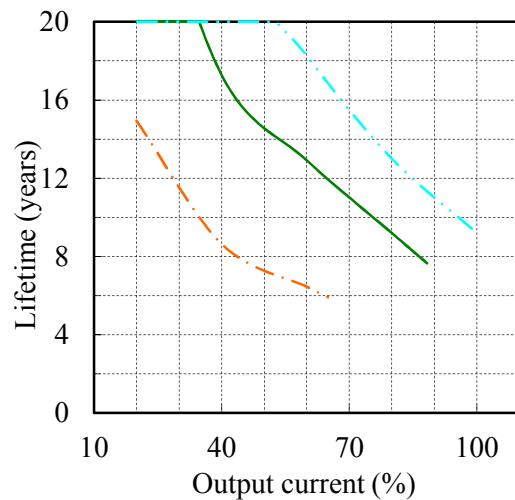
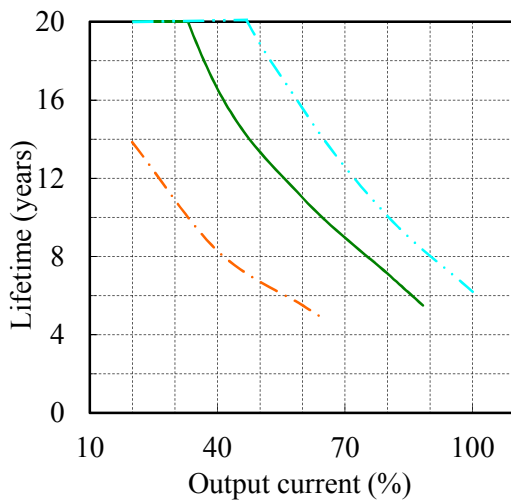
24V

V_{in} = 100VAC

Load	Ta	Lifetime (years)		
		35°C	40°C	50°C
20%		20.0	20.0	13.8
40%		20.0	16.6	8.3
60%		15.6	11.0	5.5
80%		10.1	7.1	-
100%		6.2	-	-

V_{in} = 200VAC

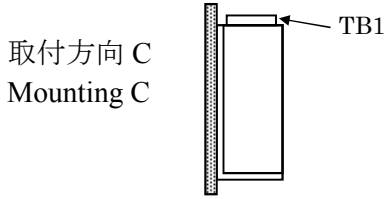
Load	Ta	Lifetime (years)		
		35°C	40°C	50°C
20%		20.0	20.0	14.9
40%		20.0	17.3	8.6
60%		18.3	12.9	6.5
80%		13.0	9.2	-
100%		9.2	-	-



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.

カバー付きタイプ (オプション) With cover type (Option model)

空冷条件 : 自然空冷 Cooling condition : Convection cooling



Conditions Ta 30°C : - - - -
40°C : ————
50°C : - · - · -

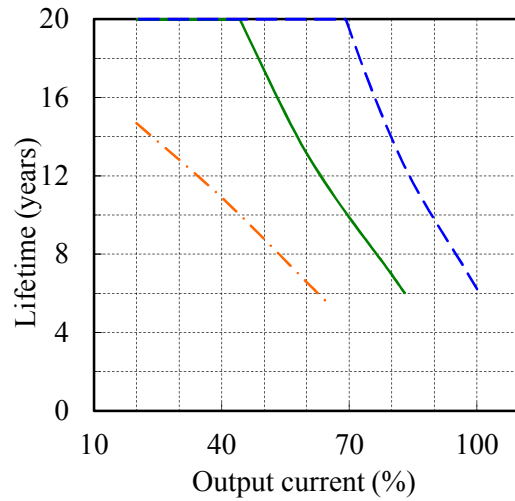
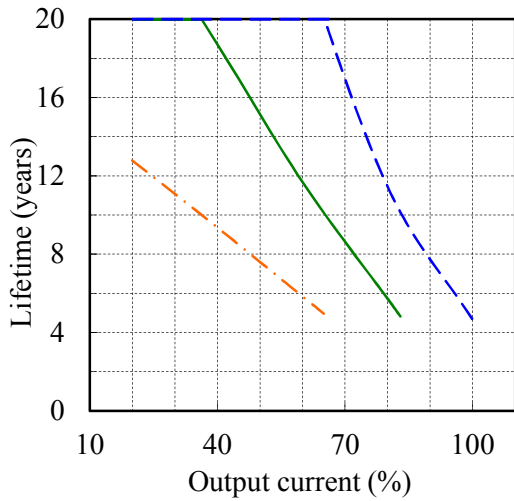
5V

V_{in} = 100VAC

Load	Ta	Lifetime (years)		
		30°C	40°C	50°C
20%		20.0	20.0	12.8
40%		20.0	18.7	9.4
60%		20.0	11.7	5.8
80%		11.4	5.7	-
100%		4.6	-	-

V_{in} = 200VAC

Load	Ta	Lifetime (years)		
		30°C	40°C	50°C
20%		20.0	20.0	14.7
40%		20.0	20.0	10.9
60%		20.0	13.1	6.6
80%		13.9	6.9	-
100%		6.2	-	-



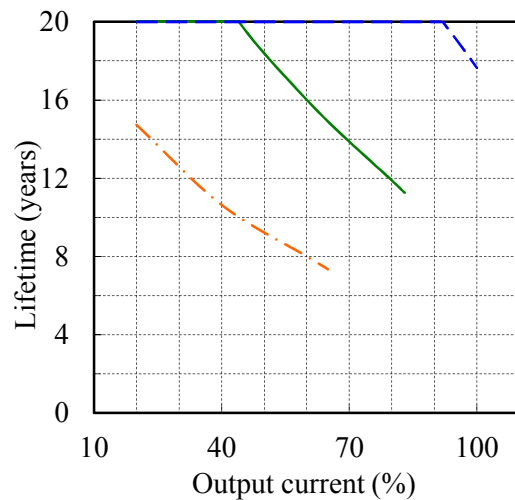
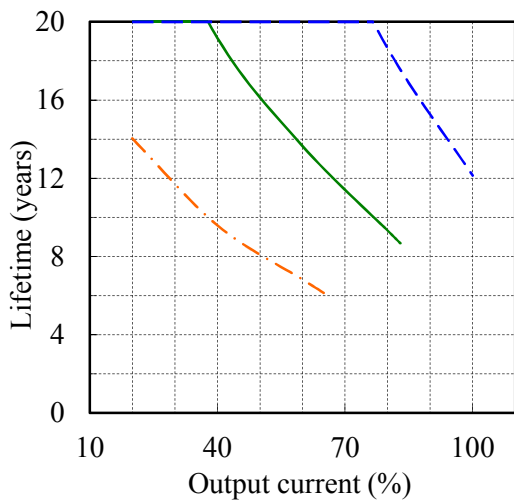
24V

V_{in} = 100VAC

Load	Ta	Lifetime (years)		
		30°C	40°C	50°C
20%		20.0	20.0	14.0
40%		20.0	19.2	9.6
60%		20.0	13.7	6.8
80%		18.6	9.3	-
100%		12.1	-	-

V_{in} = 200VAC

Load	Ta	Lifetime (years)		
		30°C	40°C	50°C
20%		20.0	20.0	14.7
40%		20.0	20.0	10.6
60%		20.0	16.0	8.0
80%		20.0	11.9	-
100%		17.6	-	-

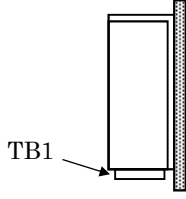


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The lifetime is calculated based on our method and doesn't include the seal rubber degradation effect etc.

カバー付きタイプ (オプション) With cover type (Option model)

空冷条件 : 自然空冷 Cooling condition : Convection cooling

取付方向 D
Mounting D



Conditions Ta 35°C : - · - · -
40°C : —
50°C : - · - · -

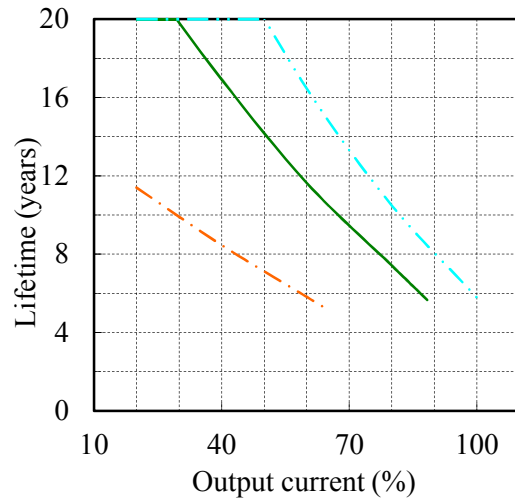
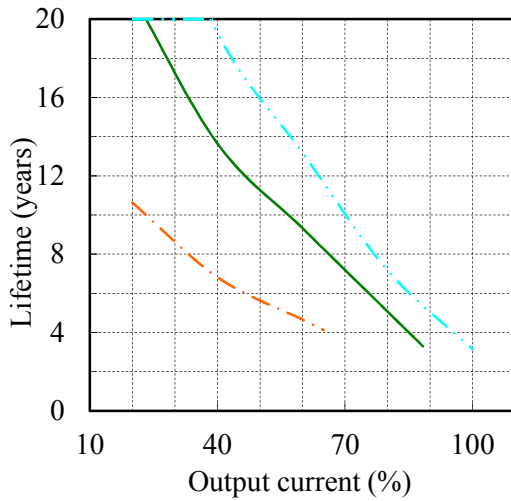
5V

V_{in} = 100VAC

Load	Ta	Lifetime (years)		
		35°C	40°C	50°C
20%		20.0	20.0	10.6
40%		19.3	13.7	6.8
60%		13.2	9.3	4.7
80%		7.2	5.1	-
100%		3.1	-	-

V_{in} = 200VAC

Load	Ta	Lifetime (years)		
		35°C	40°C	50°C
20%		20.0	20.0	11.4
40%		20.0	16.9	8.5
60%		16.5	11.6	5.8
80%		10.5	7.4	-
100%		5.8	-	-



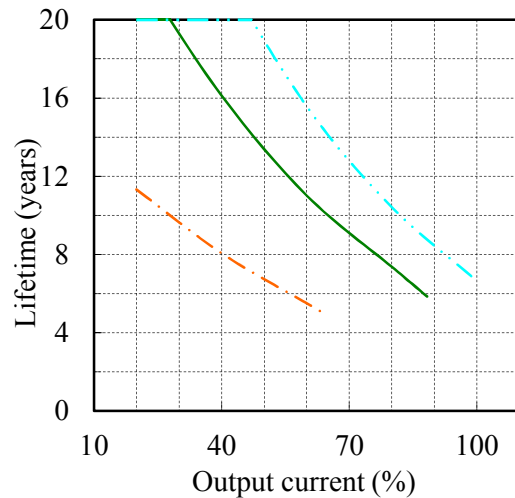
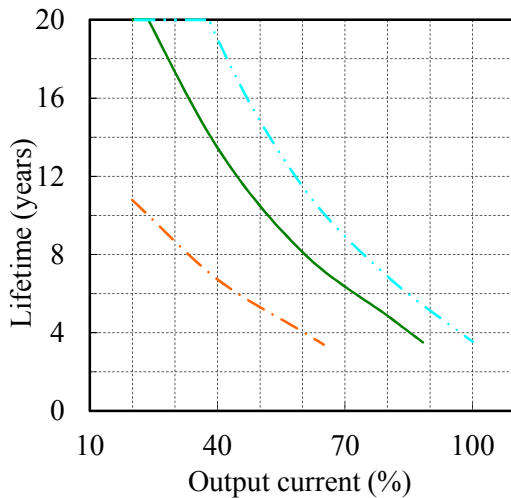
24V

V_{in} = 100VAC

Load	Ta	Lifetime (years)		
		35°C	40°C	50°C
20%		20.0	20.0	10.8
40%		19.0	13.5	6.7
60%		11.5	8.1	4.1
80%		6.9	4.9	-
100%		3.5	-	-

V_{in} = 200VAC

Load	Ta	Lifetime (years)		
		35°C	40°C	50°C
20%		20.0	20.0	11.3
40%		20.0	16.1	8.1
60%		15.6	11.0	5.5
80%		10.4	7.4	-
100%		6.6	-	-



上記推定寿命は、弊社計算方法により算出した値であり、封口ゴムの劣化等の影響を含めておりません。
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5. アブノーマル試験 Abnormal Test

MODEL : HWS100A-5

(1) 試験条件 Test Conditions

Input : 265VAC Output : 5V, 20A Ta : 25°C

(2) 試験結果 Test Results

(Da : Damaged)

No.	Test position		Test mode		Test result											記事 Note	
	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
1	Q1	D-S	○							○	○			○			Da:D101
2		D-G	○							○	○			○			Da:Q1,D101
3		G-S	○													○	力率低下 Power factor low
4		D		○												○	力率低下 Power factor low
5		S		○												○	力率低下 Power factor low
6		G		○						○	○			○			Da:Q1,D101
7	Q2	D-S	○											○			
8		D-G	○											○			
9		G-S	○											○			
10		D		○										○			
11		S		○										○			
12		G		○										○			
13	Q3	D-S	○											○			
14		D-G	○											○			
15		G-S	○											○			
16		D		○										○			
17		S		○										○			
18		G		○										○			
19	Q51	D-S	○													○	間欠発振動作 Hiccup
20		D-G	○													○	間欠発振動作 Hiccup
21		G-S	○													○	入力電力増加 Input power increase
22		D		○										○			
23		S		○										○			
24		G		○												○	入力電力増加 Input power increase

No.	Test position		Test mode		Test result											記事 Note		
	部品No.	試験端子	ショート	オープン	a	b	c	d	e	f	g	h	I	j	k		l	
					発火	発煙	破裂	異臭	赤熱	破損	ヒューズ断	OVP	OCP	出力断	変化なし		その他	
Location No.	Test point	Short	Open	Fire	Smoke	Burst	Smell	Red hot	Damaged	Fuse blown				No output	No change	Others		
25	Q52	D-S	○											○				
26		D-G	○											○				
27		G-S	○							○							○	Da:F201 入力電力増加 Input power increase
28		D		○										○				
29		S		○										○				
30		G		○													○	入力電力増加 Input power increase
31		C6		○							○				○			
32				○												○	力率低下 Power factor low	
33	C51		○											○				
34				○												○	出力リップル大 Output ripple increase	
35	D1	AC-AC	○								○			○				
36		DC-DC	○								○			○				
37		AC-DC	○								○			○				
38		AC		○										○				
39		DC		○										○				
40	D2	A-K	○							○	○			○			Da:Q1	
41		A/K		○						○	○			○			Da:Q1	
42	D107	A-K	○											○				
43		A/K		○												○	入力電力増加 Input power increase	
44	D109	A-K	○											○				
45		A/K		○												○	入力電力増加 Input power increase	
46	T1	1-2	○											○				
47		6-7	○											○				
48		1/2		○										○				
49		6/7		○										○				
50	T2	1-2	○													○	間欠発振動作 Hiccup	
51		3-4	○											○				
52		7,8-9,10	○											○				
53		11-12	○													○	間欠発振動作 Hiccup	
54		1/2		○										○				
55		3/4		○										○				
56		7,8/9,10		○										○				
57	11/12		○													○	入力電力増加 Input power increase	

6. 振動試験 Vibration Test

MODEL : HWS100A-5

(1) 振動試験種類 Vibration Test Class

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

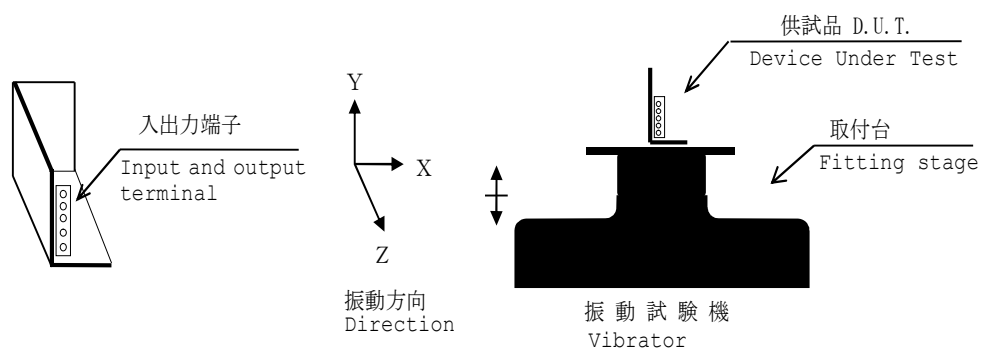
(2) 使用振動試験装置 Equipment Used

IMV (株) 製
IMV CORP・制御部 : RC-1120
Controller・加振部 : VS-1031-200
Vibrator

(3) 試験条件 Test Conditions

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

(4) 試験方法 Test Method



(5) 判定条件 Acceptable Conditions

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

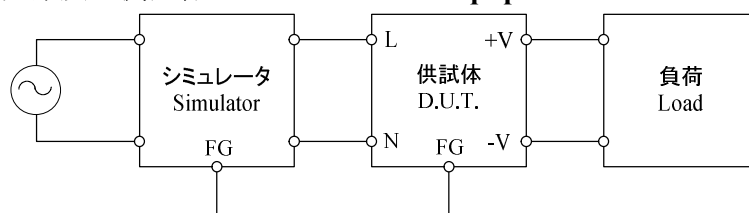
(6) 試験結果 Test Results

合格 OK

7. ノイズシミュレート試験 Noise Simulate Test

MODEL : HWS100A-5

(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	・ノイズ電圧 Noise level	: 0~2kV
・出力電圧 Output Voltage	: 定格 Rated	・位相 Phase	: 0~360 deg
・出力電流 Output current	: 0, 100%	・極性 Polarity	: +, -
・周囲温度 Ambient temperature	: 25°C	・印加モード Mode	: コモン、ノーマル Common, Normal
・パルス幅 Pulse width	: 50~1000ns	・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

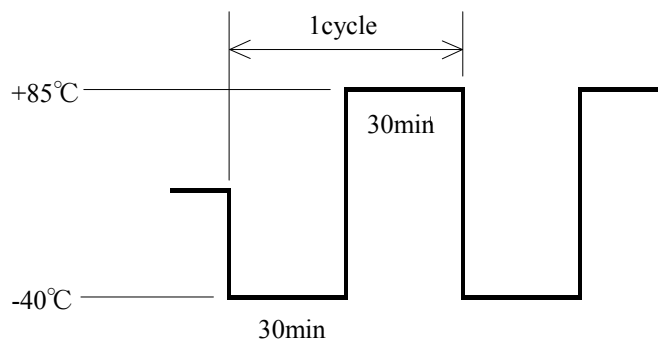
MODEL : HWS100A-5

(1) 使用計測器 Equipment Used

TSV-40ht : ESPEC

(2) 試験条件 Test Conditions

- ・電源周囲温度 : -40°C ⇔ 85°C
Ambient Temperature
- ・試験時間 : 図参照
Test Time Refer to Dwg.
- ・試験サイクル : 100 サイクル
Test Cycle 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