

ZWP300-650

RELIABILITY DATA

信頼性データ

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※ 試験結果は、代表データではありますが、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

MODEL : ZWP300-650-24

(1) 算出方法 Calculation Method

MTBF値は、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_{ssi} は、機器の動作環境及び部品の基礎故障率、電気的ストレス、動作温度により算出されます。

The MTBF value is used parts stress reliability prediction of Telcordia (*1).

Failure rate λ_{ssi} is calculated by environment of the equipment, general failure rate of the part, electrical stress and operating temperature of the 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} : 全機器平均故障率 (FITs) Total equipment mean failure rate (FITs = Failures in 10^9 hours)

λ_{Gi} : i 番目の部品に対する平均基礎故障率 Mean generic failure rate for the i th part

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

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

π_E : 機器の環境ファクタ Environmental factor of the equipment

(2) MTBF値 MTBF Values

条件 Condition

- 環境ファクタ : GB (Ground, Benign) • 出力電圧、電流 : 24VDC, 12.5A(100%)
- Environmental Factor Output Voltage and Current
- 取付け方向 : 標準取付A
- Mounting Direction : Standard mounting A

入力電圧 : 100VAC

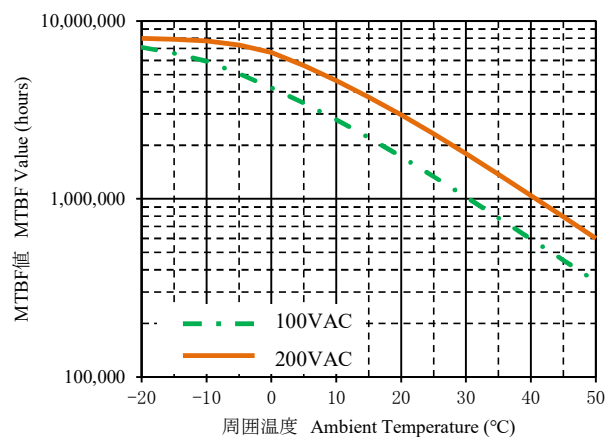
Input Voltage

周囲温度 (°C) Ambient Temperature (°C)	MTBF値 (hours) MTBF Value (hours)
25	1,336,803
40	595,554
50	344,149

入力電圧 : 200VAC

Input Voltage

周囲温度 (°C) Ambient Temperature (°C)	MTBF値 (hours) MTBF Value (hours)
25	2,323,572
40	1,047,556
50	601,179



2. 部品ディレーティング Components Derating

MODEL : ZWP300-650

(1) 算出方法 Calculation Method

(a) 算出条件 Calculation condition

取付け方向 Mounting Direction	標準取付けA Standard Mounting A	周囲温度 Ambient Temperature	50℃
入力電圧 Input voltage	100, 200VAC	出力電圧 Output Voltage	24V
出力電流 Output Current	12.5A(100%)		

(b) 半導体 Semiconductors

最大接合点定格と、ケース温度、消費電力、熱抵抗から算出される接合点温度を比較しています。
It is compared the maximum junction rating and calculated junction temperature by 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

$$\theta_{j-c} = \frac{T_{j(max)} - T_c}{P_{j(max)}} \quad \theta_{j-a} = \frac{T_{j(max)} - T_a}{P_{j(max)}}$$

T_c : 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

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

$P_{j(max)}$: 最大接合点(チャネル)損失
($P_{ch(max)}$) Maximum Junction (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-a} : 接合点(チャネル)から周囲までの熱抵抗
(θ_{ch-a}) Thermal Impedance between Junction (channel) and Ambient

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

部品番号 Location No.	測定条件 Measurement condition Vin = 100VAC Iout = Full load Ta = 50°C	
Q101 TK165V60Z1 TOSHIBA	Tch (max) = 150 °C Pch = 1.3W Tch = Tc + $\theta_{ch-c} \times Pch$ = 111.8 °C D.F. = 74.5%	θ_{ch-c} = 0.961 °C/W ΔTc = 60.6 °C Tc = 110.6 °C
Q103 IPTA60R180CM8 INFINEON	Tch (max) = 150 °C Pch = 1.7W Tch = Tc + $((\theta_{ch-c}) \times Pch)$ = 107.2 °C D.F. = 71.5%	θ_{ch-c} = 1.05 °C/W ΔTc = 55.5 °C Tc = 105.5 °C
Q104 IPTA60R180CM8 INFINEON	Tch (max) = 150 °C Pch = 2.4W Tch = Tc + $((\theta_{ch-c}) \times Pch)$ = 108.8 °C D.F. = 72.5%	θ_{ch-c} = 1.05 °C/W ΔTc = 56.3 °C Tc = 106.3 °C
Q201 STL90N10F7 STMICRO	Tch (max) = 175 °C Pch = 0.3W Tch = Tc + $((\theta_{ch-c}) \times Pch)$ = 104.3 °C D.F. = 59.6%	θ_{ch-c} = 1.5 °C/W ΔTc = 53.9 °C Tc = 103.9 °C
Q203 STL90N10F7 STMICRO	Tch (max) = 175 °C Pch = 0.4W Tch = Tc + $((\theta_{ch-c}) \times Pch)$ = 102.1 °C D.F. = 58.3%	θ_{ch-c} = 1.5 °C/W ΔTc = 51.5 °C Tc = 101.5 °C
D1 GBJ25JL DIODES	Tj (max) = 150 °C Pj = 3.5W Tj = Tc + $((\theta_{j-c}) \times Pch)$ = 118.4 °C D.F. = 78.9%	θ_{j-c} = 0.8 °C/W ΔTc = 65.6 °C Tc = 115.6 °C
D102 TRS6V65H TOSHIBA	Tj (max) = 175 °C Pj = 1.3W Tj = Tc + $((\theta_{j-c}) \times Pch)$ = 111.1 °C D.F. = 62.4%	θ_{j-c} = 2.5 °C/W ΔTc = 57.8 °C Tc = 107.8 °C
D111 CRH01B TOSHIBA	Tj (max) = 150 °C Pj = 6mW Tj = Tc + $((\theta_{j-a}) \times Pch)$ = 99.0 °C D.F. = 66.0%	θ_{j-a} = 140 °C/W ΔTc = 48.2 °C Tc = 98.2 °C
PC103 TLP385 TI	Tj (max) = 125 °C Pj = 25mW Tj = Tc + $((\theta_{j-a}) \times Pch)$ = 98.5 °C D.F. = 78.8%	θ_{j-a} = 130 °C/W ΔTc = 45.3 °C Tc = 95.3 °C
A101 TEA2017AAT NXP	Tj (max) = 150 °C Pj = 0.2W Tj = Tc + $((\theta_{j-c}) \times Pch)$ = 120.0 °C D.F. = 80.0%	θ_{j-c} = 58 °C/W ΔTc = 58.4 °C Tc = 108.4 °C
A201 TEA2096T NXP	Tj (max) = 150 °C Pj = 0.1W Tj = Tc + $((\theta_{j-c}) \times Pch)$ = 106.6 °C D.F. = 71.1%	θ_{j-c} = 50 °C/W ΔTc = 51.6 °C Tc = 101.6 °C

Vin : 入力電圧 Input Voltage

Iout : 出力電流 Output Current

D.F. : デレーティング率 Derating Factor

Ta : 周囲温度 Ambient Temperature

部品番号 Location No.	測定条件 Measurement condition Vin = 200VAC Iout = Full load Ta = 50°C	
Q101 TK165V60Z1 TOSHIBA	Tch (max) = 150 °C Pch = 0.6W Tch = Tc + ((θ_{ch-c}) × Pch) = 91.6 °C D.F. = 61.1%	θ_{ch-c} = 0.961 °C/W ΔT_c = 42.2 °C Tc = 91.1 °C
Q103 IPTA60R180CM8 INFINEON	Tch (max) = 150 °C Pch = 1.7W Tch = Tc + ((θ_{ch-c}) × Pch) = 96.3 °C D.F. = 64.2%	θ_{ch-c} = 1.05 °C/W ΔT_c = 44.6 °C Tc = 94.6 °C
Q104 IPTA60R180CM8 INFINEON	Tch (max) = 150 °C Pch = 2.4W Tch = Tc + ((θ_{ch-c}) × Pch) = 98.2 °C D.F. = 65.5%	θ_{ch-c} = 1.05 °C/W ΔT_c = 45.7 °C Tc = 95.7 °C
Q201 STL90N10F7 STMICRO	Tch (max) = 175 °C Pch = 0.3W Tch = Tc + ((θ_{ch-c}) × Pch) = 95.1 °C D.F. = 54.3%	θ_{ch-c} = 1.5 °C/W ΔT_c = 44.7 °C Tc = 94.7 °C
Q203 STL90N10F7 STMICRO	Tch (max) = 175 °C Pch = 0.4W Tch = Tc + ((θ_{ch-c}) × Pch) = 93.2 °C D.F. = 53.1%	θ_{ch-c} = 1.5 °C/W ΔT_c = 42.4 °C Tc = 92.4 °C
D1 GBJ25JL DIODES	Tj (max) = 150 °C Pj = 1.6W Tj = Tc + ((θ_{j-c}) × Pch) = 91.1 °C D.F. = 60.7%	θ_{j-c} = 0.8 °C/W ΔT_c = 9.9 °C Tc = 89.9 °C
D102 TRS6V65H TOSHIBA	Tj (max) = 175 °C Pj = 1.0W Tj = Tc + ((θ_{j-c}) × Pch) = 97.1 °C D.F. = 55.5%	θ_{j-c} = 2.5 °C/W ΔT_c = 44.6 °C Tc = 94.6 °C
D111 CRH01B TOSHIBA	Tj (max) = 150 °C Pj = 6mW Tj = Tc + ((θ_{j-a}) × Pch) = 87.3 °C D.F. = 58.2%	θ_{j-a} = 140 °C/W ΔT_c = 36.5 °C Tc = 86.5 °C
PC103 TLP385 TI	Tj (max) = 125 °C Pj = 25mW Tj = Tc + ((θ_{j-a}) × Pch) = 90.7 °C D.F. = 72.6%	θ_{j-a} = 130 °C/W ΔT_c = 37.5 °C Tc = 87.5 °C
A101 TEA2017AAT NXP	Tj (max) = 150 °C Pj = 0.2W Tj = Tc + ((θ_{j-c}) × Pch) = 113.9 °C D.F. = 75.9%	θ_{j-c} = 58 °C/W ΔT_c = 52.3 °C Tc = 102.3 °C
A201 TEA2096T NXP	Tj (max) = 150 °C Pj = 0.1W Tj = Tc + ((θ_{j-c}) × Pch) = 97.1 °C D.F. = 64.7%	θ_{j-c} = 50 °C/W ΔT_c = 42.1 °C Tc = 92.1 °C

Vin : 入力電圧 Input Voltage

Iout : 出力電流 Output Current

D.F. : デイレーティング率 Derating Factor

Ta : 周囲温度 Ambient Temperature

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

MODEL : ZWP300-650

(1) 測定条件 Measuring Conditions

入力電圧 Input Voltage	100VAC
出力電圧 Output Voltage	24VDC
出力電流 Output Current	12.5A(100%)

(2) 測定結果 Measuring Results

Location No.	Part name	ΔT Temperature Rise (°C)					
		Mounting A	Mounting B	Mounting C	Mounting D	Mounting E	Mounting F
Q101	MOSFET	60.6	60.6	60.8	66.3	64.6	70.3
Q103	MOSFET	55.5	54.7	57.3	61.3	59.3	64.1
Q104	MOSFET	56.3	55.8	58.0	61.9	60.5	65.5
Q201	MOSFET	53.9	53.5	54.6	58.4	59.6	62.6
Q203	MOSFET	51.5	50.6	53.2	56.1	57.3	60.8
D1	BRIDGE DIODE	65.6	68.2	65.3	68.0	59.9	69.8
D102	DIODE	57.8	57.1	58.4	62.9	61.5	66.3
PC103	PHOTO COUPLER	45.3	43.6	51.2	51.1	51.8	57.3
A101	CHIP IC	58.4	56.0	64.9	65.5	63.6	68.8
A201	CHIP IC	51.6	51.2	53.0	56.6	57.1	60.9
R113	RESISTOR	53.9	59.0	51.4	58.7	58.9	64.4
L1	CHOKE COIL	41.9	36.1	45.7	47.1	38.1	42.1
L2	CHOKE COIL	49.5	50.2	45.3	61.9	42.7	56.7
L4	CHOKE COIL	66.8	67.0	60.0	68.1	68.5	68.1
L51	CHOKE COIL	48.6	50.4	46.5	53.5	60.8	57.0
T1	TRANSFORMER	68.5	63.1	68.1	71.6	71.0	70.4
C9	CAP., FILM	40.7	45.9	36.1	50.2	39.7	51.5
C10	CAP., ELECT	46.0	40.0	47.6	48.0	45.2	46.3
C12	CAP., FILM	43.6	42.3	50.5	54.8	49.7	51.9
C13	CAP., ELECT	41.5	47.6	40.6	48.1	55.9	50.6
C14	CAP., ELECT	34.0	42.5	33.9	41.2	50.9	43.1
C51	CAP., ELECT	43.3	41.7	41.7	46.0	56.9	49.9
C53	CAP., ELECT	35.7	38.6	32.5	37.5	48.0	41.0
RL1	RELAY	51.0	49.9	46.5	59.1	50.9	56.3

(*) 取付け方向及び出力ディレーティングは、取扱説明書を参照ください。

(*) Refer to the instruction manual for mounting direction and output derating curve.

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

MODEL : ZWP300-650

(1) 測定条件 Measuring Conditions

入力電圧 Input Voltage	200VAC
出力電圧 Output Voltage	24VDC
出力電流 Output Current	12.5A(100%)

(2) 測定結果 Measuring Results

Location No.	Part name	ΔT Temperature Rise (°C)					
		Mounting A	Mounting B	Mounting C	Mounting D	Mounting E	Mounting F
Q101	MOSFET	41.1	41.5	41.2	45.3	43.7	47.6
Q103	MOSFET	44.6	43.9	45.3	49.3	46.6	50.5
Q104	MOSFET	45.7	45.2	46.4	50.1	48.0	52.3
Q201	MOSFET	44.7	44.3	44.9	48.3	48.3	51.2
Q203	MOSFET	42.4	41.5	43.5	46.1	46.2	49.4
D1	BRIDGE DIODE	39.9	41.3	38.9	41.9	35.7	41.9
D102	DIODE	44.6	44.4	44.9	48.9	46.9	50.8
PC103	PHOTO COUPLER	37.5	36.1	41.9	42.4	41.9	46.9
A101	CHIP IC	52.3	50.5	56.5	58.3	55.2	60.0
A201	CHIP IC	42.1	41.7	42.9	46.1	45.6	49.0
R113	RESISTOR	36.6	40.1	35.0	40.6	39.3	43.4
L1	CHOKE COIL	24.6	20.5	26.4	30.5	21.8	24.3
L2	CHOKE COIL	28.0	27.6	25.2	37.3	23.5	31.7
L4	CHOKE COIL	43.2	44.2	38.7	45.4	43.6	43.9
L51	CHOKE COIL	43.0	45.9	41.5	48.3	51.6	51.4
T1	TRANSFORMER	62.9	58.3	61.4	65.5	63.2	63.8
C9	CAP., FILM	28.7	33.2	25.3	36.1	27.2	35.2
C10	CAP., ELECT	36.4	32.0	36.1	39.1	34.2	35.8
C12	CAP., FILM	37.6	36.6	41.5	47.4	40.9	43.7
C13	CAP., ELECT	32.7	38.6	31.7	39.1	41.6	39.8
C14	CAP., ELECT	25.9	33.5	26.2	33.0	36.4	33.2
C51	CAP., ELECT	38.4	37.8	37.7	41.5	49.2	44.8
C53	CAP., ELECT	31.2	35.0	28.8	33.6	38.9	37.0
RL1	RELAY	37.5	36.9	34.0	44.6	35.3	40.4

(*) 取付け方向及び出力ディレーティングは、取扱説明書を参照ください。

(*) Refer to the instruction manual for mounting direction and output derating curve.

4. 電解コンデンサ推定寿命計算値

Electrolytic Capacitor Lifetime

MODEL : ZWP300-650

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

取付方向 A

Mounting A

Conditions Ta 40°C : ———

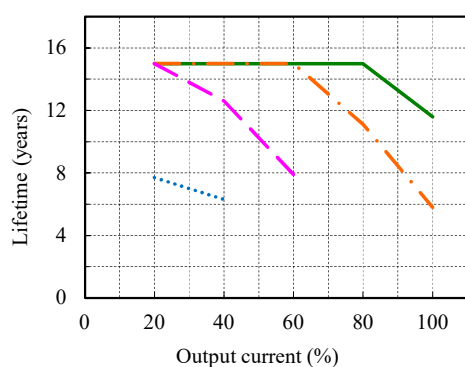
50°C : - - - - -

60°C : ·····

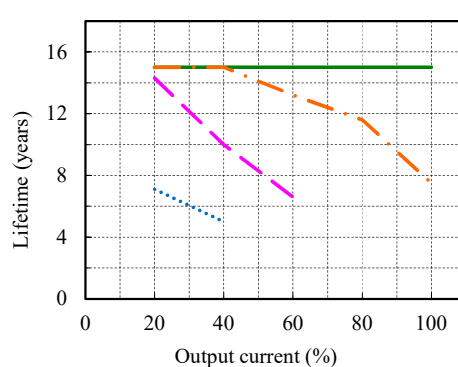
70°C : (dotted)

24V

		Vin = 100VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	15.0	7.7
40%		15.0	15.0	12.6	6.3
60%		15.0	15.0	7.9	-
80%		15.0	11.1	-	-
100%		11.6	5.8	-	-

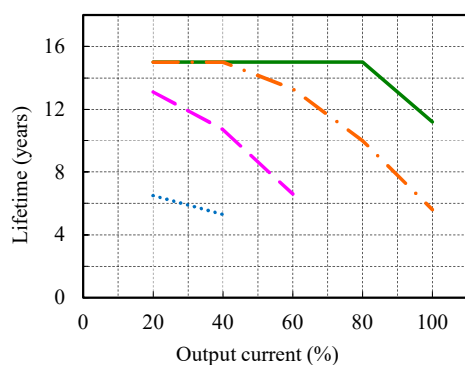


		Vin = 200VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	14.3	7.1
40%		15.0	15.0	10.0	5.0
60%		15.0	13.2	6.6	-
80%		15.0	11.6	-	-
100%		15.0	7.5	-	-

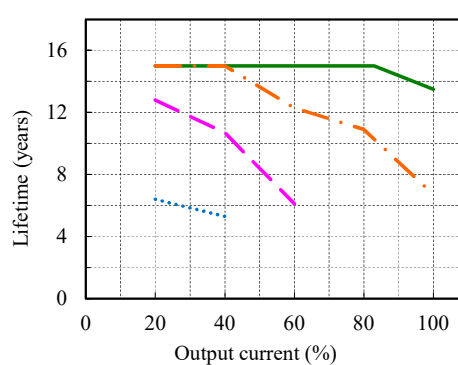


30V

		Vin = 100VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	13.1	6.5
40%		15.0	15.0	10.7	5.3
60%		15.0	13.3	6.6	-
80%		15.0	10.0	-	-
100%		11.2	5.6	-	-



		Vin = 200VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	12.8	6.4
40%		15.0	15.0	10.7	5.3
60%		15.0	12.3	6.1	-
80%		15.0	10.9	-	-
100%		13.5	6.7	-	-



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

MODEL : ZWP300-650

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

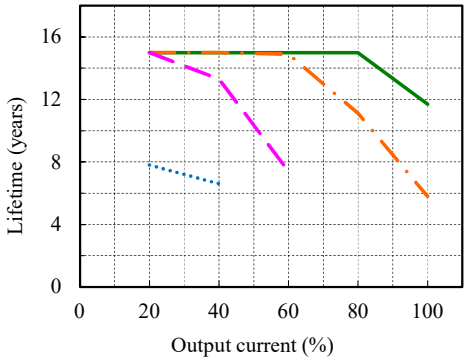
取付方向 A

Mounting A

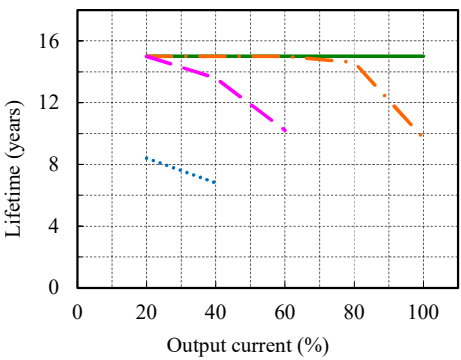
Conditions Ta 40°C : ———
50°C : - - - - -
60°C : ·····
70°C : ······

36V

		Vin = 100VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	15.0	7.8
40%		15.0	15.0	13.3	6.6
60%		15.0	14.9	7.4	-
80%		15.0	11.1	-	-
100%		11.7	5.8	-	-

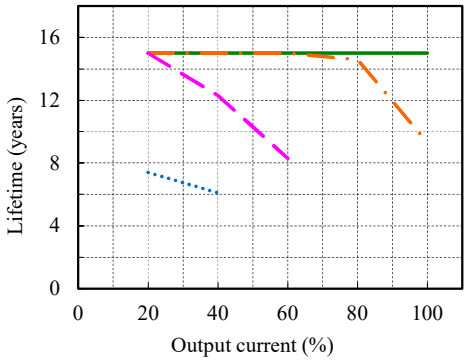


		Vin = 200VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	15.0	8.4
40%		15.0	15.0	13.6	6.8
60%		15.0	15.0	10.2	-
80%		15.0	14.6	-	-
100%		15.0	9.7	-	-

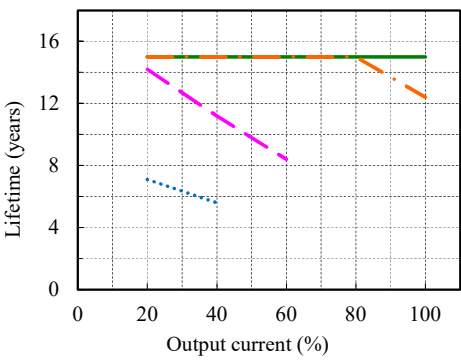


48V

		Vin = 100VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	15.0	7.4
40%		15.0	15.0	12.3	6.1
60%		15.0	15.0	8.3	-
80%		15.0	14.6	-	-
100%		15.0	9.3	-	-



		Vin = 200VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	14.2	7.1
40%		15.0	15.0	11.2	5.6
60%		15.0	15.0	8.4	-
80%		15.0	15.0	-	-
100%		15.0	12.4	-	-



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

MODEL : ZWP300-650

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

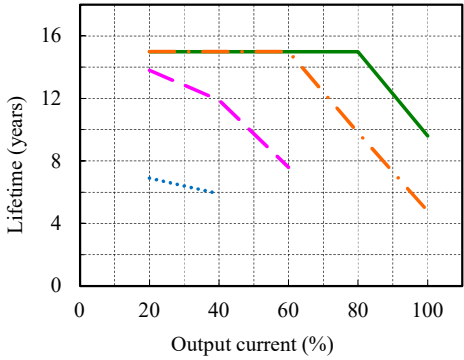
取付方向 B

Mounting B

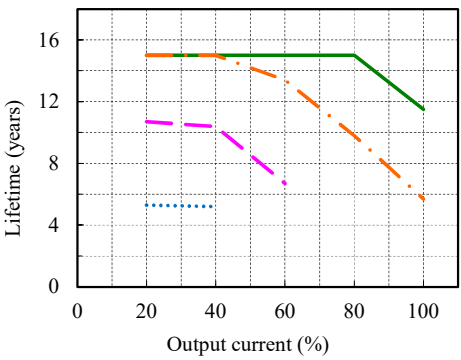
Conditions Ta 40°C : ———
50°C : - - - - -
60°C : ·····
70°C : ······

24V

		Vin = 100VAC			
		Lifetime (years)			
Load	Ta	40°C	50°C	60°C	70°C
20%		15.0	15.0	13.8	6.9
40%		15.0	15.0	11.9	5.9
60%		15.0	15.0	7.6	-
80%		15.0	9.8	-	-
100%		9.6	4.8	-	-

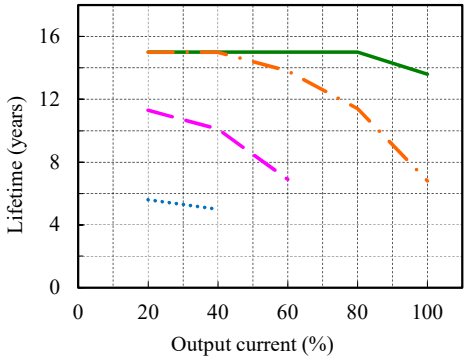


		Vin = 200VAC			
		Lifetime (years)			
Load	Ta	40°C	50°C	60°C	70°C
20%		15.0	15.0	10.7	5.3
40%		15.0	15.0	10.4	5.2
60%		15.0	13.4	6.7	-
80%		15.0	9.8	-	-
100%		11.5	5.7	-	-

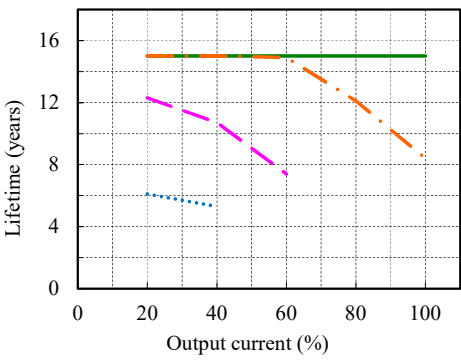


30V

		Vin = 100VAC			
		Lifetime (years)			
Load	Ta	40°C	50°C	60°C	70°C
20%		15.0	15.0	11.3	5.6
40%		15.0	15.0	10.1	5.0
60%		15.0	13.8	6.9	-
80%		15.0	11.4	-	-
100%		13.6	6.8	-	-



		Vin = 200VAC			
		Lifetime (years)			
Load	Ta	40°C	50°C	60°C	70°C
20%		15.0	15.0	12.3	6.1
40%		15.0	15.0	10.7	5.3
60%		15.0	14.9	7.4	-
80%		15.0	12.1	-	-
100%		15.0	8.4	-	-



4. 電解コンデンサ推定寿命計算値

Electrolytic Capacitor Lifetime

MODEL : ZWP300-650

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

取付方向 B

Mounting B

Conditions Ta 40°C : ———

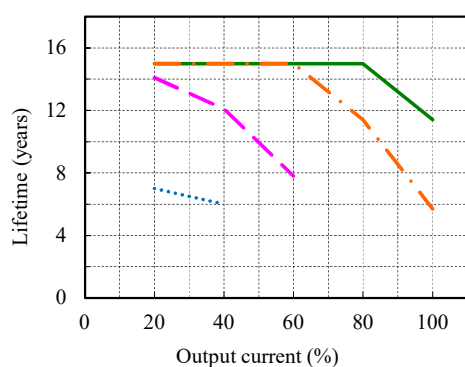
50°C : - - - - -

60°C : - - - - -

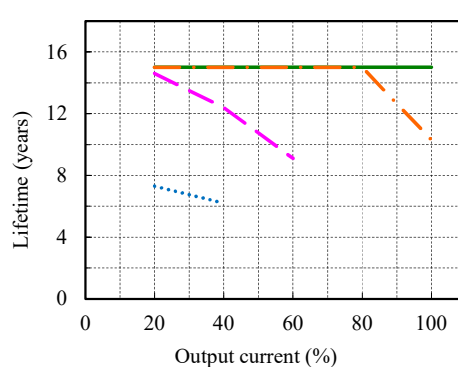
70°C : ·······

36V

		Vin = 100VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	14.1	7.0
40%		15.0	15.0	12.1	6.0
60%		15.0	15.0	7.8	-
80%		15.0	11.4	-	-
100%		11.4	5.7	-	-

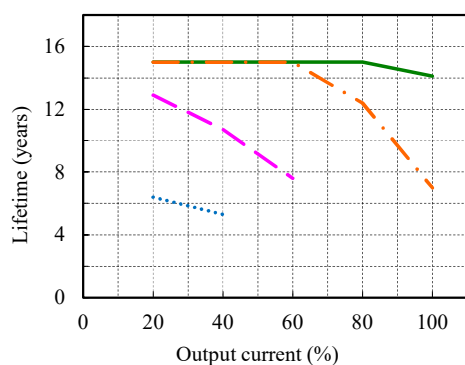


		Vin = 200VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	14.6	7.3
40%		15.0	15.0	12.4	6.2
60%		15.0	15.0	9.1	-
80%		15.0	15.0	-	-
100%		15.0	10.3	-	-

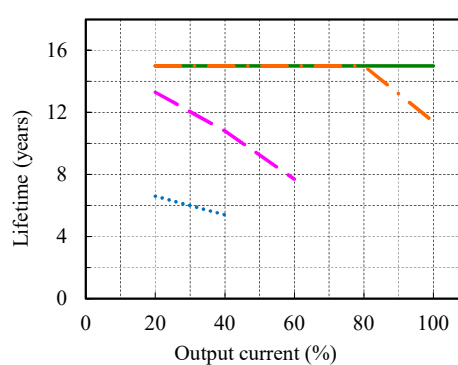


48V

		Vin = 100VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	12.9	6.4
40%		15.0	15.0	10.7	5.3
60%		15.0	15.0	7.6	-
80%		15.0	12.4	-	-
100%		14.1	7.0	-	-



		Vin = 200VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	13.3	6.6
40%		15.0	15.0	10.8	5.4
60%		15.0	15.0	7.7	-
80%		15.0	15.0	-	-
100%		15.0	11.4	-	-



4. 電解コンデンサ推定寿命計算値

Electrolytic Capacitor Lifetime

MODEL : ZWP300-650

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

取付方向 C

Mounting C

Conditions Ta 40°C : ———

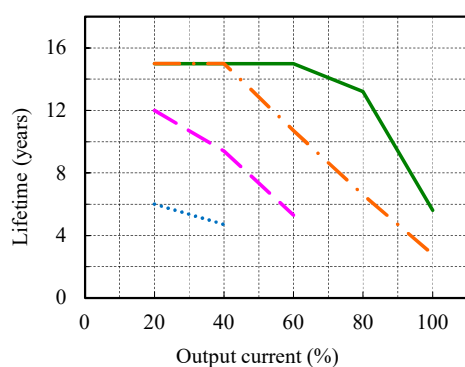
50°C : - - - - -

60°C : - - - - -

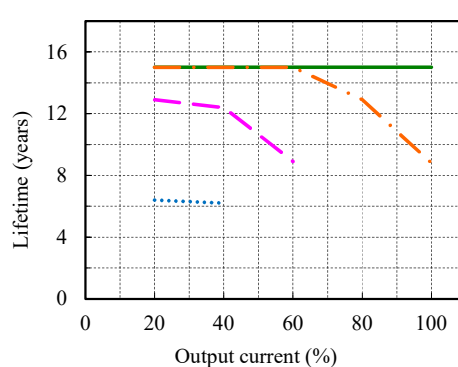
70°C : ·······

24V

		Vin = 100VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	12.0	6.0
40%		15.0	15.0	9.4	4.7
60%		15.0	10.7	5.3	-
80%		13.2	6.6	-	-
100%		5.6	2.8	-	-

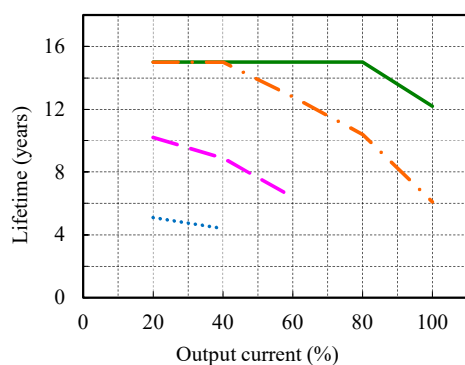


		Vin = 200VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	12.9	6.4
40%		15.0	15.0	12.4	6.2
60%		15.0	15.0	8.9	-
80%		15.0	12.9	-	-
100%		15.0	8.8	-	-

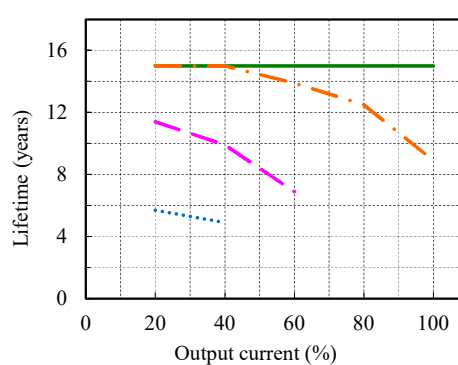


30V

		Vin = 100VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	10.2	5.1
40%		15.0	15.0	8.9	4.4
60%		15.0	12.8	6.4	-
80%		15.0	10.4	-	-
100%		12.2	6.1	-	-



		Vin = 200VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	11.4	5.7
40%		15.0	15.0	9.9	4.9
60%		15.0	13.9	6.9	-
80%		15.0	12.5	-	-
100%		15.0	8.9	-	-



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

MODEL : ZWP300-650

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

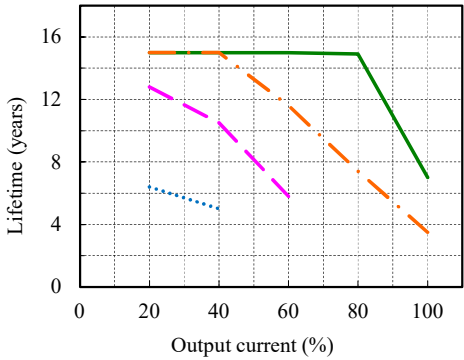
取付方向 C

Mounting C

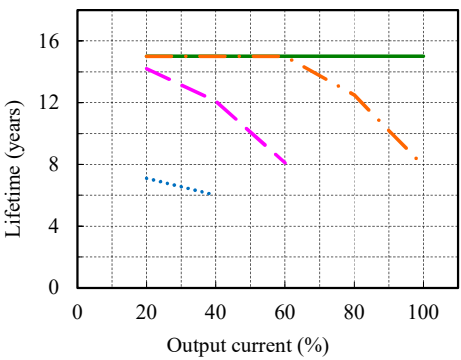
Conditions Ta 40°C : ———
50°C : - - - - -
60°C : ·····
70°C : ······

36V

		Vin = 100VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	12.8	6.4
40%		15.0	15.0	10.5	5.0
60%		15.0	11.6	5.8	-
80%		14.9	7.4	-	-
100%		7.0	3.5	-	-

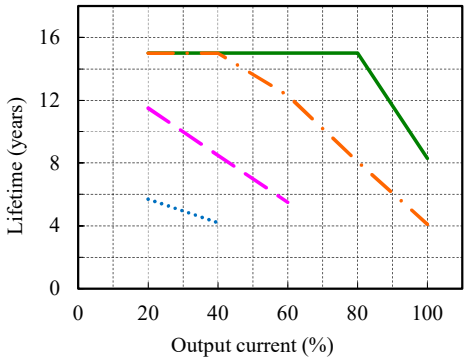


		Vin = 200VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	14.2	7.1
40%		15.0	15.0	12.1	6.0
60%		15.0	15.0	8.1	-
80%		15.0	12.5	-	-
100%		15.0	7.9	-	-

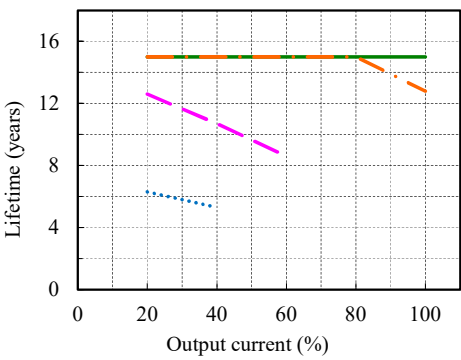


48V

		Vin = 100VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	11.5	5.7
40%		15.0	15.0	8.5	4.2
60%		15.0	12.3	5.5	-
80%		15.0	8.1	-	-
100%		8.3	4.1	-	-



		Vin = 200VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	12.6	6.3
40%		15.0	15.0	10.7	5.3
60%		15.0	15.0	8.6	-
80%		15.0	15.0	-	-
100%		15.0	12.8	-	-



4. 電解コンデンサ推定寿命計算値

Electrolytic Capacitor Lifetime

MODEL : ZWP300-650

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

取付方向 D

Mounting D

Conditions Ta 40°C : ———

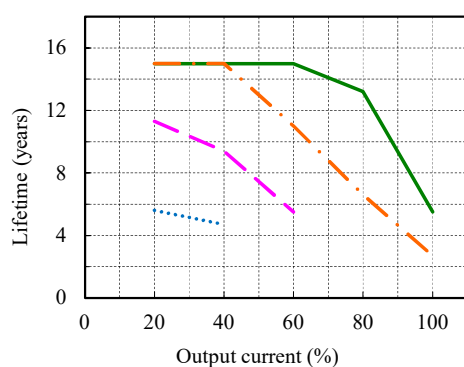
50°C : - - - - -

60°C : - - - - -

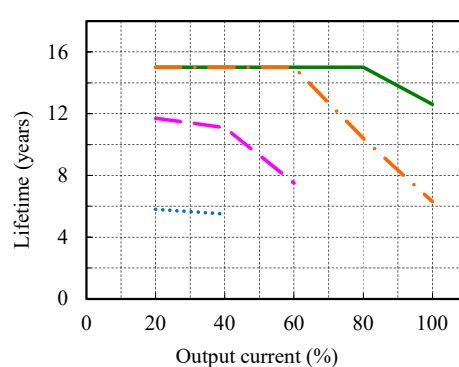
70°C : ·····

24V

		Vin = 100VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	11.3	5.6
40%		15.0	15.0	9.4	4.7
60%		15.0	11.0	5.5	-
80%		13.2	6.6	-	-
100%		5.5	2.7	-	-

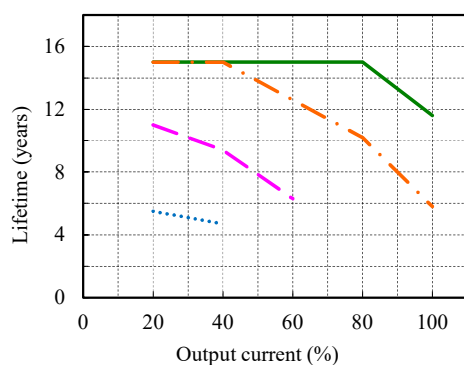


		Vin = 200VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	11.7	5.8
40%		15.0	15.0	11.1	5.5
60%		15.0	15.0	7.5	-
80%		15.0	10.4	-	-
100%		12.6	6.3	-	-

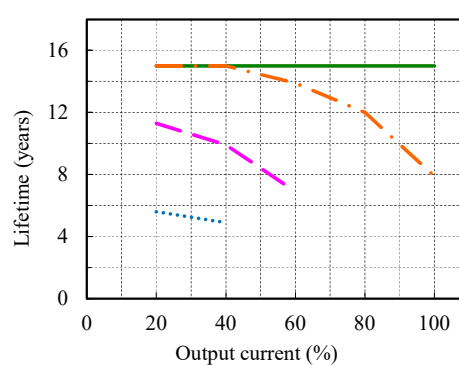


30V

		Vin = 100VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	11.0	5.5
40%		15.0	15.0	9.4	4.7
60%		15.0	12.6	6.3	-
80%		15.0	10.2	-	-
100%		11.6	5.8	-	-



		Vin = 200VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	11.3	5.6
40%		15.0	15.0	9.9	4.9
60%		15.0	13.9	6.9	-
80%		15.0	12.0	-	-
100%		15.0	7.9	-	-



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

MODEL : ZWP300-650

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

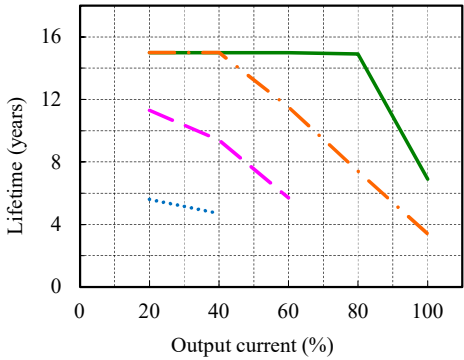
取付方向 D

Mounting D

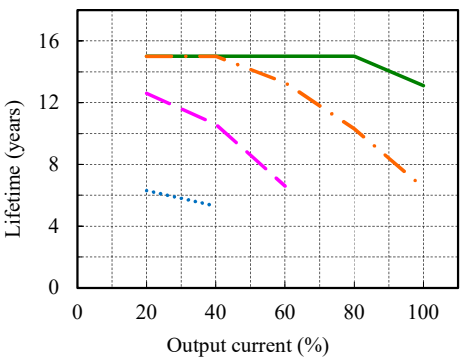
Conditions Ta 40°C : ———
50°C : - - - - -
60°C : - - - - -
70°C : ·······

36V

		Vin = 100VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	11.3	5.6
40%		15.0	15.0	9.4	4.7
60%		15.0	11.5	5.7	-
80%		14.9	7.4	-	-
100%		6.9	3.4	-	-

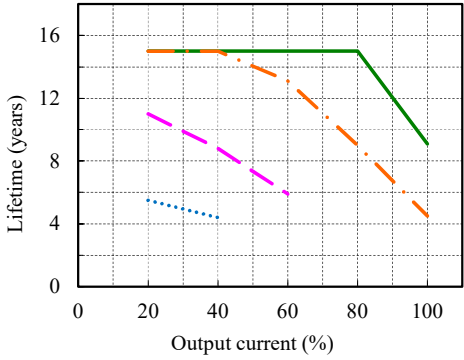


		Vin = 200VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	12.6	6.3
40%		15.0	15.0	10.6	5.3
60%		15.0	13.3	6.6	-
80%		15.0	10.3	-	-
100%		13.1	6.5	-	-

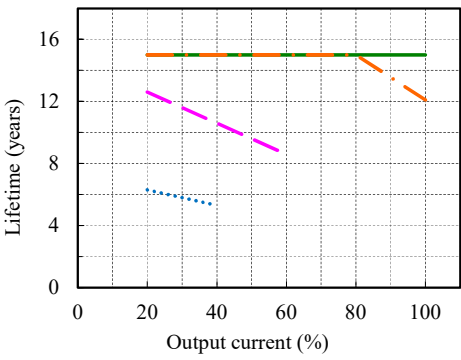


48V

		Vin = 100VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	11.0	5.5
40%		15.0	15.0	8.8	4.4
60%		15.0	13.1	5.9	-
80%		15.0	9.0	-	-
100%		9.1	4.5	-	-



		Vin = 200VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	12.6	6.3
40%		15.0	15.0	10.6	5.3
60%		15.0	15.0	8.6	-
80%		15.0	15.0	-	-
100%		15.0	12.1	-	-



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

MODEL : ZWP300-650

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

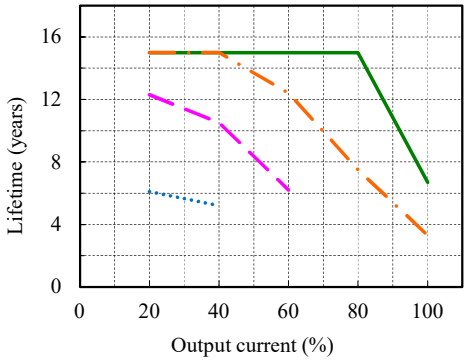
取付方向 E

Mounting E

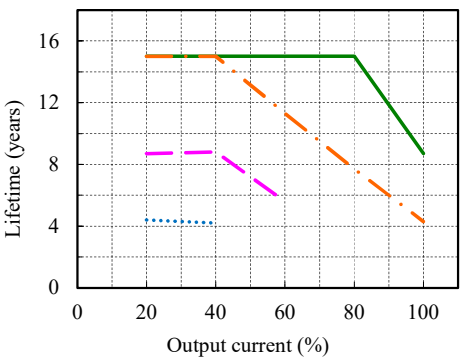
Conditions Ta 40°C : ———
50°C : - - - - -
60°C : ······
70°C : ······

24V

		Vin = 100VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	12.3	6.1
40%		15.0	15.0	10.5	5.2
60%		15.0	12.4	6.2	-
80%		15.0	7.5	-	-
100%		6.7	3.3	-	-

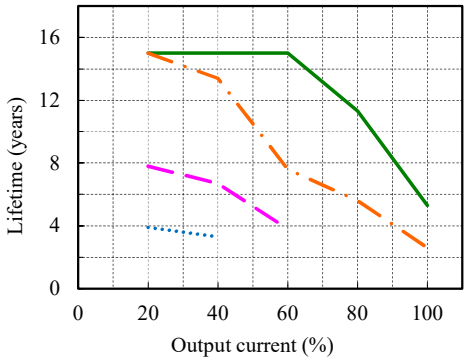


		Vin = 200VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	8.7	4.4
40%		15.0	15.0	8.8	4.2
60%		15.0	11.3	5.6	-
80%		15.0	7.7	-	-
100%		8.7	4.3	-	-

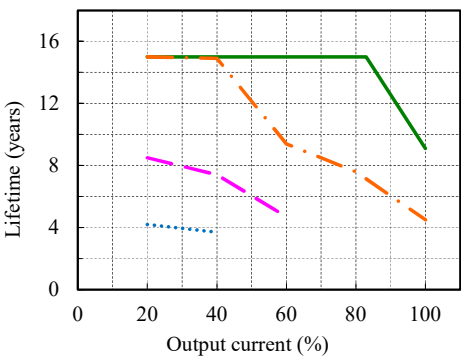


30V

		Vin = 100VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	7.8	3.9
40%		15.0	13.4	6.7	3.3
60%		15.0	7.6	3.8	-
80%		11.3	5.6	-	-
100%		5.3	2.6	-	-



		Vin = 200VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	8.5	4.2
40%		15.0	14.9	7.4	3.7
60%		15.0	9.4	4.7	-
80%		15.0	7.6	-	-
100%		9.1	4.5	-	-



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

MODEL : ZWP300-650

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

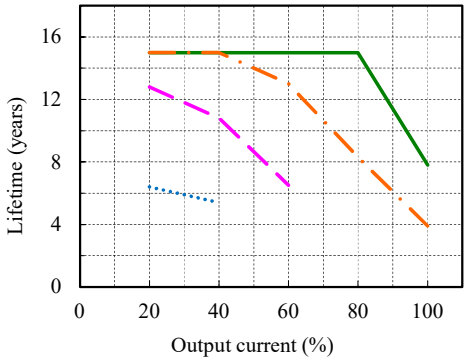
取付方向 E

Mounting E

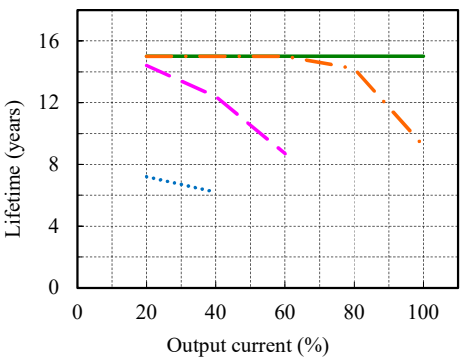
Conditions Ta 40°C : ———
50°C : - - - - -
60°C : ·····
70°C : ······

36V

		Vin = 100VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	12.8	6.4
40%		15.0	15.0	10.8	5.4
60%		15.0	13.0	6.5	-
80%		15.0	8.3	-	-
100%		7.8	3.9	-	-

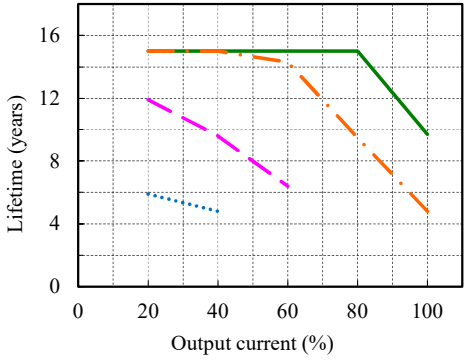


		Vin = 200VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	14.4	7.2
40%		15.0	15.0	12.4	6.2
60%		15.0	15.0	8.7	-
80%		15.0	14.2	-	-
100%		15.0	9.2	-	-

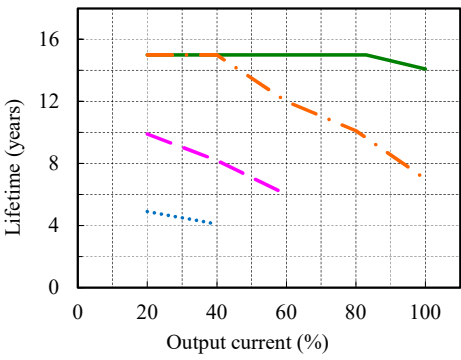


48V

		Vin = 100VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	11.9	5.9
40%		15.0	15.0	9.6	4.8
60%		15.0	14.3	6.4	-
80%		15.0	9.5	-	-
100%		9.7	4.8	-	-



		Vin = 200VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	9.9	4.9
40%		15.0	15.0	8.2	4.1
60%		15.0	12.0	6.0	-
80%		15.0	10.1	-	-
100%		14.1	7.0	-	-



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

MODEL : ZWP300-650

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

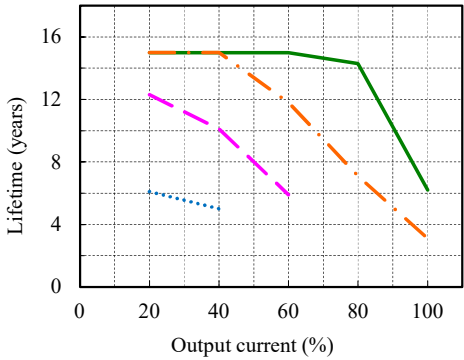
取付方向 F

Mounting F

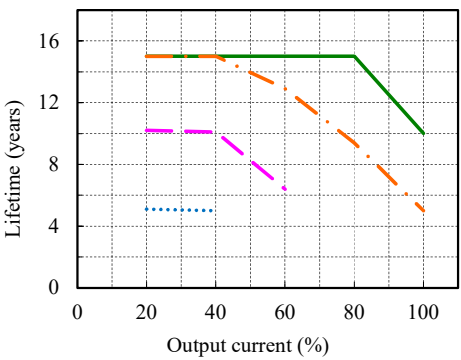
Conditions Ta 40°C : ———
50°C : - - - - -
60°C : ·····
70°C : ······

24V

Ta		Vin = 100VAC			
		Lifetime (years)			
Load		40°C	50°C	60°C	70°C
20%		15.0	15.0	12.3	6.1
40%		15.0	15.0	10.1	5.0
60%		15.0	11.8	5.9	-
80%		14.3	7.1	-	-
100%		6.2	3.1	-	-

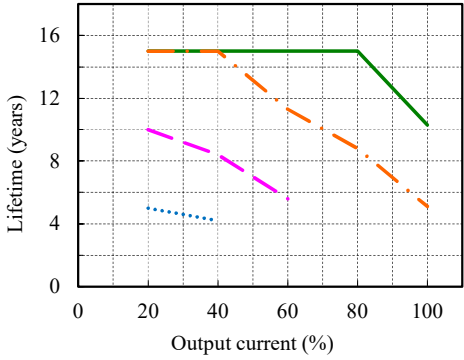


Ta		Vin = 200VAC			
		Lifetime (years)			
Load		40°C	50°C	60°C	70°C
20%		15.0	15.0	10.2	5.1
40%		15.0	15.0	10.1	5.0
60%		15.0	12.9	6.4	-
80%		15.0	9.4	-	-
100%		10.0	5.0	-	-

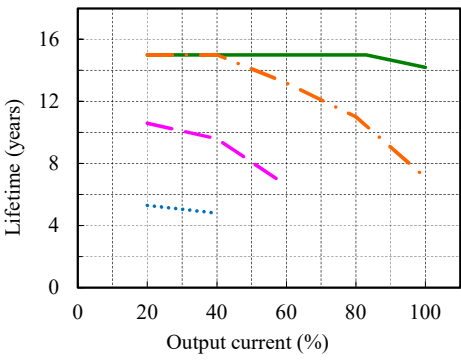


30V

Ta		Vin = 100VAC			
		Lifetime (years)			
Load		40°C	50°C	60°C	70°C
20%		15.0	15.0	10.0	5.0
40%		15.0	15.0	8.4	4.2
60%		15.0	11.3	5.6	-
80%		15.0	8.8	-	-
100%		10.3	5.1	-	-



Ta		Vin = 200VAC			
		Lifetime (years)			
Load		40°C	50°C	60°C	70°C
20%		15.0	15.0	10.6	5.3
40%		15.0	15.0	9.6	4.8
60%		15.0	13.2	6.6	-
80%		15.0	11.0	-	-
100%		14.2	7.1	-	-



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

MODEL : ZWP300-650

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

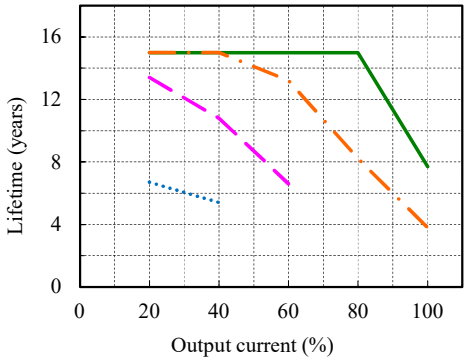
取付方向 F

Mounting F

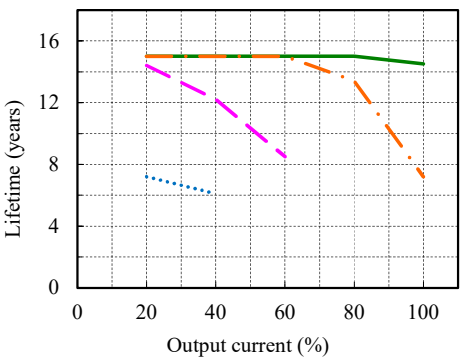
Conditions Ta 40°C : ———
50°C : - - - - -
60°C : ·····
70°C : ······

36V

		Vin = 100VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	13.4	6.7
40%		15.0	15.0	10.8	5.4
60%		15.0	13.2	6.6	-
80%		15.0	8.2	-	-
100%		7.7	3.8	-	-

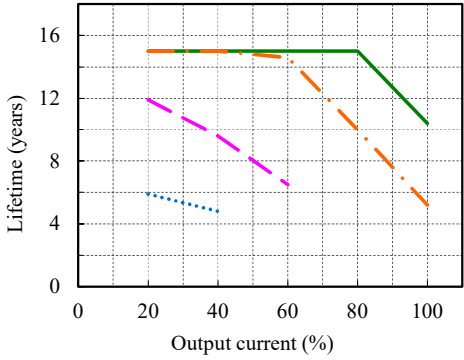


		Vin = 200VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	14.4	7.2
40%		15.0	15.0	12.2	6.1
60%		15.0	15.0	8.5	-
80%		15.0	13.4	-	-
100%		14.5	7.2	-	-

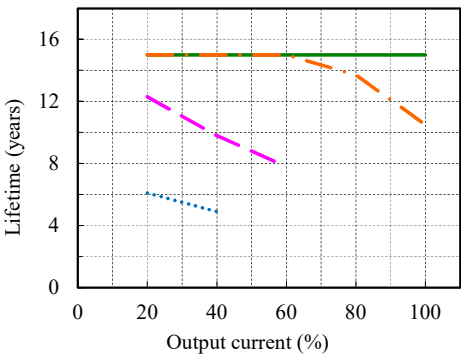


48V

		Vin = 100VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	11.9	5.9
40%		15.0	15.0	9.6	4.8
60%		15.0	14.6	6.5	-
80%		15.0	10.0	-	-
100%		10.4	5.2	-	-



		Vin = 200VAC			
Load	Ta	Lifetime (years)			
		40°C	50°C	60°C	70°C
20%		15.0	15.0	12.3	6.1
40%		15.0	15.0	9.8	4.9
60%		15.0	15.0	7.8	-
80%		15.0	13.7	-	-
100%		15.0	10.5	-	-



5. アブノーマル試験 Abnormal Test

MODEL : ZWP300-650

(1) 試験条件 Test Conditions

入力電圧 Vin Input Voltage	230VAC
出力電圧 Vout Output Voltage	24VDC
出力電流 Iout Output Current	12.5A(100%)

(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 O V P	i O C P	j 出力断 No output	k 変化なし No change	l その他 Others		
1	Q101	D-S	○				○			○	○			○			Fuse:F1, Da:R112-R114	
2		D-G	○				○			○	○			○			Fuse:F1, Da:Q101,Q102,R106,R111 , A101,R112-R114,D109	
3		G-S	○														○ Only Q102 operate	
4		D		○													○ Only Q102 operate	
5		S		○													○ Only Q102 operate	
6		G		○													○ Only Q102 operate	
7	Q103	D-S	○				○			○	○			○			Fuse:F1, Da:R112-R114, Q101,Q104,R108,A101	
8		D-G	○				○			○	○			○			Fuse:F1, Da:R112- R114,Q101,Q103, Q104,A101	
9		G-S	○											○				
10		D		○						○				○			Da:Q103,Q104,A101	
11		S		○						○				○			Da:Q103,Q104,A101	
12		G		○						○				○			Da:TFR1,Q103,Q104	
13	Q104	D-S	○				○			○	○			○			Fuse:F1, Da:R112- R114,R128,R129, D101,Q103,Q104,A101	
14		D-G	○							○				○			Da:Q103,Q104,A101	
15		G-S	○											○				
16		D		○						○				○			Da:Q103,Q104,A101	
17		S		○						○				○			Da:Q103,Q104,A101	
18		G		○			○			○				○			Da: TFR1,Q103,Q104	

(Da : Damaged)

No.	Test position		Test mode		Test result													記事 Note
	部品No.	試験端子 Test point	ショート	オープン	a 発火	b 発煙	c 破裂	d 異臭	e 赤熱	f 破損	g ヒューズ断	h OVP	i OCP	j 出力断	k 変化なし	l その他		
			Short	Open	Fire	Smoke	Burst	Smell	Red hot	Damaged	Fuse blown			No output	No change	Others		
1	Q201	D-S	○													○	Vout hiccup	
2		D-G	○							○				○			Da:Q201	
3		G-S	○													○	Component temperature rises. (Q202)	
4		D		○												○	Component temperature rises. (Q202)	
5		S		○												○	Component temperature rises. (Q202)	
6		G		○						○				○			Da:Q201	
7	Q203	D-S	○													○	Vout hiccup	
8		D-G	○							○				○			Da:Q203	
9		G-S	○													○	Component temperature rises. (Q204)	
10		D		○												○	Component temperature rises. (Q204)	
11		S		○												○	Component temperature rises. (Q204)	
12		G		○						○				○			Da:Q203	
13	D1	1-2	○								○			○			Fuse:F1	
14		1-3	○								○			○			Fuse:F1	
15		1-4	○								○			○			Fuse:F1	
16		2-3	○								○			○			Fuse:F1	
17		2-4	○								○			○			Fuse:F1	
18		3-4	○								○			○			Fuse:F1	
19		1		○											○			
20		2		○											○			
21		3		○											○			
22		4		○											○			
23	D102	A-K	○				○			○	○			○			Fuse:F1, Da:R112-R114,Q101-Q104,A101	
24		A or K		○											○			

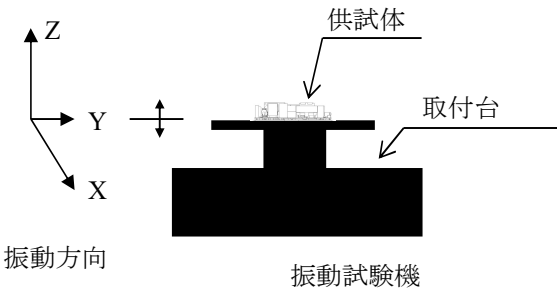
(Da : Damaged)

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	T1	1-2	○													○	Vout hiccup
2		1-8	○							○						○	Vout hiccup, Da:A101,T1
3		2-8	○							○						○	Vout hiccup, Da:A101,T1
4		2-3	○				○			○	○				○		Fuse:F1, Da:Q101-Q104,R112-R114,R108,R110,R127, A101
5		3-4	○													○	
6		9-10	○													○	
7		10-11	○													○	Vout hiccup
8		11-12	○													○	
9		12-13	○													○	
10		13-14	○													○	
11		14-15	○													○	Vout hiccup
12		15-16	○													○	
13		16-17	○													○	Vout hiccup
14		17-18	○													○	Vout hiccup
15		1		○							○				○		
16		2		○							○				○		
17		3		○											○		
18		4		○											○		
19		8		○							○				○		
20		9		○												○	
21		10		○												○	
22		11		○												○	
23		12		○												○	
24		13		○												○	
25		14		○												○	
26		15		○												○	
27		16		○												○	
28		17		○													○ Pin increases
29		18		○													○ Pin increases

6. 振動試験 Vibration Test

MODEL : ZWP300-650-24

- (1) 振動試験種類 Vibration Test Class
掃引振動数耐久試験 Frequency variable endurance test
- (2) 使用機器 Equipment Used
振動試験装置 : EM2201 (IMV (株)製)
Vibration tester : IMV CORP.
- (3) 試験方法 Test Method



- (4) 判定条件 Acceptable Conditions
- 1. 破壊しない事
Not broken.
 - 2. 試験後の出力に異常がない事
No abnormality of outline and electrical performance after test.

(5) 試験結果 Test Results

掃引周波数 (Hz) Sweep frequency (Hz)	掃引時間 (min) Sweep time (min)	振動方向 Direction	加速度 (m/s^2) Acceleration (m/s^2)	試験時間 Test time	ZWP300-650
10 - 55	1	x, y, z	19.6	1 hour each	PASS

7. ノイズシミュレート試験 Noise Simulate Test

MODEL : ZWP300-650-24

(1) 使用計測器 Equipment Used

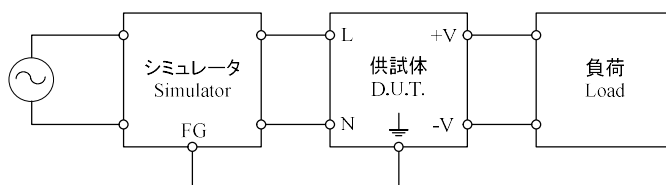
ノイズシミュレータ: INS-400L, INS-AX2-450TH (ノイズ研究所)

Noise 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	: 24V
・出力電流 Output current	: 0%, 100% (12.5A)	・印加モード Mode	: コモン、ノーマル Common, Normal
・極性 Polarity	: +, -	・位相 Phase	: 0° - 360°
・パルス幅 Pulse width	: 50~1000ns	・トリガ選択 Trigger select	: Line
・周囲温度 Ambient temperature	: 25°C		

(1) 試験方法及び印加箇所 Test Method and Test Point

入力端子 (N, L, $\frac{+}{-}$)Input terminal (N, L, $\frac{+}{-}$)

(4) 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
No output voltage fluctuation more than 5% 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 after test shall not have obvious deviation from the output voltage before test.
3. 発煙・発火のない事
No smoke and fire are allowed.

(5) 試験結果 Test Results

試験端子 Test terminal	試験電圧 (kV) Test voltage (kV)	ZWP300-650-24
入力 Input	2	PASS

8. 熱衝撃試験 Thermal Shock Test

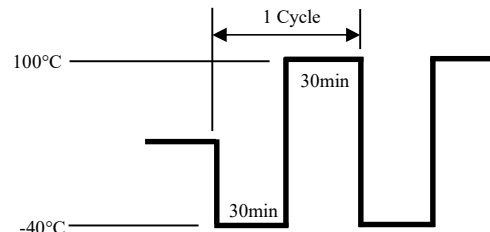
MODEL : ZWP300-650-24

(1) 使用機器 Equipment Used

冷熱衝撃装置 : TSA-71S-A (ESPEC)
Thermal Shock Chamber

(2) 試験条件 Test Conditions

・電源周囲温度 : $-40^{\circ}\text{C} \Leftrightarrow +100^{\circ}\text{C}$
Ambient Temperature
・試験時間 : 図参照
Test Time Refer to Dwg.
・試験サイクル : 680 サイクル
Test Cycle 680 Cycles
・非動作
Not Operating



(3) 試験方法 Test Method

試験前に、供試品の出力電圧に異常がない事を確認し、供試品を冷熱衝撃槽に入れ、上記のサイクルで試験を行う。試験後に、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 the test, check the output voltage of the D.U.T. if there is no abnormality, then put the D.U.T in thermal shock chamber, and conduct test for the above cycle. After the test. leave the D.U.T at nominal temperature and humidity for 1hour, then check the output voltage of the D.U.T if there is no abnormality.

(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 PASS