HWS100A/E_A

RELIABILITY DATA

信頼性データ

INDEX

* モデル名HWS100A/E_Aの「_(アンダーバー)」には端子台の方向を示すHまたはVが入ります。

試験結果は端子台の方向による影響はなく同等な特性を示します。

In the model name HWS100A/E_A, "_(under bar)" is replaced by H or V,

which indicates the direction of the terminal block.

Test results are not affected by the direction of the terminal block

and have nearly the same characteristics.

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 : HWS100A-24/E_A

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 prediction of Telcordia (*1).
Individual failure rate λ_{SS} is calculated by the electric stress and temperature rise of the each part.

*1: Telcordia document "Reliability Prediction Procedure for Electronic Equipment"
(Document number SR-332,Issue3)

<算出式>

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

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

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
- ・出力電圧、電流 : 24VDC, 4.5A (100%)
  Output voltage & current
- ・環境ファクタ : GB (Ground, Benign)
  Environmental factor
  SR-332,Issue3
- ・取付方法 : 標準取付 A
  Mounting method : Standard mounting A

MTBF(Ta=25℃) ≒ 3,146,792 時間 (Hours)

MTBF(Ta=40℃) ≒ 1,456,628 時間 (Hours)

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

MODEL ： HWS100A-24/E_A

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>

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

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 ≒ 243,290 時間 (Hours)

2. 部品ディレーティング Components Derating

MODEL : HWS100A-24/E_A

(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 : 24V, 4.5A(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

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

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

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

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

部品番号 Location No.	Vin = 100VAC Load = 100% Ta = 50^{o}C
Q1 TK16A60W,S4VX TOSHIBA	Tj (max) = 150 ^{o}C θj-c = 3.13 ^{o}C/W Pch = 0.90 W ΔTc = 57.7 ^{o}C Tc = 107.7 ^{o}C Tch = Tc + ((θj-c) × Pch) = 110.5 ^{o}C D.F. = 73.7 %
Q2 TK8A50D TOSHIBA	Tj (max) = 150 ^{o}C θj-c = 3.125 ^{o}C/W Pch = 0.89 W ΔTc = 63.6 ^{o}C Tc = 113.6 ^{o}C Tch = Tc + ((θj-c) × Pch) = 116.4 ^{o}C D.F. = 77.6 %
Q3 TK8A50D TOSHIBA	Tj (max) = 150 ^{o}C θj-c = 3.125 ^{o}C/W Pch = 1.02 W ΔTc = 62.6 ^{o}C Tc = 112.6 ^{o}C Tch = Tc + ((θj-c) × Pch) = 115.8 ^{o}C D.F. = 77.2 %
Q101 2SC3928A ISAHAYA	Tj (max) = 150 ^{o}C θj-c = 625.0 ^{o}C/W Pc = 0.1 mW ΔTc = 47.8 ^{o}C Tc = 97.8 ^{o}C Tch = Tc + ((θj-c) × Pc) = 97.9 ^{o}C D.F. = 65.3 %
Q104 2SA2167 ISAHAYA	Tj (max) = 150 ^{o}C θj-c = 250.0 ^{o}C/W Pc = 13.2 mW ΔTc = 53.4 ^{o}C Tc = 103.4 ^{o}C Tch = Tc + ((θj-c) × Pc) = 106.7 ^{o}C D.F. = 71.1 %
D1 KBJ1006G LITE-ON	Tj (max) = 150 ^{o}C θj-c = 2.0 ^{o}C/W Pd = 2.60 W ΔTc = 65.5 ^{o}C Tc = 115.5 ^{o}C Tch = Tc + ((θj-c) × Pd) = 120.7 ^{o}C D.F. = 80.5 %
D2 RFU5TF6S ROHM	Tj (max) = 150 ^{o}C θj-c = 4.0 ^{o}C/W Pd = 0.62 W ΔTc = 58.6 ^{o}C Tc = 108.6 ^{o}C Tch = Tc + ((θj-c) × Pd) = 111.1 ^{o}C D.F. = 74.1 %
D51 FCH10A15 KYOCERA	Tj (max) = 150 ^{o}C θj-c = 3 ^{o}C/W Pch = 1.17 W ΔTc = 45.8 ^{o}C Tc = 95.8 ^{o}C Tch = Tc + ((θj-c) × Pch) = 99.3 ^{o}C D.F. = 66.2 %
D52 FCH10A15 KYOCERA	Tj (max) = 150 ^{o}C θj-c = 3 ^{o}C/W Pch = 2.79 W ΔTc = 46.6 ^{o}C Tc = 96.6 ^{o}C Tch = Tc + ((θj-c) × Pch) = 105.0 ^{o}C D.F. = 70.0 %
D104 CRH01 TOSHIBA	Tj (max) = 150 ^{o}C θj-l = 30.0 ^{o}C/W Pd = 2.8 mW ΔTl = 46.2 ^{o}C Tl = 96.2 ^{o}C Tch = Tl + ((θj-l) × Pd) = 96.3 ^{o}C D.F. = 64.2 %
D105 CRH01 TOSHIBA	Tj (max) = 150 ^{o}C θj-l = 30.0 ^{o}C/W Pd = 2.8 mW ΔTl = 46.1 ^{o}C Tl = 96.1 ^{o}C Tch = Tl + ((θj-l) × Pd) = 96.2 ^{o}C D.F. = 64.1 %

部品番号 Location No.	Vin = 100VAC Load = 100% Ta = 50°C		
D106 CRS04 TOSHIBA	Tj (max) = 150 °C Pd = 19.2 mW Tch = Tl + ((θj-l) × Pd) = 102.8 °C D.F. = 68.5 %	θj-l = 20.0 °C/W ΔTl = 52.4 °C	 Tl = 102.4 °C
D107・D109 LN1F60 SHINDENGEN	Tj (max) = 150 °C Pd = 9.6 mW Tch = Tl + ((θj-l) × Pd) = 105.2 °C D.F. = 70.1 %	θj-l = 23.0 °C/W ΔTl = 55.0 °C	 Tl = 105.0 °C
D112・D113 CRH01 TOSHIBA	Tj (max) = 150 °C Pd = 2.8 mW Tch = Tl + ((θj-l) × Pd) = 98.3 °C D.F. = 65.5 %	θj-l = 30.0 °C/W ΔTl = 48.2 °C	 Tl = 98.2 °C
D114 CRH01 TOSHIBA	Tj (max) = 150 °C Pd = 2.1 mW Tch = Tl + ((θj-l) × Pd) = 99.6 °C D.F. = 66.4 %	θj-l = 30.0 °C/W ΔTl = 49.5 °C	 Tl = 99.5 °C
Z101 UDZVTE-1713B ROHM	Tj (max) = 150 °C Pd = 1.43 mW Tch = Tc + ((θj-c) × Pd) = 96.7 °C D.F. = 64.5 %	θj-c = 625.0 °C/W ΔTc = 45.8 °C	 Tc = 95.8 °C
PC2 PS2561DL1 (LED) RENESAS	Tj (max) = 125 °C Pd = 1.2 mW Tch = Tc + ((θj-c) × Pd) = 84.9 °C D.F. = 67.9 %	θj-c = 150.0 °C/W ΔTc = 34.7 °C	 Tc = 84.7 °C
PC2 PS2561DL1 (TRANSISTOR) RENESAS	Tj (max) = 125 °C Pc = 2.1 mW Tch = Tc + ((θj-c) × Pc) = 85.0 °C D.F. = 68.0 %	θj-c = 150.0 °C/W ΔTc = 34.7 °C	 Tc = 84.7 °C
PD51 SEL2410G SANKEN	I_F = 5.0 mA Allowable I_F (max) = 11.8 mA (at Ta = 65.4°C) D.F. = 42.4 %	ΔTa = 15.4 °C	Ta = 65.4 °C

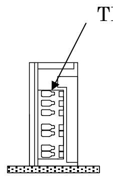
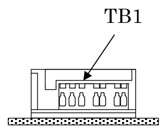
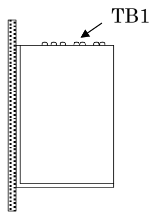
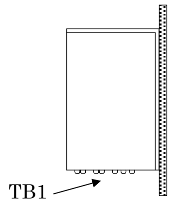
部品番号 Location No.	Vin = 200VAC Load = 100% Ta = 50^{o}C
Q1 TK16A60W,S4VX TOSHIBA	Tj (max) = 150 ^{o}C θj-c = 3.13 ^{o}C/W Pch = 0.61 W ΔTc = 47.2 ^{o}C Tc = 97.2 ^{o}C Tch = Tc + ((θj-c) × Pch) = 99.1 ^{o}C D.F. = 66.1 %
Q2 TK8A50D TOSHIBA	Tj (max) = 150 ^{o}C θj-c = 3.125 ^{o}C/W Pch = 0.89 W ΔTc = 55.6 ^{o}C Tc = 105.6 ^{o}C Tch = Tc + ((θj-c) × Pch) = 108.4 ^{o}C D.F. = 72.3 %
Q3 TK8A50D TOSHIBA	Tj (max) = 150 ^{o}C θj-c = 3.125 ^{o}C/W Pch = 1.02 W ΔTc = 54.9 ^{o}C Tc = 104.9 ^{o}C Tch = Tc + ((θj-c) × Pch) = 108.1 ^{o}C D.F. = 72.1 %
Q101 2SC3928A ISAHAYA	Tj (max) = 150 ^{o}C θj-c = 625.0 ^{o}C/W Pc = 0.1 mW ΔTc = 39.6 ^{o}C Tc = 89.6 ^{o}C Tch = Tc + ((θj-c) × Pc) = 89.7 ^{o}C D.F. = 59.8 %
Q104 2SA2167 ISAHAYA	Tj (max) = 150 ^{o}C θj-c = 250.0 ^{o}C/W Pc = 13.2 mW ΔTc = 47.4 ^{o}C Tc = 97.4 ^{o}C Tch = Tc + ((θj-c) × Pc) = 100.7 ^{o}C D.F. = 67.1 %
D1 KBJ1006G LITE-ON	Tj (max) = 150 ^{o}C θj-c = 2.0 ^{o}C/W Pd = 1.35 W ΔTc = 37.9 ^{o}C Tc = 87.9 ^{o}C Tch = Tc + ((θj-c) × Pd) = 90.6 ^{o}C D.F. = 60.4 %
D2 RFU5TF6S ROHM	Tj (max) = 150 ^{o}C θj-c = 4.0 ^{o}C/W Pd = 0.62 W ΔTc = 49.8 ^{o}C Tc = 99.8 ^{o}C Tch = Tc + ((θj-c) × Pd) = 102.3 ^{o}C D.F. = 68.2 %
D51 FCH10A15 KYOCERA	Tj (max) = 150 ^{o}C θj-c = 3 ^{o}C/W Pch = 1.17 W ΔTc = 42.6 ^{o}C Tc = 92.6 ^{o}C Tch = Tc + ((θj-c) × Pch) = 96.1 ^{o}C D.F. = 64.1 %
D52 FCH10A15 KYOCERA	Tj (max) = 150 ^{o}C θj-c = 3 ^{o}C/W Pch = 2.79 W ΔTc = 43.5 ^{o}C Tc = 93.5 ^{o}C Tch = Tc + ((θj-c) × Pch) = 101.9 ^{o}C D.F. = 67.9 %
D104 CRH01 TOSHIBA	Tj (max) = 150 ^{o}C θj-l = 30.0 ^{o}C/W Pd = 2.8 mW ΔTl = 38.1 ^{o}C Tl = 88.1 ^{o}C Tch = Tl + ((θj-l) × Pd) = 88.2 ^{o}C D.F. = 58.8 %
D105 CRH01 TOSHIBA	Tj (max) = 150 ^{o}C θj-l = 30.0 ^{o}C/W Pd = 2.8 mW ΔTl = 37.8 ^{o}C Tl = 87.8 ^{o}C Tch = Tl + ((θj-l) × Pd) = 87.9 ^{o}C D.F. = 58.6 %

部品番号 Location No.	Vin = 200VAC Load = 100% Ta = 50°C		
D106 CRS04 TOSHIBA	Tj (max) = 150 °C Pd = 19.2 mW Tch = Tl + ((θj-l) × Pd) = 97.0 °C D.F. = 64.7 %	θj-l = 20.0 °C/W ΔTl = 46.6 °C	 Tl = 96.6 °C
D107・D109 LN1F60 SHINDENGEN	Tj (max) = 150 °C Pd = 9.6 mW Tch = Tl + ((θj-l) × Pd) = 98.7 °C D.F. = 65.8 %	θj-l = 23.0 °C/W ΔTl = 48.5 °C	 Tl = 98.5 °C
D112・D113 CRH01 TOSHIBA	Tj (max) = 150 °C Pd = 2.8 mW Tch = Tl + ((θj-l) × Pd) = 92.2 °C D.F. = 61.5 %	θj-l = 30.0 °C/W ΔTl = 42.1 °C	 Tl = 92.1 °C
D114 CRH01 TOSHIBA	Tj (max) = 150 °C Pd = 2.1 mW Tch = Tl + ((θj-l) × Pd) = 93.8 °C D.F. = 62.5 %	θj-l = 30.0 °C/W ΔTl = 43.7 °C	 Tl = 93.7 °C
Z101 UDZVTE-1713B ROHM	Tj (max) = 150 °C Pd = 4.54 mW Tch = Tc + ((θj-c) × Pd) = 91.0 °C D.F. = 60.7 %	θj-c = 625.0 °C/W ΔTc = 38.2 °C	 Tc = 88.2 °C
PC2 PS2561DL1 (LED) RENESAS	Tj (max) = 125 °C Pd = 1.2 mW Tch = Tc + ((θj-c) × Pd) = 78.0 °C D.F. = 62.4 %	θj-c = 150.0 °C ΔTc = 27.8 °C	 Tc = 77.8 °C
PC2 PS2561DL1 (TRANSISTOR) RENESAS	Tj (max) = 125 °C Pc = 2.1 mW Tch = Tc + ((θj-c) × Pc) = 78.1 °C D.F. = 62.5 %	θj-c = 150.0 °C/W ΔTc = 27.8 °C	 Tc = 77.8 °C
PD51 SEL2410G SANKEN	 I_F = 5.0 mA Allowable I_F (max) = 12.4 mA (at Ta = 64.2°C) D.F. = 40.3 %	 ΔTa = 14.2 °C	 Ta = 64.2 °C

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

MODEL : HWS100A-24/E_A

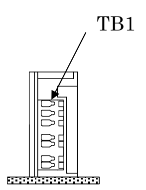
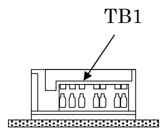
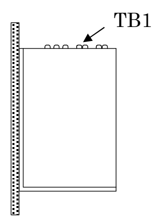
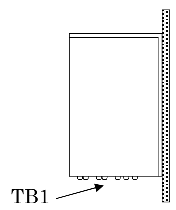
(1) 測定条件 Measuring Conditions

	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	24VDC			
出力電流 Io Output Current	4.5A(100%)			

(2) 測定結果 Measuring Results

		ΔT Temperature Rise (°C)			
出力ディレーティング Output Derating		Io=100 %			
		Ta=50°C	Ta=40°C	Ta=40°C	Ta=40°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	57.7	58.0	68.9	75.4
Q2	MOS FET	63.6	55.9	69.8	77.7
Q3	MOS FET	62.6	55.3	70.3	75.7
D1	BRIDGE DIODE	65.5	68.0	79.4	73.0
D2	DIODE	58.6	57.8	68.9	74.7
D51	DIODE	45.8	38.6	55.7	52.0
D52	DIODE	46.6	39.4	57.1	52.0
A101	CHIP IC	47.3	46.4	57.4	59.7
A102	CHIP IC	41.8	39.0	52.4	51.1
A201	CHIP IC	43.1	37.9	54.1	46.7
T1	DRIVE TRANS	43.2	41.3	46.4	51.5
T2	TRANS	61.0	57.8	70.8	67.4
L1	BALUN	47.4	52.1	69.0	54.2
L2	BALUN	48.0	55.2	63.8	61.0
L3	CHOKE COIL	55.8	64.2	68.7	70.7
L51	CHOKE COIL	53.4	48.3	62.2	52.6
C6	E.CAP.	41.0	38.0	46.0	58.9
C7	E.CAP.	40.2	34.3	44.2	56.6
C51	E.CAP.	20.8	18.6	39.1	24.2
PC2	PHOTO COUPLER	34.7	33.3	47.8	43.7
PD51	LED	15.4	10.1	42.2	15.9

(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	24VDC			
出力電流 Io Output Current	4.5A(100%)			

(2) 測定結果 Measuring Results

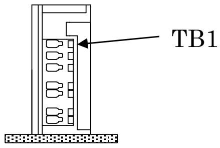
		ΔT Temperature Rise (°C)			
出力ディレーティング Output Derating		Io=100 %			
		Ta=50°C	Ta=40°C	Ta=40°C	Ta=40°C
部品番号 Location No.	部品名 Part name	取付方向 Mounting A	取付方向 Mounting B	取付方向 Mounting C	取付方向 Mounting D
Q1	MOS FET	47.2	47.4	57.0	61.5
Q2	MOS FET	55.6	49.6	61.6	68.0
Q3	MOS FET	54.9	49.0	62.1	66.4
D1	BRIDGE DIODE	37.9	39.3	50.6	45.2
D2	DIODE	49.8	49.2	58.9	63.0
D51	DIODE	42.6	36.6	51.4	48.5
D52	DIODE	43.5	37.6	53.0	48.8
A101	CHIP IC	39.3	38.8	48.7	50.2
A102	CHIP IC	35.5	34.0	45.6	44.7
A201	CHIP IC	38.7	35.5	49.4	43.3
T1	DRIVE TRANS	36.5	36.7	41.1	45.5
T2	TRANS	56.7	55.2	66.4	64.0
L1	BALUN	25.2	27.3	41.8	32.0
L2	BALUN	26.9	31.4	41.2	37.0
L3	CHOKE COIL	39.4	45.9	51.0	51.2
L51	CHOKE COIL	48.3	46.1	57.8	49.7
C6	E.CAP.	36.0	33.4	40.6	51.1
C7	E.CAP.	35.8	30.5	39.0	49.6
C51	E.CAP.	18.8	17.3	35.0	22.5
PC2	PHOTO COUPLER	27.8	28.1	40.5	36.8
PD51	LED	14.2	9.8	38.8	14.9

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

MODEL ： HWS100A/E_A

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 :

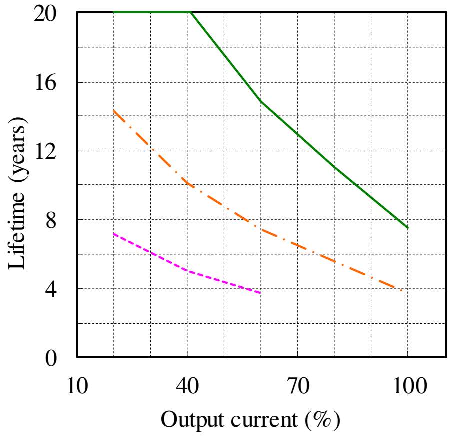
12V

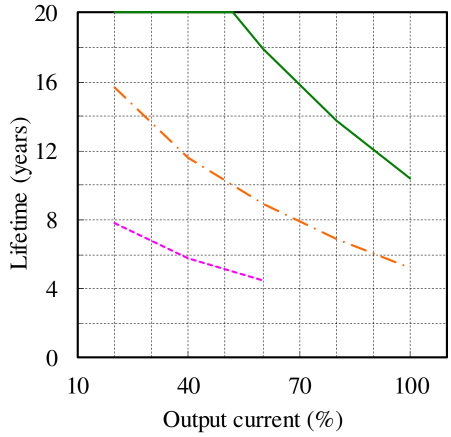
Vin = 100VAC

Ta / Load	Lifetime (years)		
	40°C	50°C	60°C
20%	20.0	14.3	7.2
40%	20.0	10.1	5.1
60%	14.8	7.4	3.7
80%	11.1	5.5	-
100%	7.5	3.8	-

Vin = 200VAC

Ta / Load	Lifetime (years)		
	40°C	50°C	60°C
20%	20.0	15.7	7.8
40%	20.0	11.6	5.8
60%	17.9	8.9	4.5
80%	13.7	6.9	-
100%	10.4	5.2	-





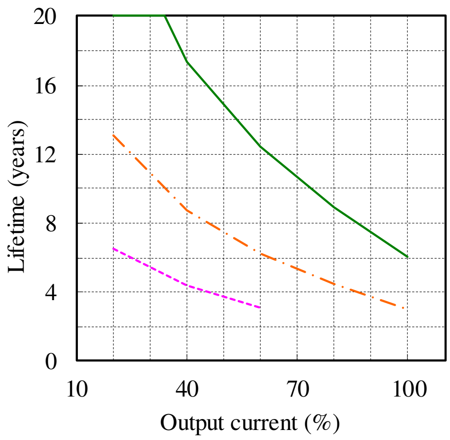
24V

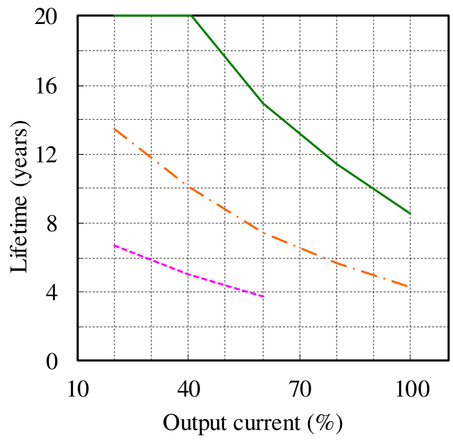
Vin = 100VAC

Ta / Load	Lifetime (years)		
	40°C	50°C	60°C
20%	20.0	13.1	6.5
40%	17.4	8.7	4.3
60%	12.5	6.2	3.1
80%	8.9	4.4	-
100%	6.0	3.0	-

Vin = 200VAC

Ta / Load	Lifetime (years)		
	40°C	50°C	60°C
20%	20.0	13.5	6.7
40%	20.0	10.1	5.1
60%	14.9	7.5	3.7
80%	11.4	5.7	-
100%	8.5	4.3	-





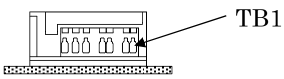
上記推定寿命は、弊社計算方法により算出した値であり、封口ゴムの劣化等の影響を含めておりません。
The lifetime is calculated based on our method and doesn't include the seal rubber degradation effect etc.

MODEL ： HWS100A/E_A

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

取付方向 B

Mounting B

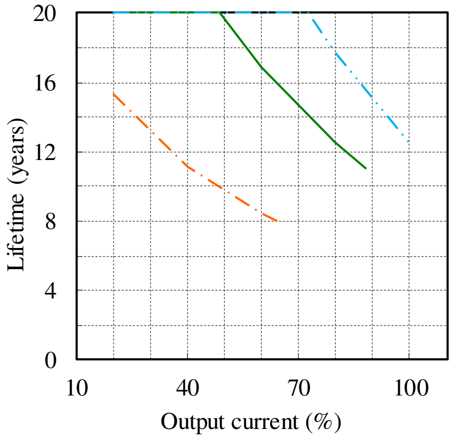


Conditions　Ta　35°C :　40°C :　50°C :

12V

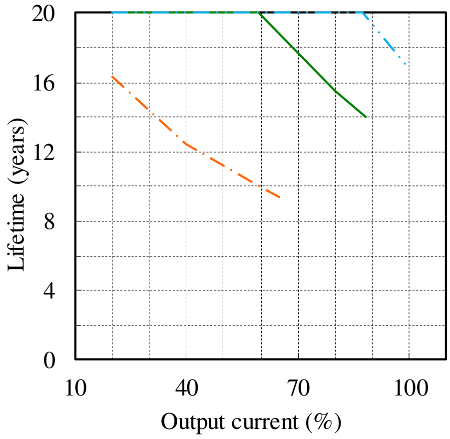
Vin = 100VAC

Load \ Ta	Lifetime (years)		
	35℃	40℃	50℃
20%	20.0	20.0	15.4
40%	20.0	20.0	11.2
60%	20.0	16.9	8.5
80%	17.8	12.6	-
100%	12.6	-	-



Vin = 200VAC

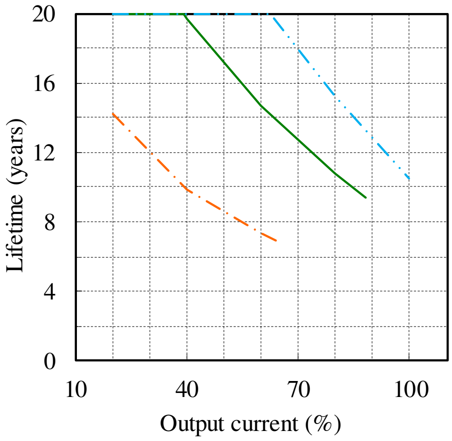
Load \ Ta	Lifetime (years)		
	35℃	40℃	50℃
20%	20.0	20.0	16.3
40%	20.0	20.0	12.5
60%	20.0	19.8	9.9
80%	20.0	15.5	-
100%	16.8	-	-



24V

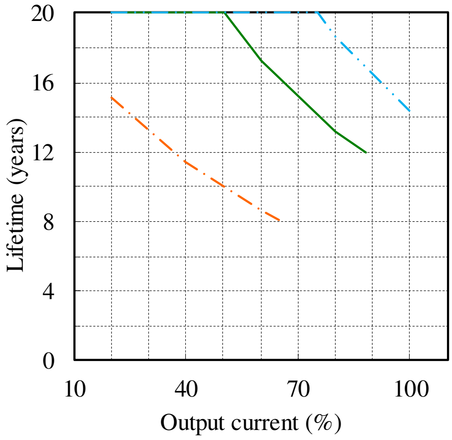
Vin = 100VAC

Load \ Ta	Lifetime (years)		
	35℃	40℃	50℃
20%	20.0	20.0	14.2
40%	20.0	19.7	9.9
60%	20.0	14.6	7.3
80%	15.3	10.8	-
100%	10.5	-	-



Vin = 200VAC

Load \ Ta	Lifetime (years)		
	35℃	40℃	50℃
20%	20.0	20.0	15.1
40%	20.0	20.0	11.4
60%	20.0	17.3	8.6
80%	18.6	13.2	-
100%	14.4	-	-



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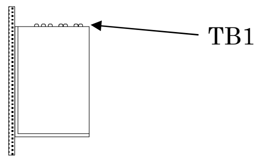
The lifetime is calculated based on our method and doesn't include the seal rubber degradation effect etc.

MODEL ： HWS100A/E_A

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

取付方向 C

Mounting C



Conditions　　Ta

30°C :

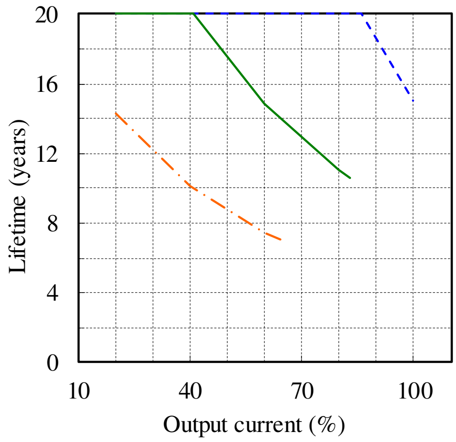
40°C :

50°C :

12V

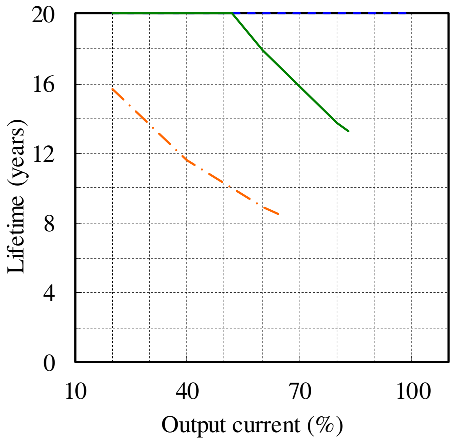
Vin = 100VAC

Load \ Ta	Lifetime (years)		
	30℃	40℃	50℃
20%	20.0	20.0	14.3
40%	20.0	20.0	10.1
60%	20.0	14.8	7.4
80%	20.0	11.1	-
100%	15.0	-	-



Vin = 200VAC

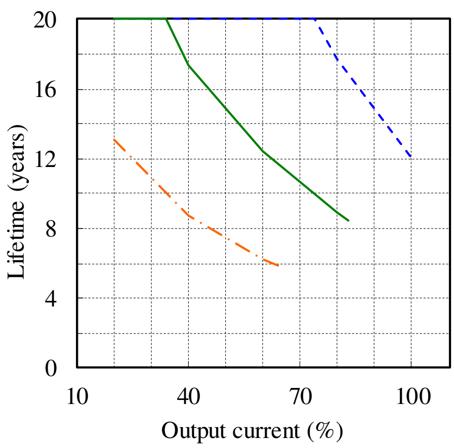
Load \ Ta	Lifetime (years)		
	30℃	40℃	50℃
20%	20.0	20.0	15.7
40%	20.0	20.0	11.6
60%	20.0	17.9	8.9
80%	20.0	13.7	-
100%	20.0	-	-



24V

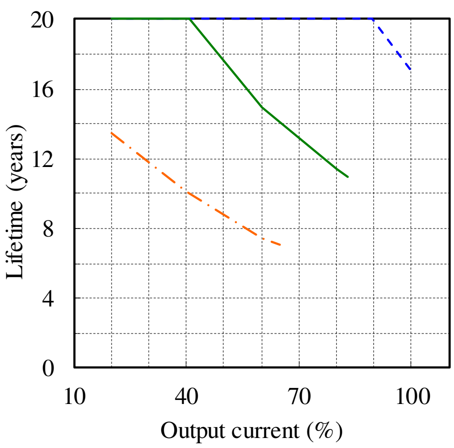
Vin = 100VAC

Load \ Ta	Lifetime (years)		
	30℃	40℃	50℃
20%	20.0	20.0	13.1
40%	20.0	17.4	8.7
60%	20.0	12.5	6.2
80%	17.8	8.9	-
100%	12.1	-	-



Vin = 200VAC

Load \ Ta	Lifetime (years)		
	30℃	40℃	50℃
20%	20.0	20.0	13.5
40%	20.0	20.0	10.1
60%	20.0	14.9	7.5
80%	20.0	11.4	-
100%	17.0	-	-



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

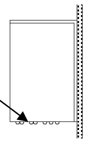
MODEL ： HWS100A/E_A

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

取付方向 D

Mounting D

TB1



Conditions　Ta　35°C : 　40°C : 　50°C :

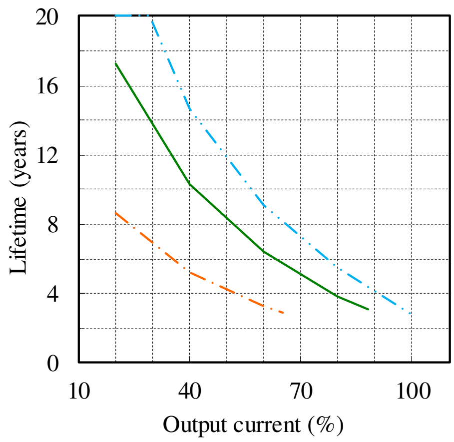
12V

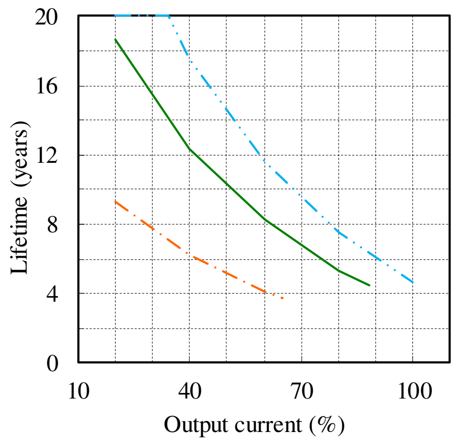
Vin = 100VAC

Ta / Load	Lifetime (years)		
	35℃	40℃	50℃
20%	20.0	17.3	8.6
40%	14.6	10.3	5.2
60%	9.1	6.5	3.2
80%	5.5	3.9	-
100%	2.8	-	-

Vin = 200VAC

Ta / Load	Lifetime (years)		
	35℃	40℃	50℃
20%	20.0	18.6	9.3
40%	17.5	12.4	6.2
60%	11.6	8.2	4.1
80%	7.6	5.4	-
100%	4.7	-	-





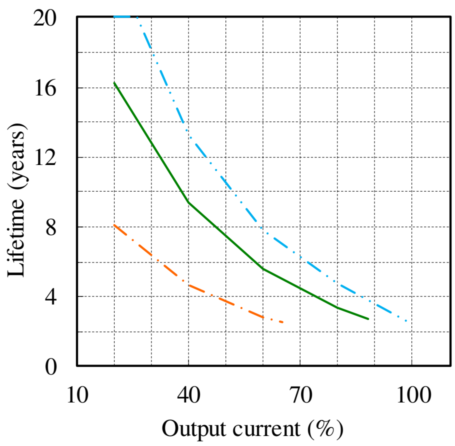
24V

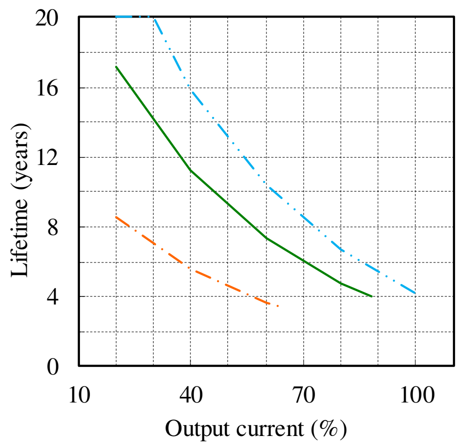
Vin = 100VAC

Ta / Load	Lifetime (years)		
	35℃	40℃	50℃
20%	20.0	16.2	8.1
40%	13.3	9.4	4.7
60%	7.8	5.5	2.8
80%	4.8	3.4	-
100%	2.5	-	-

Vin = 200VAC

Ta / Load	Lifetime (years)		
	35℃	40℃	50℃
20%	20.0	17.2	8.6
40%	15.9	11.2	5.6
60%	10.4	7.4	3.7
80%	6.7	4.7	-
100%	4.2	-	-





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.

5. アブノーマル試験 Abnormal Test

MODEL : HWS100A-24/E_A

(1) 試験条件 Test Conditions

Input : 265VAC　Output : 24V, 4.5A　Ta : 25°C

(2) 試験結果 Test Results

(Da : Damaged)

No.	Test position: 部品No. Location No.	Test position: 試験端子 Test point	Test mode: ショート Short	Test mode: オープン Open	Test result: 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
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	C6		○								○			○			
20				○												○	力率低下 Power factor low
21	C51		○										○	○			
22				○												○	出力リップル大 Output ripple increase

(Da : Damaged)

No.	部品No. Location No.	試験端子 Test point	Test mode ショート Short	Test mode 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
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	D51	A-K	○													○	間欠発振動作 Hiccup
31		A/K		○										○			
32	D52	A-K	○											○			
33		A/K		○												○	間欠発振動作 Hiccup
34	D107	A-K	○											○			
35		A/K		○												○	入力電力増加 Input power increase
36	D109	A-K	○											○			
37		A/K		○												○	入力電力増加 Input power increase
38	T1	1-2	○											○			
39		6-7	○											○			
40		1/2		○										○			
41		6/7		○										○			
42	T2	1-2	○													○	間欠発振動作 Hiccup
43		3-4	○											○			
44		7,8-9,10	○											○			
45		1/2		○										○			
46		3/4		○										○			
47		7,8/9,10		○										○			

6. 振動試験 Vibration Test

MODEL : HWS100A-24/E_A

(1) 振動試験種類 Vibration Test Class

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

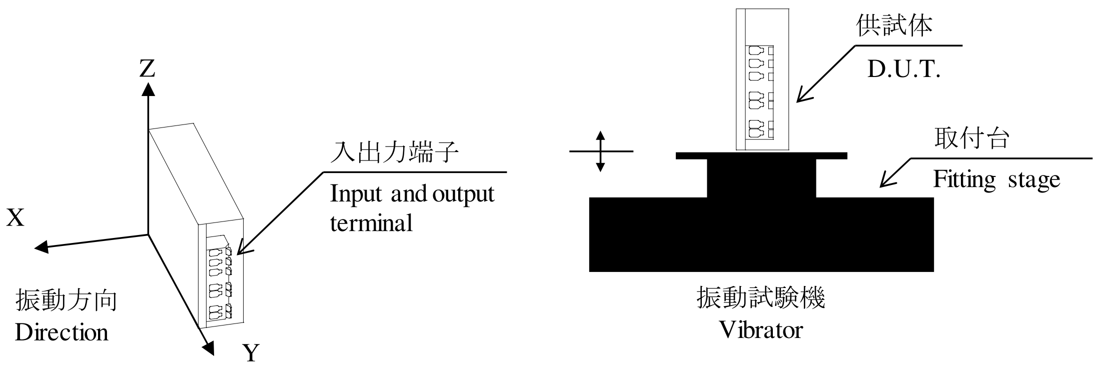
(2) 使用振動試験装置 Equipment Used

EMIC (株) 製　EM2201
EMIC CORP.

(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 o be broken.
2. 試験後の出力に異常がない事
   No abnormal output after test.

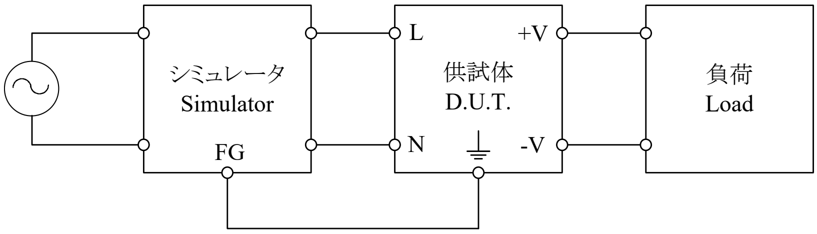
(6) 試験結果 Test Results

合格 **OK**

7. ノイズシミュレート試験 Noise Simulate Test

MODEL : HWS100A-24/E_A

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



シミュレータ：INS-AX2-450TH （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%
- 周囲温度 Ambient temperature : 25^{o}C
- パルス幅 Pulse width : 50 - 1000ns
- ノイズ電圧 Noise level : 0 - 2kV
- 位相 Phase : 0 - 360 deg
- 極性 Polarity : +、-
- 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

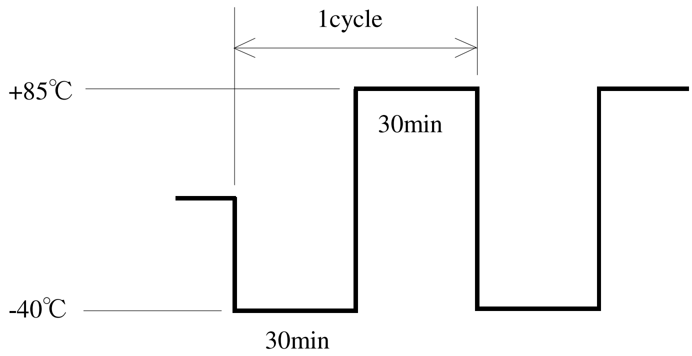
MODEL : HWS100A-24/E_A

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

ESPEC(株) 製　TSA-72EH
ESPEC CORP.

(2) 試験条件 **Test Conditions**

- 電源周囲温度 / Ambient Temperature : -40℃ ⇔ 85℃
- 試験時間 / Test Time : 図参照 / Refer to figure.
- 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**