HWS50A

RELIABILITY DATA

信頼性データ

I N D E X

PAGE

※ 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 projection MTBF

MODEL：HWS50A-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 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, 2.2A (100%)
・環境ファクタ Environmental factor : GB (Ground, Benign)
・取付方法 Mounting method : 標準取付 A : Standard mounting A

SR-332,Issue3

MTBF(Ta=25℃) ≒ 3,726,622 時間 (Hours)

MTBF(Ta=40℃) ≒ 1,951,297 時間 (Hours)

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

MODEL：HWS50A-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＞

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

λequip : 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 ≒ 216,309 時間 (Hours)

２．部品ディレーティング　Components Derating

MODEL：HWS50A-5

(1) 算出方法　Calculating Method

(a) 測定方法　Measuring method

・取付方法　:標準取付 : A Mounting method　Standard mounting : A	・周囲温度　:50℃ Ambient temperature
・入力電圧　:100 , 200VAC Input voltage	・出力電圧、電流　:5V, 10A(100%) Output voltage & current

(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

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

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

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

Pch(max)　:最大チャネル損失
Maximum Channel Dissipation

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

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

θj-l　:接合点(チャネル)からリードまでの熱抵抗
(θch-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.	Vin = 100VAC	Load = 100%	Ta = 50℃
Q1 R6009ENX ROHM	Tj (max) = 150 ℃ Pch = 1.35 W Tch = Tc + ((θj-c) × Pch) = 105.7 ℃ D.F. = 70.5 %	θj-c = 3.13 ℃/W ΔTc = 51.5 ℃	Tc = 101.5 ℃
Q2 R6009ENX ROHM	Tj (max) = 150 ℃ Pch = 1.22 W Tch = Tc + ((θj-c) × Pch) = 106.4 ℃ D.F. = 70.9 %	θj-c = 3.13 ℃/W ΔTc = 52.6 ℃	Tc = 102.6 ℃
Q51 IPA057N08N3 G INFINEON	Tj (max) = 175 ℃ Pch = 1.40 W Tch = Tc + ((θj-c) × Pch) = 97.1 ℃ D.F. = 55.5 %	θj-c = 3.8 ℃/W ΔTc = 41.8 ℃	Tc = 91.8 ℃
Q101 2SC3928A ISAHAYA	Tj (max) = 150 ℃ Pc = 0.1 mW Tj = Ta + ((θj-a) × Pc) = 90.0 ℃ D.F. = 60.0 %	θj-a = 625 ℃/W ΔTa = 39.9 ℃	Ta = 89.9 ℃
Q201 2SA1298 TOSHIBA	Tj (max) = 150 ℃ Pc = 0.01 W Tj = Ta + ((θj-a) × Pc) = 109.2 ℃ D.F. = 72.8 %	θj-a = 625 ℃/W ΔTa = 52.9 ℃	Ta = 102.9 ℃
Q202 2SC2873 TOSHIBA	Tj (max) = 150 ℃ Pc = 0.03 W Tj = Ta + ((θj-a) × Pc) = 109.9 ℃ D.F. = 73.3 %	θj-a = 250 ℃/W ΔTa = 52.4 ℃	Ta = 102.4 ℃
D1 KBJ406G LITE-ON	Tj (max) = 150 ℃ Pd = 1.34 W Tch = Tc + ((θj-c) × Pd) = 107.9 ℃ D.F. = 71.9 %	θj-c = 5.5 ℃/W ΔTc = 50.5 ℃	Tc = 100.5 ℃
D2 S2L60 SHINDENGEN	Tj (max) = 150 ℃ Pd = 0.52 W Tch = Tl + ((θj-l) × Pd) = 105.2 ℃ D.F. = 70.1 %	θj-l = 12.0 ℃/W ΔTl = 49.0 ℃	Tl = 99.0 ℃
D104 CRH01 TOSHIBA	Tj (max) = 150 ℃ Pd = 2.8 mW Tch = Tl + ((θj-l) × Pd) = 89.3 ℃ D.F. = 59.5 %	θj-l = 30.0 ℃/W ΔTl = 39.2 ℃	Tl = 89.2 ℃
D105 CRH01 TOSHIBA	Tj (max) = 150 ℃ Pd = 2.8 mW Tch = Tl + ((θj-l) × Pd) = 90.0 ℃ D.F. = 60.0 %	θj-l = 30.0 ℃/W ΔTl = 39.9 ℃	Tl = 89.9 ℃
D106 LN1F60 SHINDENGEN	Tj (max) = 150 ℃ Pd = 0.33 W Tch = Tl + ((θj-l) × Pd) = 113.6 ℃ D.F. = 75.7 %	θj-l = 23.0 ℃/W ΔTl = 56.0 ℃	Tl = 106.0 ℃

部品番号 Location No.	Vin = 100VAC	Load = 100%	Ta = 50℃
D109 CRH01 TOSHIBA	Tj (max) = 150 ℃ Pd = 11.1 mW Tch = Tl + ((θj-l) × Pd) = 95.4 ℃ D.F. = 63.6 %	θj-l = 30.0 ℃/W ΔTl = 45.1 ℃	 Tl = 95.1 ℃
D110 CRH01 TOSHIBA	Tj (max) = 150 ℃ Pd = 1.6 mW Tch = Tl + ((θj-l) × Pd) = 95.1 ℃ D.F. = 63.4 %	θj-l = 30.0 ℃/W ΔTl = 45.1 ℃	 Tl = 95.1 ℃
D201 CRH01 TOSHIBA	Tj (max) = 150 ℃ Pd = 1.4 mW Tch = Tl + ((θj-l) × Pd) = 102.9 ℃ D.F. = 68.6 %	θj-l = 30.0 ℃/W ΔTl = 52.9 ℃	 Tl = 102.9 ℃
D203 CRS04 TOSHIBA	Tj (max) = 150 ℃ Pd = 24.1 mW Tch = Tl + ((θj-l) × Pd) = 102.9 ℃ D.F. = 68.6 %	θj-l = 20.0 ℃/W ΔTl = 52.4 ℃	 Tl = 102.4 ℃
Z101 UDZV TE-17 16B ROHM	Tj (max) = 150 ℃ Pd = 4.6 mW Tj = Ta + ((θj-a) × Pd) = 92.8 ℃ D.F. = 61.9 %	θj-a = 625 ℃/W ΔTa = 39.9 ℃	 Ta = 89.9 ℃
PC102 PS2561DL (LED) RENESAS	Tj (max) = 125 ℃ Pd = 0.9 mW Tch = Tc + ((θj-c) × Pd) = 81.9 ℃ D.F. = 65.5 %	θj-c = 150 ℃/W ΔTc = 31.8 ℃	 Tc = 81.8 ℃
PC102 PS2561DL (TRANSISTOR) RENESAS	Tj (max) = 125 ℃ Pc = 3.1 mW Tch = Tc + ((θj-c) × Pc) = 82.3 ℃ D.F. = 65.8 %	θj-c = 150 ℃/W ΔTc = 31.8 ℃	 Tc = 81.8 ℃
PD51 SEL2410G SANKEN	 I_F=3.0mA Allowable I_F(max)= 11.3mA(at Ta= 66.5℃) D.F. = 26.5 %	 ΔTa = 16.5 ℃	 Ta = 66.5 ℃

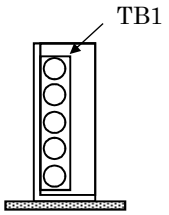
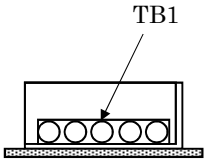
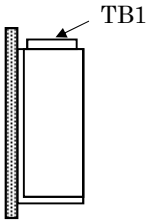
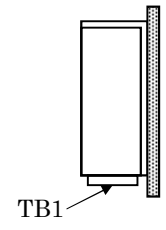
部品番号 Location No.	Vin = 200VAC	Load = 100%	Ta = 50℃
Q1 R6009ENX ROHM	Tj (max) = 150 ℃ Pch = 1.35 W Tch = Tc + ((θj-c) × Pch) = 93.6 ℃ D.F. = 62.4 %	θj-c = 3.13 ℃/W ΔTc = 39.4 ℃	Tc = 89.4 ℃
Q2 R6009ENX ROHM	Tj (max) = 150 ℃ Pch = 1.22 W Tch = Tc + ((θj-c) × Pch) = 98.8 ℃ D.F. = 65.9 %	θj-c = 3.13 ℃/W ΔTc = 45.0 ℃	Tc = 95.0 ℃
Q51 IPA057N08N3 G INFINEON	Tj (max) = 175 ℃ Pch = 1.40 W Tch = Tc + ((θj-c) × Pch) = 93.5 ℃ D.F. = 53.4 %	θj-c = 3.8 ℃/W ΔTc = 38.2 ℃	Tc = 88.2 ℃
Q101 2SC3928A ISAHAYA	Tj (max) = 150 ℃ Pc = 0.1 mW Tj = Ta + ((θj-a) × Pc) = 81.9 ℃ D.F. = 54.6 %	θj-a = 625 ℃/W ΔTa = 31.8 ℃	Ta = 81.8 ℃
Q201 2SA1298 TOSHIBA	Tj (max) = 150 ℃ Pc = 0.01 W Tj = Ta + ((θj-a) × Pc) = 106.3 ℃ D.F. = 70.9 %	θj-a = 625 ℃/W ΔTa = 50.0 ℃	Ta = 100.0 ℃
Q202 2SC2873 TOSHIBA	Tj (max) = 150 ℃ Pc = 0.03 W Tj = Ta + ((θj-a) × Pc) = 106.5 ℃ D.F. = 71.0 %	θj-a = 250 ℃/W ΔTa = 49.0 ℃	Ta = 99.0 ℃
D1 KBJ406G LITE-ON	Tj (max) = 150 ℃ Pd = 0.69 W Tch = Tc + ((θj-c) × Pd) = 86.8 ℃ D.F. = 57.9 %	θj-c = 5.5 ℃/W ΔTc = 33.0 ℃	Tc = 83.0 ℃
D2 S2L60 SHINDENGEN	Tj (max) = 150 ℃ Pd = 0.52 W Tch = Tl + ((θj-l) × Pd) = 96.4 ℃ D.F. = 64.3 %	θj-l = 12.0 ℃/W ΔTl = 40.2 ℃	Tl = 90.2 ℃
D104 CRH01 TOSHIBA	Tj (max) = 150 ℃ Pd = 2.8 mW Tch = Tl + ((θj-l) × Pd) = 81.5 ℃ D.F. = 54.3 %	θj-l = 30.0 ℃/W ΔTl = 31.4 ℃	Tl = 81.4 ℃
D105 CRH01 TOSHIBA	Tj (max) = 150 ℃ Pd = 2.8 mW Tch = Tl + ((θj-l) × Pd) = 81.9 ℃ D.F. = 54.6 %	θj-l = 30.0 ℃/W ΔTl = 31.8 ℃	Tl = 81.8 ℃
D106 LN1F60 SHINDENGEN	Tj (max) = 150 ℃ Pd = 0.33 W Tch = Tl + ((θj-l) × Pd) = 107.7 ℃ D.F. = 71.8 %	θj-l = 23.0 ℃/W ΔTl = 50.1 ℃	Tl = 100.1 ℃

部品番号 Location No.	Vin = 200VAC	Load = 100%	Ta = 50℃
D109 CRH01 TOSHIBA	Tj (max) = 150 ℃ Pd = 11.1 mW Tch = Tl + ((θj-l) × Pd) = 90.7 ℃ D.F. = 60.5 %	θj-l = 30.0 ℃/W ΔTl = 40.4 ℃	 Tl = 90.4 ℃
D110 CRH01 TOSHIBA	Tj (max) = 150 ℃ Pd = 1.6 mW Tch = Tl + ((θj-l) × Pd) = 90.4 ℃ D.F. = 60.3 %	θj-l = 30.0 ℃/W ΔTl = 40.4 ℃	 Tl = 90.4 ℃
D201 CRH01 TOSHIBA	Tj (max) = 150 ℃ Pd = 1.4 mW Tch = Tl + ((θj-l) × Pd) = 99.0 ℃ D.F. = 66.0 %	θj-l = 30.0 ℃/W ΔTl = 49.0 ℃	 Tl = 99.0 ℃
D203 CRS04 TOSHIBA	Tj (max) = 150 ℃ Pd = 24.1 mW Tch = Tl + ((θj-l) × Pd) = 100.5 ℃ D.F. = 67.0 %	θj-l = 20.0 ℃/W ΔTl = 50.0 ℃	 Tl = 100.0 ℃
Z101 UDZV TE-17 16B ROHM	Tj (max) = 150 ℃ Pd = 4.6 mW Tj = Ta + ((θj-a) × Pd) = 84.7 ℃ D.F. = 56.5 %	θj-a = 625 ℃/W ΔTa = 31.8 ℃	 Ta = 81.8 ℃
PC102 PS2561DL (LED) RENESAS	Tj (max) = 125 ℃ Pd = 0.9 mW Tch = Tc + ((θj-c) × Pd) = 77.1 ℃ D.F. = 61.7 %	θj-c = 150 ℃/W ΔTc = 27.0 ℃	 Tc = 77.0 ℃
PC102 PS2561DL (TRANSISTOR) RENESAS	Tj (max) = 125 ℃ Pc = 3.1 mW Tch = Tc + ((θj-c) × Pc) = 77.5 ℃ D.F. = 62.0 %	θj-c = 150 ℃/W ΔTc = 27.0 ℃	 Tc = 77.0 ℃
PD51 SEL2410G SANKEN	 I_F=3.0mA Allowable I_F(max)= 11.8mA(at Ta= 65.5℃) D.F. = 25.4 %	 ΔTa = 15.5 ℃	 Ta = 65.5 ℃

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

MODEL : HWS50A-5

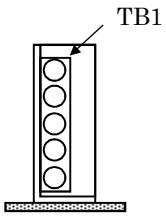
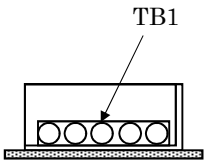
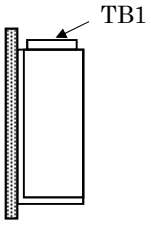
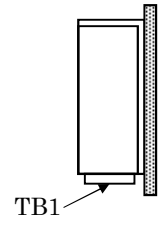
(1) 測定条件 Measuring Conditions

	Mounting A	Mounting B	Mounting C	Mounting D
取付方法 Mounting Method (標準取付 : A) (Standard Mounting : A)				
入力電圧 Vin Input Voltage	100VAC			
出力電圧 Vo Output Voltage	5VDC			
出力電流 Io Output Current	10A(100%)			

(2) 測定結果 Measuring Results

		ΔT Temperature Rise (℃)			
出力ディレーティング Output Derating		Io=100 %			
		Ta=50℃	Ta=50℃	Ta=45℃	Ta=50℃
部品番号	部品名	取付方向	取付方向	取付方向	取付方向
Location No.	Part name	Mounting A	Mounting B	Mounting C	Mounting D
Q1	MOS FET	51.5	51.3	52.1	57.0
Q2	MOS FET	52.6	51.6	54.2	57.7
Q51	MOS FET	41.8	39.0	45.8	40.0
D1	BRIDGE DIODE	50.5	52.3	54.9	50.9
D2	DIODE	49.0	47.8	49.0	54.6
A101	CHIP IC	43.8	45.8	45.1	47.4
A102	CHIP IC	42.6	29.1	38.0	39.9
A103	CHIP IC	42.8	31.2	36.8	41.9
A201	CHIP IC	45.6	44.4	56.2	45.8
T1	TRANS	51.5	45.6	55.9	49.5
T51	TRANS	43.8	43.0	55.1	47.1
L1	BALUN	30.4	29.8	39.5	27.4
L2	BALUN	47.6	43.1	54.4	40.4
L3	CHOKE COIL	42.8	47.2	43.2	47.0
L51	CHOKE COIL	32.2	28.6	39.9	29.0
C6	E.CAP.	32.7	36.9	36.6	40.2
C52	E.CAP.	19.3	20.9	29.2	19.5
PC102	PHOTO COUPLER	31.8	30.2	39.0	29.8
PD51	LED	16.5	13.5	32.4	13.4

(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 Vin Input Voltage	200VAC			
出力電圧 Vo Output Voltage	5VDC			
出力電流 Io Output Current	10A(100%)			

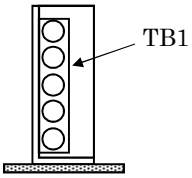
(2) 測定結果 Measuring Results

		ΔT Temperature Rise (℃)			
出力ディレーティング Output Derating		Io=100 %			
		Ta=50℃	Ta=50℃	Ta=45℃	Ta=50℃
部品番号	部品名	取付方向	取付方向	取付方向	取付方向
Location No.	Part name	Mounting A	Mounting B	Mounting C	Mounting D
Q1	MOS FET	39.4	41.4	41.2	46.0
Q2	MOS FET	45.0	45.6	47.4	50.7
Q51	MOS FET	38.2	36.3	42.2	37.0
D1	BRIDGE DIODE	33.0	34.2	36.9	32.6
D2	DIODE	40.2	40.4	40.9	45.8
A101	CHIP IC	35.5	38.0	37.4	39.3
A102	CHIP IC	37.4	26.7	34.3	36.2
A103	CHIP IC	37.5	28.6	33.4	37.8
A201	CHIP IC	43.0	43.2	53.2	43.9
T1	TRANS	48.1	43.5	52.9	47.5
T51	TRANS	40.9	41.3	52.0	45.0
L1	BALUN	18.4	18.1	25.4	16.5
L2	BALUN	30.3	26.0	36.1	23.7
L3	CHOKE COIL	29.7	34.1	31.0	33.0
L51	CHOKE COIL	30.9	28.5	38.2	27.9
C6	E.CAP.	26.6	31.3	31.0	34.2
C52	E.CAP.	17.8	20.4	26.4	17.9
PC102	PHOTO COUPLER	27.0	27.2	34.3	26.7
PD51	LED	15.5	13.1	30.1	12.8

MODEL : HWS50A

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

取付方向 A
Mounting A

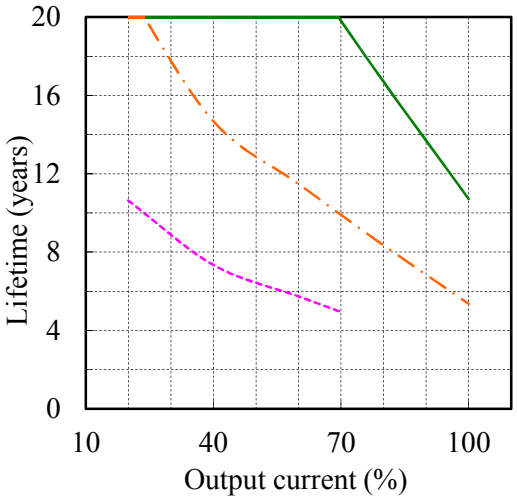


Conditions　Ta　40℃ :
50℃ :
60℃ :

5V

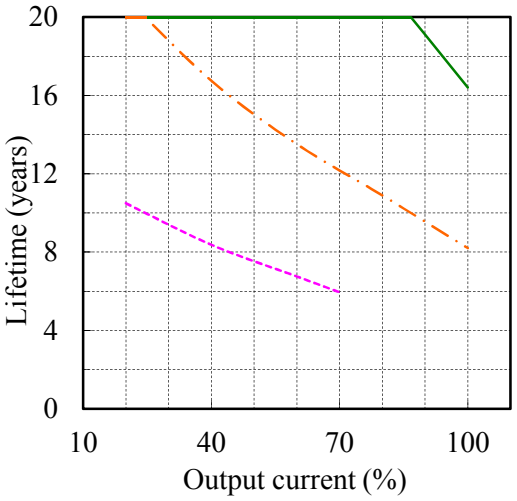
Vin = 100VAC

Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	20.0	10.6
40%	20.0	14.7	7.3
60%	20.0	11.5	5.7
80%	16.7	8.3	-
100%	10.7	5.4	-



Vin = 200VAC

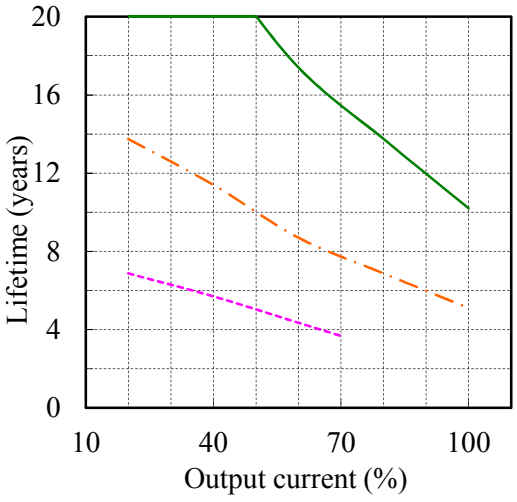
Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	20.0	10.5
40%	20.0	16.7	8.4
60%	20.0	13.5	6.8
80%	20.0	10.9	-
100%	16.4	8.2	-



24V

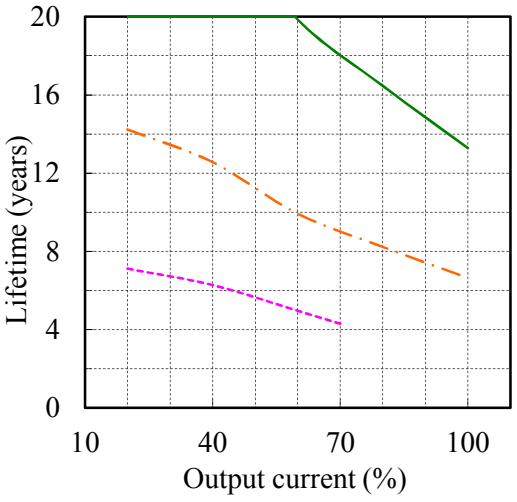
Vin = 100VAC

Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	13.7	6.9
40%	20.0	11.4	5.7
60%	17.4	8.7	4.3
80%	13.7	6.9	-
100%	10.2	5.1	-



Vin = 200VAC

Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	14.2	7.1
40%	20.0	12.6	6.3
60%	19.8	9.9	5.0
80%	16.5	8.2	-
100%	13.3	6.6	-

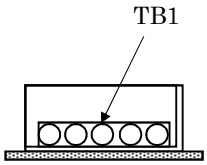


上記推定寿命は、弊社計算方法により算出した値であり、封口ｺﾞﾑの劣化等の影響を含めておりません。
The lifetime is calculated based on our method and doesn't include the seal rubber degradation effect etc.

MODEL : HWS50A

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

取付方向 B
Mounting B

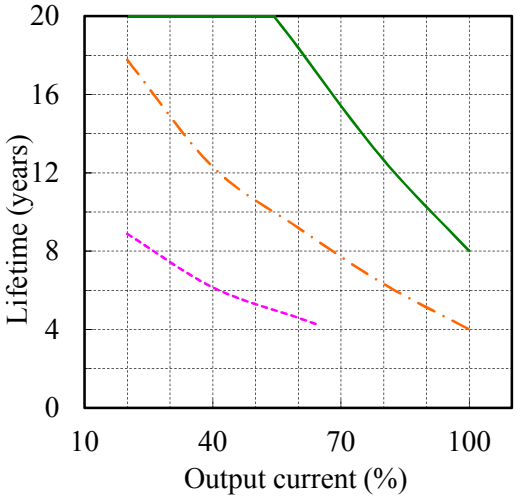


Conditions　Ta　40℃ :
50℃ :
60℃ :

5V

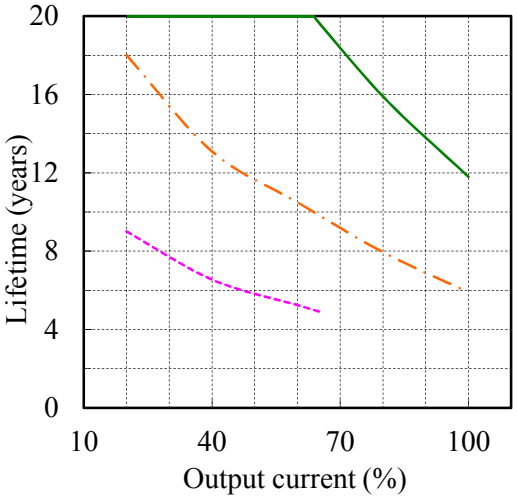
Vin = 100VAC

Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	17.8	8.9
40%	20.0	12.3	6.2
60%	18.4	9.2	4.6
80%	12.6	6.3	-
100%	8.0	4.0	-



Vin = 200VAC

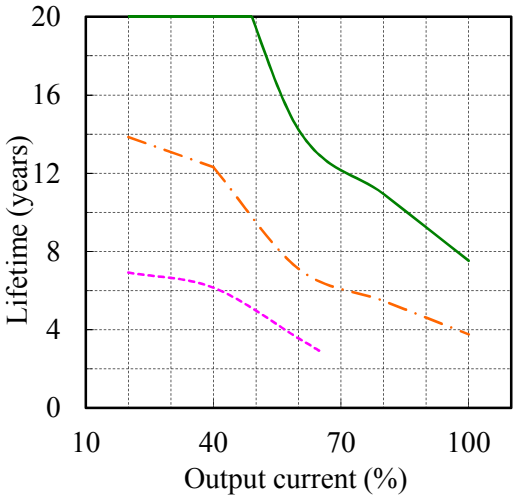
Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	18.0	9.0
40%	20.0	13.1	6.5
60%	20.0	10.5	5.2
80%	15.9	8.0	-
100%	11.8	5.9	-



24V

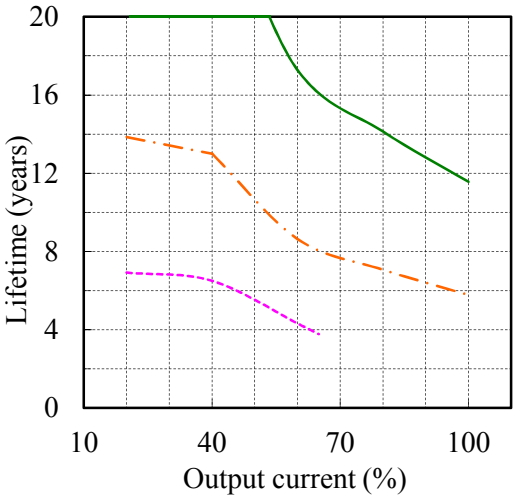
Vin = 100VAC

Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	13.8	6.9
40%	20.0	12.3	6.2
60%	14.2	7.1	3.6
80%	10.9	5.5	-
100%	7.5	3.8	-



Vin = 200VAC

Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	13.8	6.9
40%	20.0	13.0	6.5
60%	17.3	8.6	4.3
80%	14.1	7.1	-
100%	11.6	5.8	-

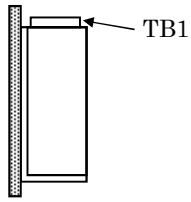


上記推定寿命は、弊社計算方法により算出した値であり、封口ｺﾞﾑの劣化等の影響を含めておりません。
The lifetime is calculated based on our method and doesn't include the seal rubber degradation effect etc.

MODEL : HWS50A

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

取付方向 C
Mounting C

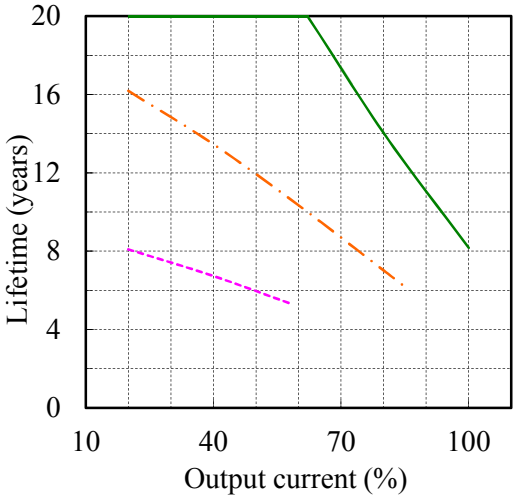


Conditions　Ta　40℃ :
50℃ :
60℃ :

5V

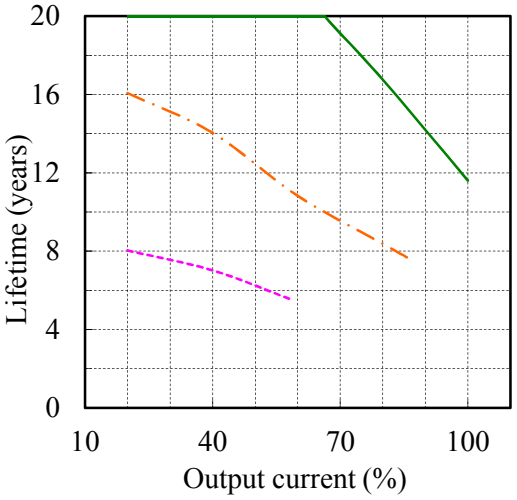
Vin = 100VAC

Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	16.2	8.1
40%	20.0	13.5	6.7
60%	20.0	10.3	-
80%	14.0	7.0	-
100%	8.2	-	-



Vin = 200VAC

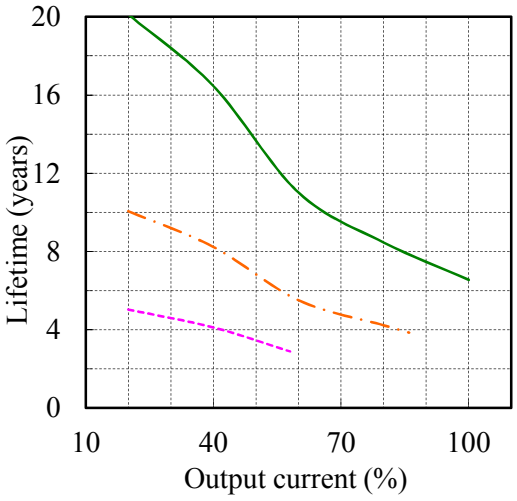
Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	16.1	8.0
40%	20.0	14.0	7.0
60%	20.0	10.8	-
80%	16.8	8.4	-
100%	11.6	-	-



24V

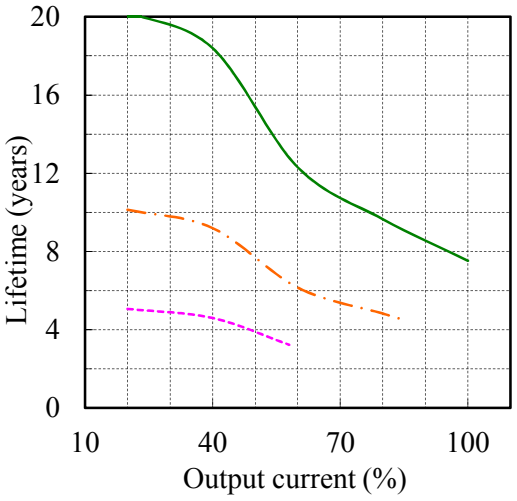
Vin = 100VAC

Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	10.1	5.0
40%	16.5	8.2	4.1
60%	11.0	5.5	-
80%	8.5	4.2	-
100%	6.5	-	-



Vin = 200VAC

Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	10.1	5.1
40%	18.4	9.2	4.6
60%	12.3	6.2	-
80%	9.7	4.8	-
100%	7.5	-	-

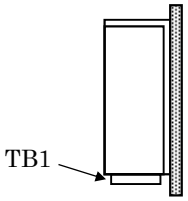


上記推定寿命は、弊社計算方法により算出した値であり、封口ｺﾞﾑの劣化等の影響を含めておりません。
The lifetime is calculated based on our method and doesn't include the seal rubber degradation effect etc.

MODEL : HWS50A

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

取付方向 D
Mounting D

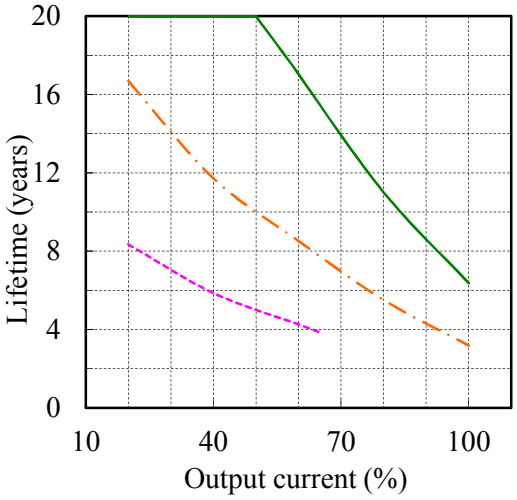


Conditions　Ta　40℃ :
50℃ :
60℃ :

5V

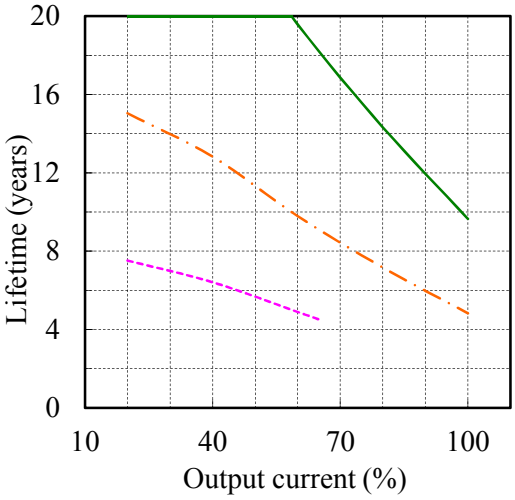
Vin = 100VAC

Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	16.7	8.3
40%	20.0	11.7	5.9
60%	17.0	8.5	4.3
80%	11.0	5.5	-
100%	6.4	3.2	-



Vin = 200VAC

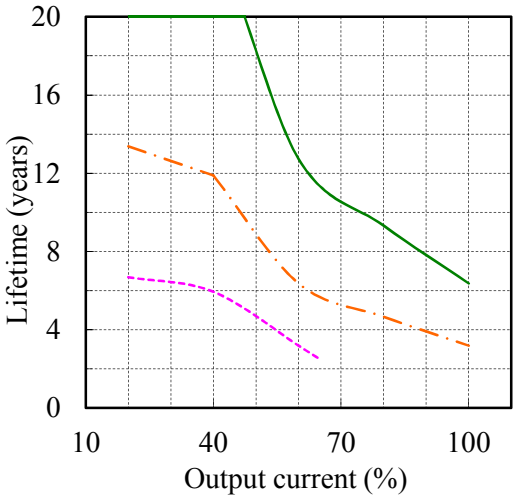
Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	15.0	7.5
40%	20.0	12.8	6.4
60%	19.6	9.8	4.9
80%	14.3	7.2	-
100%	9.7	4.8	-



24V

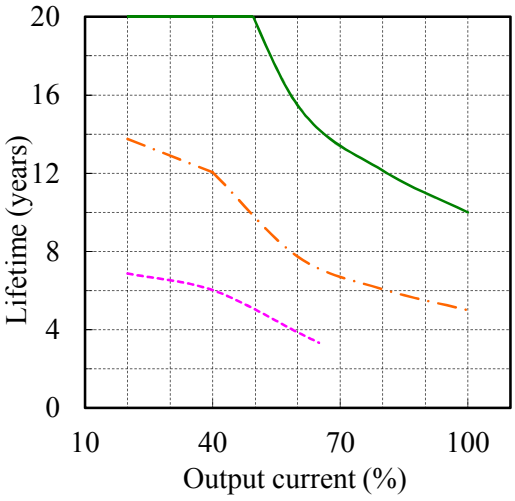
Vin = 100VAC

Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	13.4	6.7
40%	20.0	11.9	5.9
60%	12.7	6.4	3.2
80%	9.3	4.7	-
100%	6.4	3.2	-



Vin = 200VAC

Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	13.7	6.9
40%	20.0	12.1	6.0
60%	15.5	7.7	3.9
80%	12.1	6.1	-
100%	10.0	5.0	-

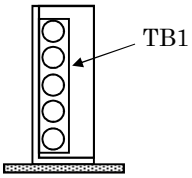


上記推定寿命は、弊社計算方法により算出した値であり、封口ｺﾞﾑの劣化等の影響を含めておりません。
The lifetime is calculated based on our method and doesn't include the seal rubber degradation effect etc.

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 A
Mounting A

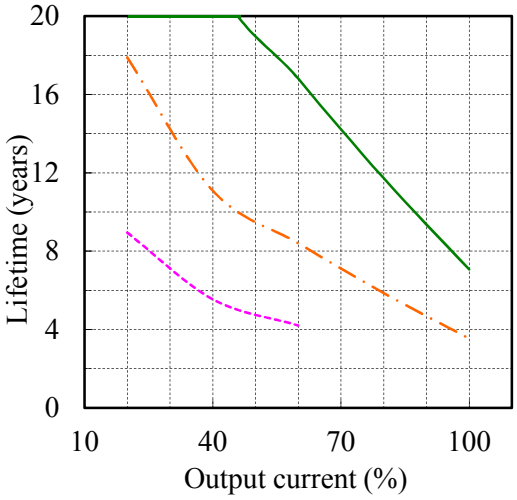


Conditions Ta 40℃ :
50℃ :
60℃ :

5V

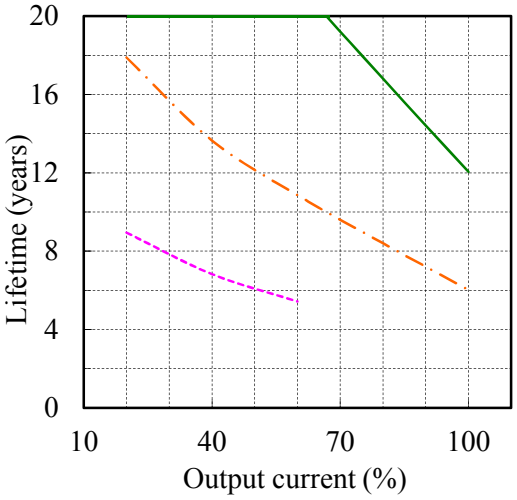
Vin = 100VAC

Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	17.9	8.9
40%	20.0	11.1	5.5
60%	16.8	8.4	4.2
80%	11.7	5.9	-
100%	7.1	3.5	-



Vin = 200VAC

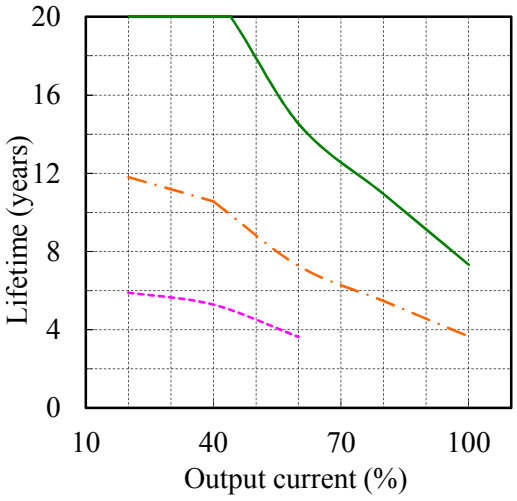
Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	17.9	8.9
40%	20.0	13.7	6.8
60%	20.0	10.9	5.4
80%	16.8	8.4	-
100%	12.1	6.0	-



24V

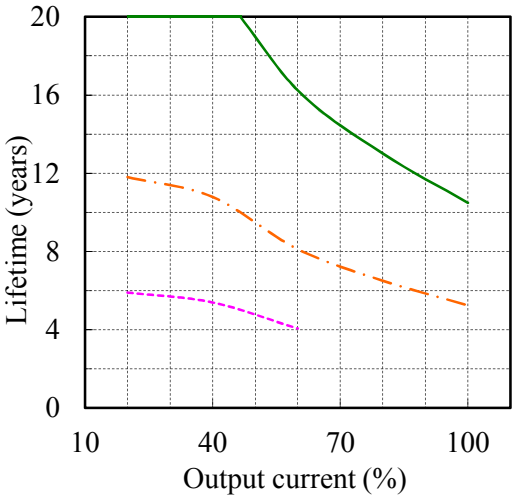
Vin = 100VAC

Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	11.8	5.9
40%	20.0	10.6	5.3
60%	14.5	7.3	3.6
80%	10.9	5.5	-
100%	7.3	3.7	-



Vin = 200VAC

Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	11.8	5.9
40%	20.0	10.8	5.4
60%	16.2	8.1	4.1
80%	13.0	6.5	-
100%	10.5	5.2	-

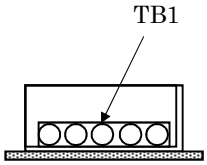


上記推定寿命は、弊社計算方法により算出した値であり、封口ｺﾞﾑの劣化等の影響を含めておりません。
The lifetime is calculated based on our method and doesn't include the seal rubber degradation effect etc.

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

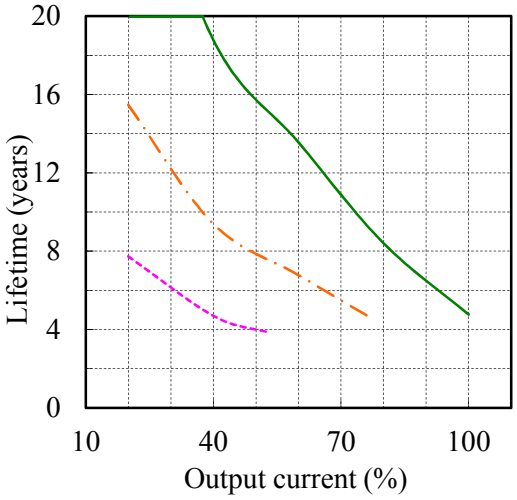


Conditions Ta 40℃ :
50℃ :
60℃ :

5V

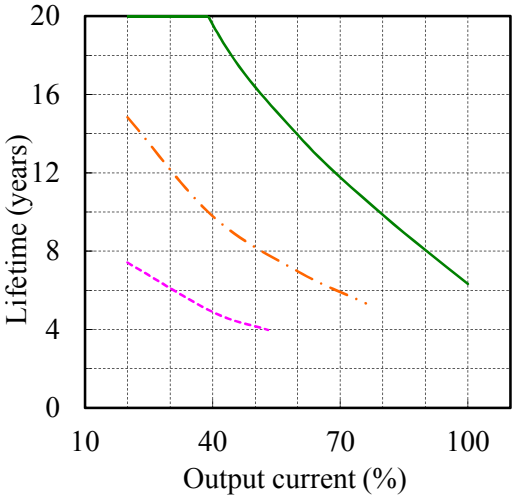
Vin = 100VAC

Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	15.5	7.7
40%	18.8	9.4	4.7
60%	13.6	6.8	-
80%	8.4	-	-
100%	4.8	-	-



Vin = 200VAC

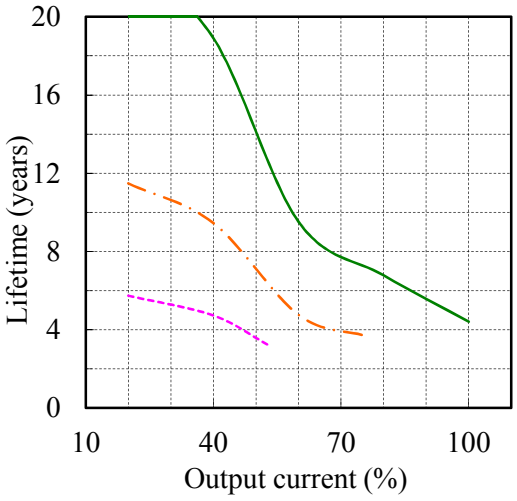
Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	14.8	7.4
40%	19.6	9.8	4.9
60%	13.9	7.0	-
80%	9.9	-	-
100%	6.3	-	-



24V

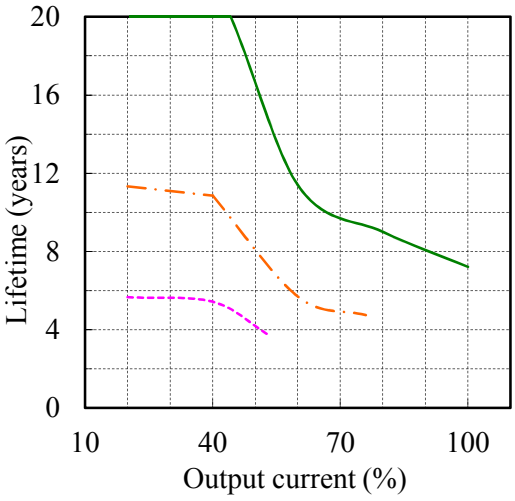
Vin = 100VAC

Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	11.5	5.7
40%	18.9	9.5	4.7
60%	9.5	4.8	-
80%	6.8	-	-
100%	4.4	-	-



Vin = 200VAC

Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	11.3	5.7
40%	20.0	10.9	5.4
60%	11.4	5.7	-
80%	9.0	-	-
100%	7.2	-	-

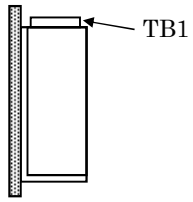


上記推定寿命は、弊社計算方法により算出した値であり、封口ｺﾞﾑの劣化等の影響を含めておりません。
The lifetime is calculated based on our method and doesn't include the seal rubber degradation effect etc.

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 C
Mounting C

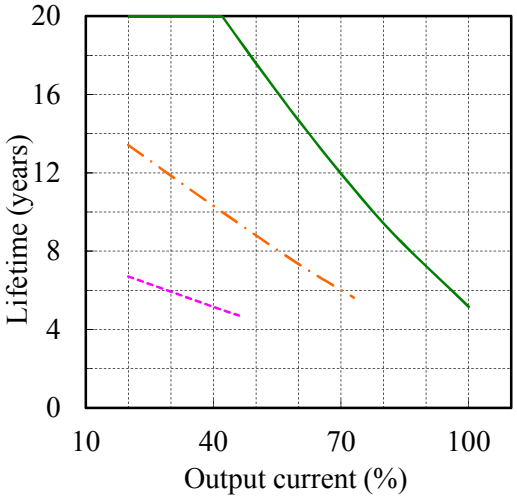


Conditions Ta 40℃ :
50℃ :
60℃ :

5V

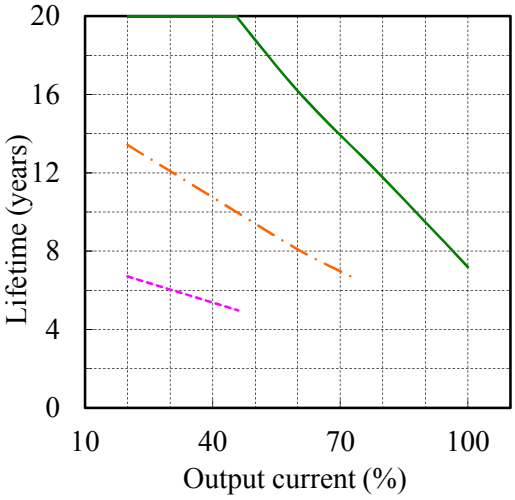
Vin = 100VAC

Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	13.4	6.7
40%	20.0	10.3	5.2
60%	14.7	7.3	-
80%	9.4	-	-
100%	5.2	-	-



Vin = 200VAC

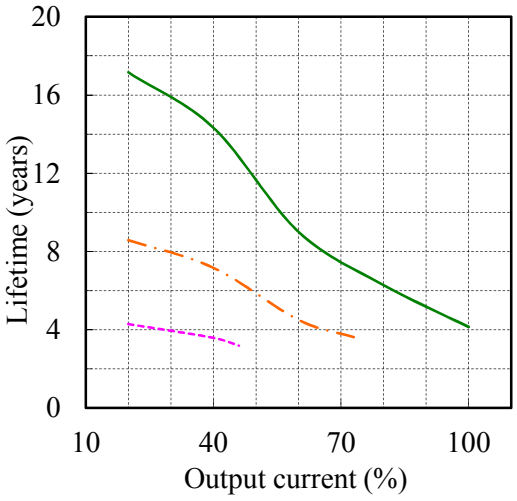
Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	13.4	6.7
40%	20.0	10.8	5.4
60%	16.2	8.1	-
80%	11.8	-	-
100%	7.2	-	-



24V

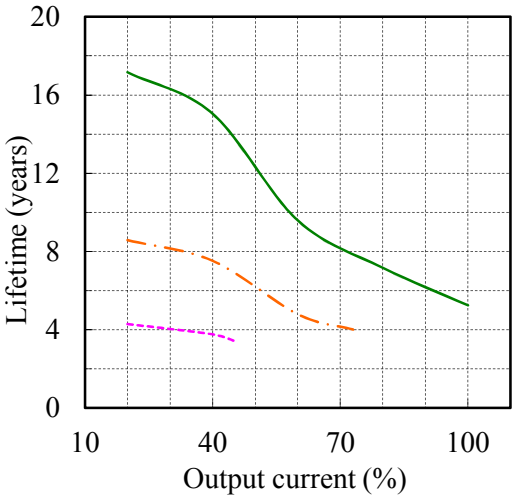
Vin = 100VAC

Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	17.2	8.6	4.3
40%	14.3	7.2	3.6
60%	9.0	4.5	-
80%	6.3	-	-
100%	4.1	-	-



Vin = 200VAC

Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	17.2	8.6	4.3
40%	15.0	7.5	3.8
60%	9.6	4.8	-
80%	7.2	-	-
100%	5.2	-	-

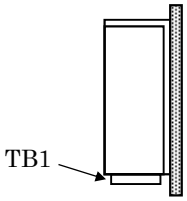


上記推定寿命は、弊社計算方法により算出した値であり、封口ｺﾞﾑの劣化等の影響を含めておりません。
The lifetime is calculated based on our method and doesn't include the seal rubber degradation effect etc.

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

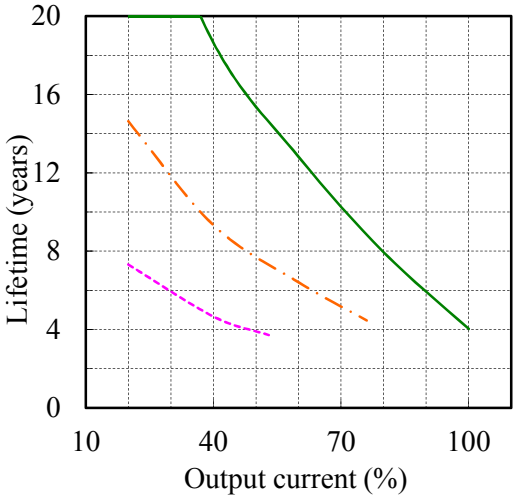


Conditions Ta 40℃ :
50℃ :
60℃ :

5V

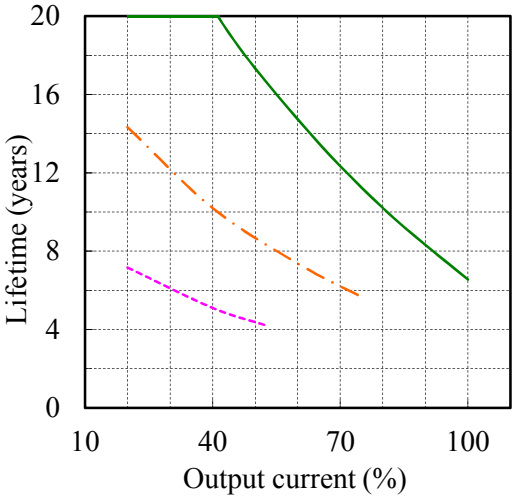
Vin = 100VAC

Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	14.6	7.3
40%	18.6	9.3	4.7
60%	12.8	6.4	-
80%	8.0	-	-
100%	4.0	-	-



Vin = 200VAC

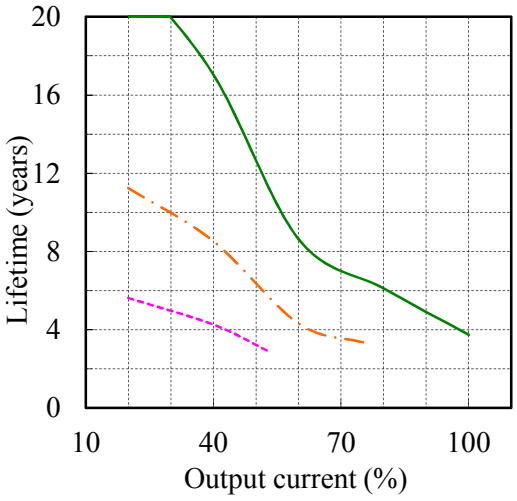
Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	14.3	7.2
40%	20.0	10.2	5.1
60%	14.7	7.4	-
80%	10.2	-	-
100%	6.5	-	-



24V

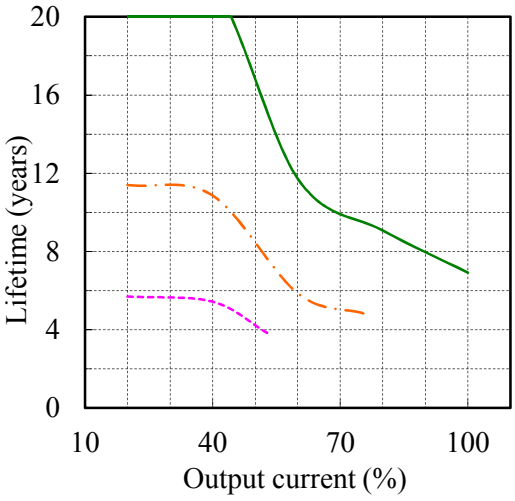
Vin = 100VAC

Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	11.2	5.6
40%	17.0	8.5	4.3
60%	8.6	4.3	-
80%	6.1	-	-
100%	3.7	-	-



Vin = 200VAC

Load \ Ta	Lifetime (years) 40℃	50℃	60℃
20%	20.0	11.4	5.7
40%	20.0	10.9	5.4
60%	11.7	5.9	-
80%	9.1	-	-
100%	6.9	-	-



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.

５．アブノーマル試験　Abnormal Test

MODEL : HWS50A-5

(1) 試験条件　Test Conditions

Input : 265VAC　Output : 5V, 10A　Ta : 25℃

(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	○							○	○			○			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	○							○	○			○			Da:Q2,Z103	
8		D-G	○							○	○			○			Da:Q2,A103,Z103	
9		G-S	○											○				
10		D		○										○				
11		S		○										○				
12		G		○						○	○			○			Da:Q2,Z103	
13	Q51	D-S	○													○	間欠発振動作 Hiccup	
14		D-G	○											○				
15		G-S	○													○	入力電力増加 Input power increase	
16		D		○										○				
17		S		○										○				
18		G		○												○	入力電力増加 Input power increase	
19	C6		○								○			○				
20				○										○				
21	C52		○											○				
22				○												○	出力リップル大 Output ripple increase	

(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	
23	D1	AC-AC	○									○		○				
24		DC-DC	○									○		○				
25		AC-DC	○									○		○				
26		AC		○										○				
27		DC		○										○				
28	D2	A-K	○							○	○			○			Da:Q1	
29		A/K		○						○	○			○			Da:Q1	
30	D106	A-K	○													○	入力電力増加 Input power increase	
31		A/K		○												○	入力電力増加 Input power increase	
32	T1	1-3	○											○				
33		5-6	○													○	間欠発振動作 Hiccup	
34		9,10-11,12	○											○				
35		7-8	○													○	間欠発振動作 Hiccup	
36		1/3		○										○				
37		5/6		○										○				
38		9,10/11,12		○										○				
39		7/8		○												○	入力電力増加 Input power increase	
40	T51	7-8	○													○	入力電力増加 Input power increase	
41		1-2	○													○	入力電力増加 Input power increase	
42		7/8		○										○				
43		1/2		○												○	入力電力増加 Input power increase	

６．振動試験 Vibration Test

MODEL：HWS50A-5

(1) 振動試験種類 Vibration Test Class

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

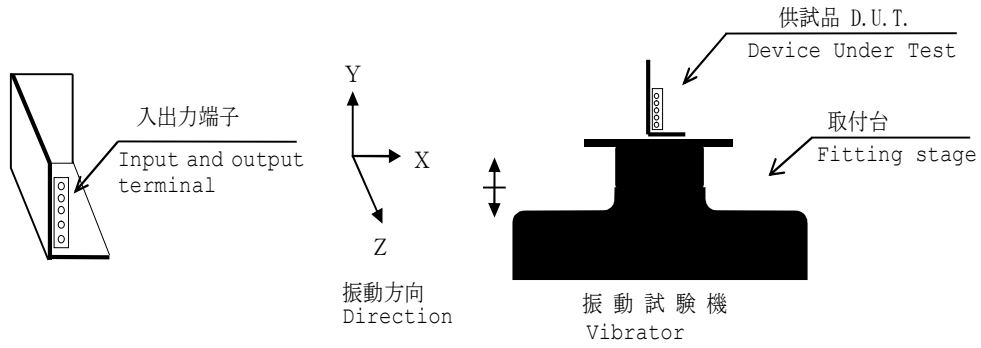
(2) 使用振動試験装置 Equipment Used

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.

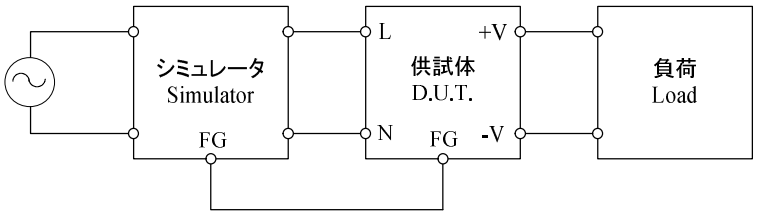
(6) 試験結果 Test Results

合格 OK

7. ノイズシミュレート試験 Noise Simulate Test

MODEL：HWS50A-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℃	・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

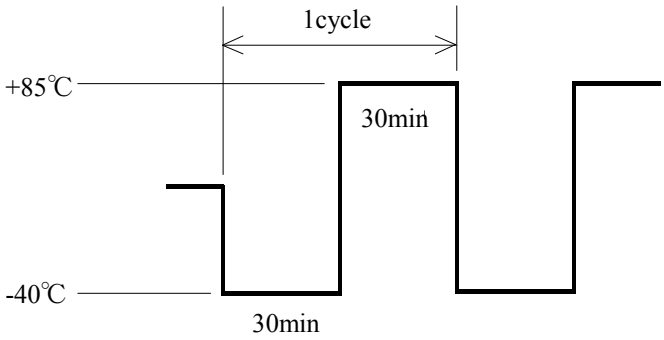
MODEL：HWS50A-5

(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℃ ⇔ 85℃
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