ZWS240BP

RELIABILITY DATA

信頼性データ

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※ 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

MODEL : ZWS240BP-24

(1) 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＞

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

(2) MTBF値 MTBF values

G_F : 地上固定 (Ground, Fixed)

RCR-9102B

MTBF ≒ 197,152 時間 (hours)

2. 部品ディレーティング Components Derating

MODEL：ZWS240BP-24

(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 :24V, 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

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

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

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

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

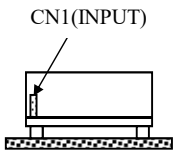
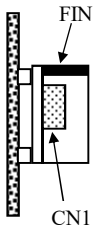
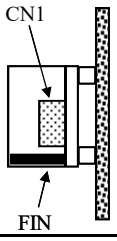
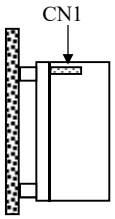
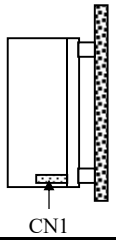
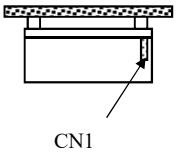
部品番号 Location No.	Vin = 100VAC	Load = 100%	Ta = 50℃
Q1 FMW20N60S1HF FUJI ELECTRIC	Tch (max) = 150 ℃ Pch = 5.0 W Tch = Tc + ((θch-c) × Pch) = 118.8 ℃ D.F. = 79.2 %	θch-c = 0.96 ℃/W ΔTc = 64.0 ℃	Pch (max) = 40 W Tc= 114.0 ℃
Q2 FMV20N50ES FUJI ELECTRIC	Tch (max) = 150 ℃ Pch = 2.3 W Tch = Tc + ((θch-c) × Pch) = 112.0 ℃ D.F. = 74.7 %	θch-c = 1.32 ℃/W ΔTc = 59.0 ℃	Pch (max) = 40 W Tc= 109.0 ℃
Q3 FMV20N50ES FUJI ELECTRIC	Tch (max) = 150 ℃ Pch = 2.0 W Tch = Tc + ((θch-c) × Pch) = 109.6 ℃ D.F. = 73.1 %	θch-c = 1.32 ℃/W ΔTc = 57.0 ℃	Pch (max) = 40 W Tc= 107.0 ℃
D51 YG868C15R FUJI ELECTRIC	Tj (max) = 150 ℃ Pd = 2.9 W Tj = Tc + ((θj-c) × Pd) = 109.5 ℃ D.F. = 73.0 %	θj-c = 1.2 ℃/W ΔTc = 56.0 ℃	Tc= 106.0 ℃
D52 YG868C15R FUJI ELECTRIC	Tj (max) = 150 ℃ Pd = 3.1 W Tj = Tc + ((θj-c) × Pd) = 109.7 ℃ D.F. = 73.1 %	θj-c = 1.2 ℃/W ΔTc = 56.0 ℃	Tc= 106.0 ℃
D53 YG868C15R FUJI ELECTRIC	Tj (max) = 150 ℃ Pd = 3.1 W Tj = Tc + ((θj-c) × Pd) = 107.7 ℃ D.F. = 71.8 %	θj-c = 1.2 ℃/W ΔTc = 54.0 ℃	Tc= 104.0 ℃
D1 D15XB60H SHINDENGEN	Tj (max) = 150 ℃ Pd = 6.1 W Tj = Tc + ((θj-c) × Pd) = 106.2 ℃ D.F. = 70.8 %	θj-c = 1.5 ℃/W ΔTc = 47.0 ℃	Tc= 97.0 ℃
D2 SF10L60U-7600 SHINDENGEN	Tj (max) = 150 ℃ Pd = 1.2 W Tj = Tc + ((θj-c) × Pd) = 117.5 ℃ D.F. = 78.3 %	θj-c = 2.0 ℃/W ΔTc = 65.0 ℃	Tc= 115.0 ℃
PC102 PS2861B (LED) NEC	Tj (max) = 125 ℃ Pd = 0.9 mW Tj = Tc + ((θj-c) × Pd) = 91.3 ℃ D.F. = 73.0 %	θj-c = 330 ℃/W ΔTc = 41.0 ℃	Tc= 91.0 ℃

部品番号 Location No.	Vin = 200VAC	Load = 100%	Ta = 50℃
Q1 FMW20N60S1HF FUJI ELECTRIC	Tch (max) = 150 ℃ Pch = 2.9 W Tch = Tc + ((θch-c) × Pch) = 91.8 ℃ D.F. = 61.2 %	θch-c = 0.96 ℃/W ΔTc = 39.0 ℃	Pch (max) = 40 W Tc= 89.0 ℃
Q2 FMV20N50ES FUJI ELECTRIC	Tch (max) = 150 ℃ Pch = 2.3 W Tch = Tc + ((θch-c) × Pch) = 109.0 ℃ D.F. = 72.7 %	θch-c = 1.32 ℃/W ΔTc = 56.0 ℃	Pch (max) = 40 W Tc= 106.0 ℃
Q3 FMV20N50ES FUJI ELECTRIC	Tch (max) = 150 ℃ Pch = 2.0 W Tch = Tc + ((θch-c) × Pch) = 106.6 ℃ D.F. = 71.1 %	θch-c = 1.32 ℃/W ΔTc = 54.0 ℃	Pch (max) = 40 W Tc= 104.0 ℃
D51 YG868C15R FUJI ELECTRIC	Tj (max) = 150 ℃ Pd = 2.9 W Tj = Tc + ((θj-c) × Pd) = 104.5 ℃ D.F. = 69.7 %	θj-c = 1.2 ℃/W ΔTc = 51.0 ℃	Tc= 101.0 ℃
D52 YG868C15R FUJI ELECTRIC	Tj (max) = 150 ℃ Pd = 3.1 W Tj = Tc + ((θj-c) × Pd) = 104.7 ℃ D.F. = 69.8 %	θj-c = 1.2 ℃/W ΔTc = 51.0 ℃	Tc= 101.0 ℃
D53 YG868C15R FUJI ELECTRIC	Tj (max) = 150 ℃ Pd = 3.1 W Tj = Tc + ((θj-c) × Pd) = 102.7 ℃ D.F. = 68.5 %	θj-c = 1.2 ℃/W ΔTc = 49.0 ℃	Tc= 99.0 ℃
D1 D15XB60H SHINDENGEN	Tj (max) = 150 ℃ Pd = 3.1 W Tj = Tc + ((θj-c) × Pd) = 86.7 ℃ D.F. = 57.8 %	θj-c = 1.5 ℃/W ΔTc = 32.0 ℃	Tc= 82.0 ℃
D2 SF10L60U-7600 SHINDENGEN	Tj (max) = 150 ℃ Pd = 1.3 W Tj = Tc + ((θj-c) × Pd) = 92.6 ℃ D.F. = 61.7 %	θj-c = 2.0 ℃/W ΔTc = 40.0 ℃	Tc= 90.0 ℃
PC102 PS2861B (LED) NEC	Tj (max) = 125 ℃ Pd = 0.9 mW Tj = Tc + ((θj-c) × Pd) = 90.3 ℃ D.F. = 72.2 %	θj-c = 330 ℃/W ΔTc = 40.0 ℃	Tc= 90.0 ℃

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

MODEL : ZWS240BP-24

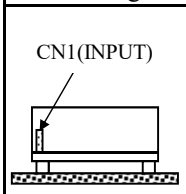
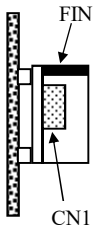
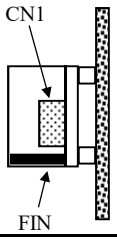
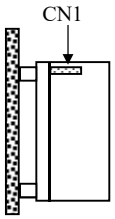
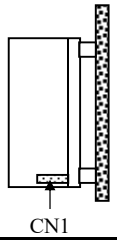
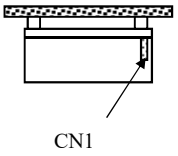
(1) 測定条件 Measuring Conditions

取付方法 Mounting Method (標準取付 : A) (Standard Mounting : A)	Mounting A	Mounting B	Mounting C	Mounting D	Mounting E	Mounting F
						
入力電圧 Vin Input Voltage	100VAC					
出力電圧 Vo Output Voltage	24VDC					
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=40℃	Ta=40℃	Ta=20℃	Ta=30℃	Ta=20℃
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	取付方向 Mounting E	取付方向 Mounting F
Q1	MOS FET	64	59	59	66	66	67
Q2	MOS FET	59	57	63	63	73	72
Q3	MOS FET	57	55	63	60	72	70
D51	DIODE	56	60	58	61	66	64
D52	DIODE	56	60	58	61	67	64
D53	DIODE	54	58	56	59	66	63
D1	BRIDGE DIODE	47	52	49	60	53	56
D2	DIODE	65	61	63	75	67	70
A101	CHIP IC	46	47	40	55	46	56
A102	CHIP IC	51	46	47	54	57	64
A201	CHIP IC	22	14	31	19	34	32
T1	DRIVE TRANS	49	49	48	55	59	62
T2	TRANS	70	68	77	77	87	81
L1	BALUN	39	33	37	59	39	44
L2	BALUN	37	33	36	59	37	44
L3	PFC CHOKE COIL	58	60	53	68	61	64
L51	CHOKE COIL	47	44	51	46	68	54
C7	E.CAP.	21	22	38	24	34	33
C8	E.CAP.	18	19	34	21	32	29
C51	E.CAP.	15	11	20	14	30	19
C52	E.CAP.	20	15	25	18	36	25
PC102	PHOTO COUPLER	41	32	47	39	53	53

(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	Mounting E	Mounting F
						
入力電圧 Vin Input Voltage	200VAC					
出力電圧 Vo Output Voltage	24VDC					
出力電流 Io Output Current	10A(100%)					

(2) 測定結果 Measuring Results

出力ディレーティング Output Derating		ΔT Temperature Rise (℃) Io=100 %					
		Ta=50℃	Ta=40℃	Ta=40℃	Ta=20℃	Ta=30℃	Ta=20℃
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	取付方向 Mounting E	取付方向 Mounting F
Q1	MOS FET	39	36	36	45	38	41
Q2	MOS FET	56	53	58	59	63	65
Q3	MOS FET	54	52	58	57	62	64
D51	DIODE	51	56	52	56	57	58
D52	DIODE	51	56	53	56	58	58
D53	DIODE	49	55	51	54	58	57
D1	BRIDGE DIODE	32	37	35	44	36	39
D2	DIODE	40	39	40	51	41	44
A101	CHIP IC	35	38	32	47	34	45
A102	CHIP IC	46	42	42	50	47	57
A201	CHIP IC	23	14	30	18	28	30
T1	DRIVE TRANS	42	40	38	48	42	50
T2	TRANS	70	66	74	74	78	77
L1	BALUN	19	17	21	36	19	24
L2	BALUN	19	17	22	38	19	24
L3	PFC CHOKE COIL	42	46	39	54	43	48
L51	CHOKE COIL	45	44	49	45	62	52
C7	E.CAP.	20	21	36	23	28	30
C8	E.CAP.	17	18	32	19	26	26
C51	E.CAP.	15	11	20	13	25	18
C52	E.CAP.	20	15	24	17	30	24
PC102	PHOTO COUPLER	40	32	44	38	46	50

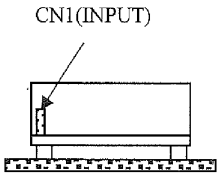
4. 電解コンデンサ推定寿命計算値　Electrolytic Capacitor Lifetime

MODEL : ZWS240BP-24

空冷条件：自然空冷

Cooling condition : Convection cooling

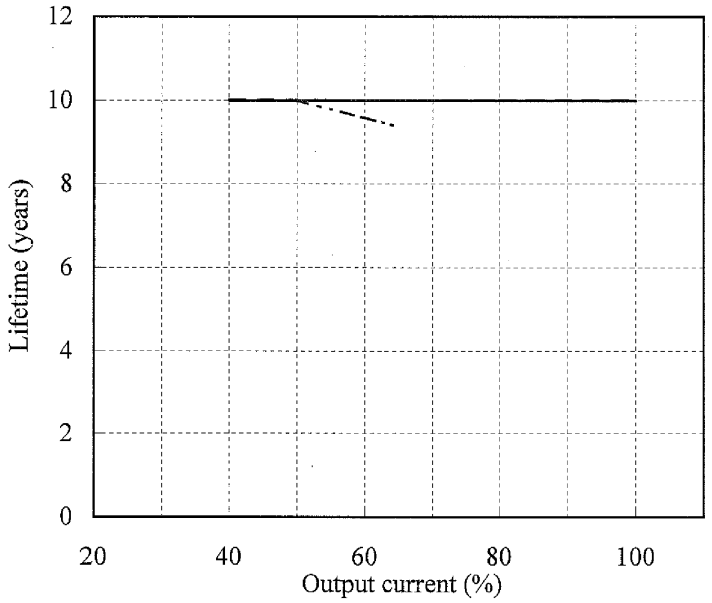
取付方向 A
Mounting A



Conditions　Ta　40℃ : ———
50℃ : – – –
60℃ : —··—

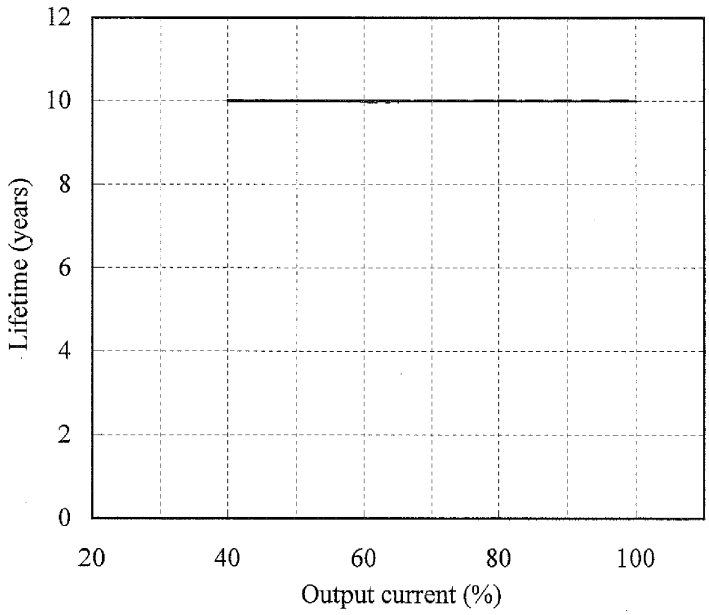
Vin=100VAC

Load (%)	Lifetime (years)		
	Ta= 40℃	Ta= 50℃	Ta= 60℃
40	10.0	10.0	10.0
60	10.0	10.0	9.6
80	10.0	10.0	-
100	10.0	10.0	-

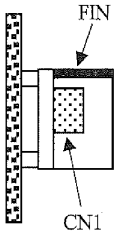


Vin=200VAC

Load (%)	Lifetime (years)		
	Ta= 40℃	Ta= 50℃	Ta= 60℃
40	10.0	10.0	10.0
60	10.0	10.0	10.0
80	10.0	10.0	-
100	10.0	10.0	-



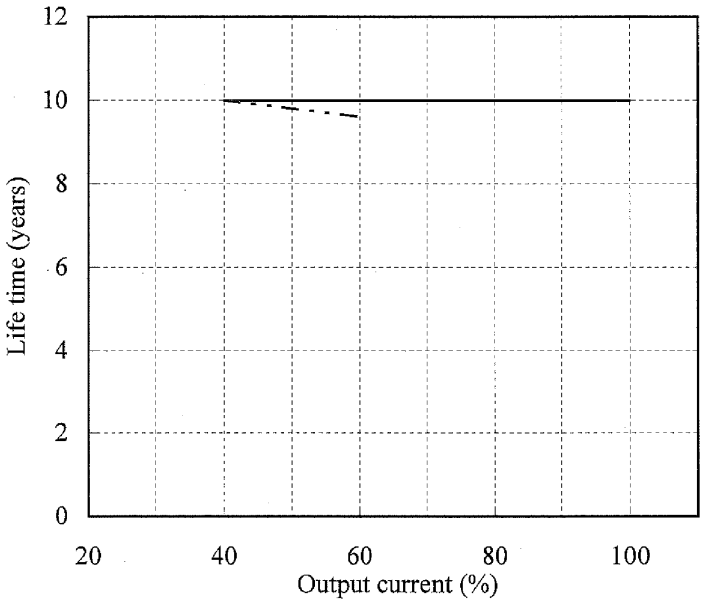
取付方向 B
Mounting B



Vin=100VAC

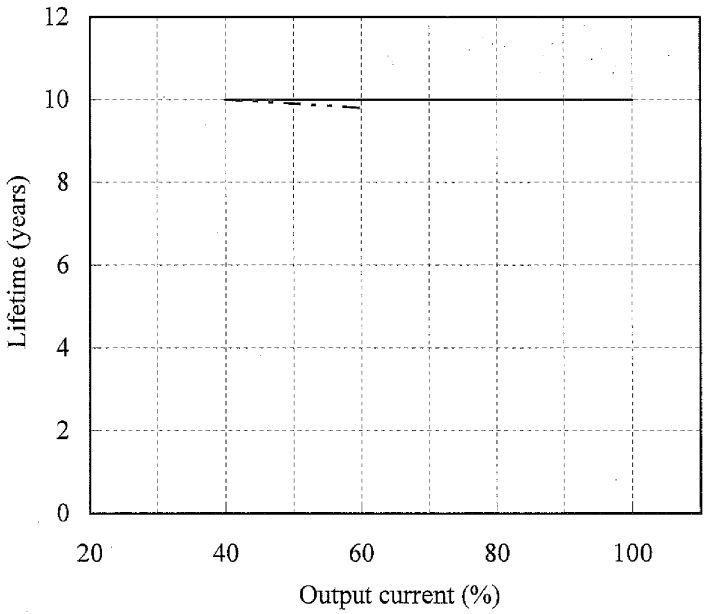
Load (%)	Lifetime (years)		
	Ta= 40℃	Ta= 50℃	Ta= 60℃
40	10.0	10.0	10.0
60	10.0	10.0	9.6
80	10.0	10.0	-
100	10.0	-	-

Conditions Ta 40℃ : ——
50℃ : — — —
60℃ : —··—

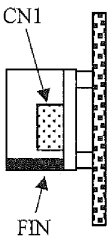


Vin=200VAC

Load (%)	Lifetime (years)		
	Ta= 40℃	Ta= 50℃	Ta= 60℃
40	10.0	10.0	10.0
60	10.0	10.0	9.8
80	10.0	10.0	-
100	10.0	-	-



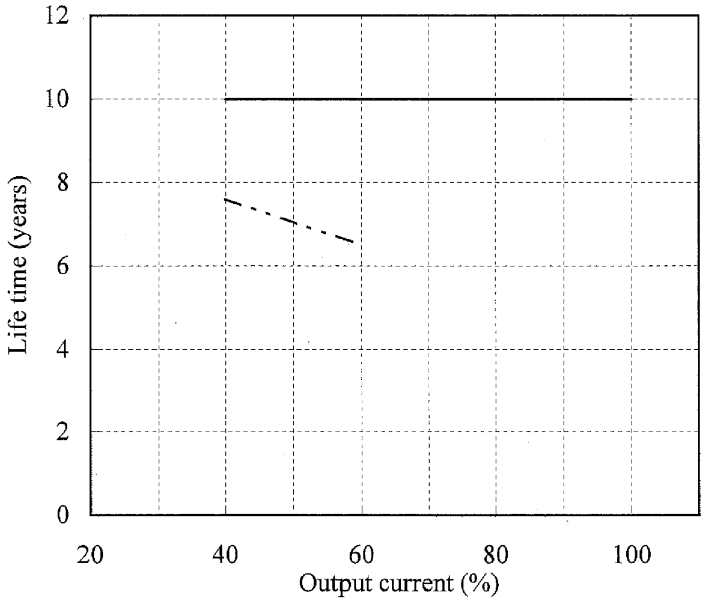
取付方向 C
Mounting C



Vin=100VAC

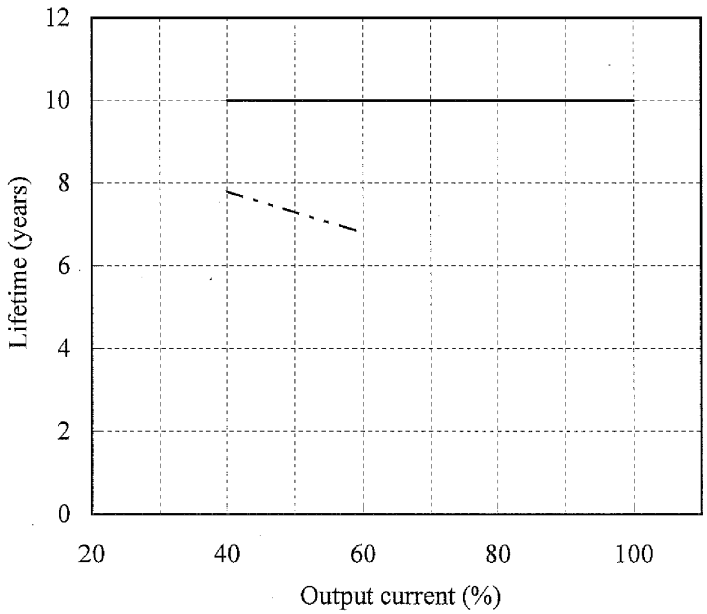
Load (%)	Lifetime (years)		
	Ta= 40℃	Ta= 50℃	Ta= 60℃
40	10.0	10.0	7.6
60	10.0	10.0	6.5
80	10.0	10.0	-
100	10.0	-	-

Conditions Ta 40℃ : ——
50℃ : – – –
60℃ : —··—

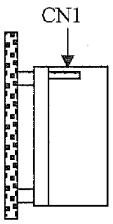


Vin=200VAC

Load (%)	Lifetime (years)		
	Ta= 40℃	Ta= 50℃	Ta= 60℃
40	10.0	10.0	7.8
60	10.0	10.0	6.8
80	10.0	10.0	-
100	10.0	-	-



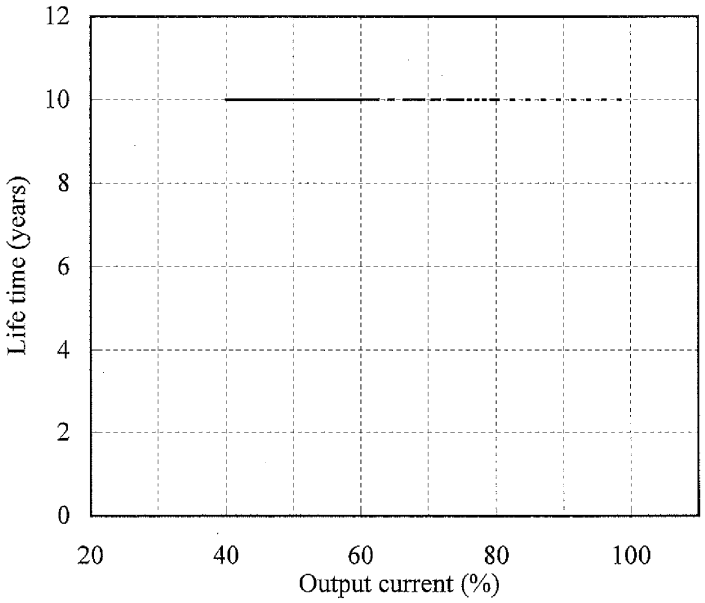
取付方向 D
Mounting D



Vin=100VAC

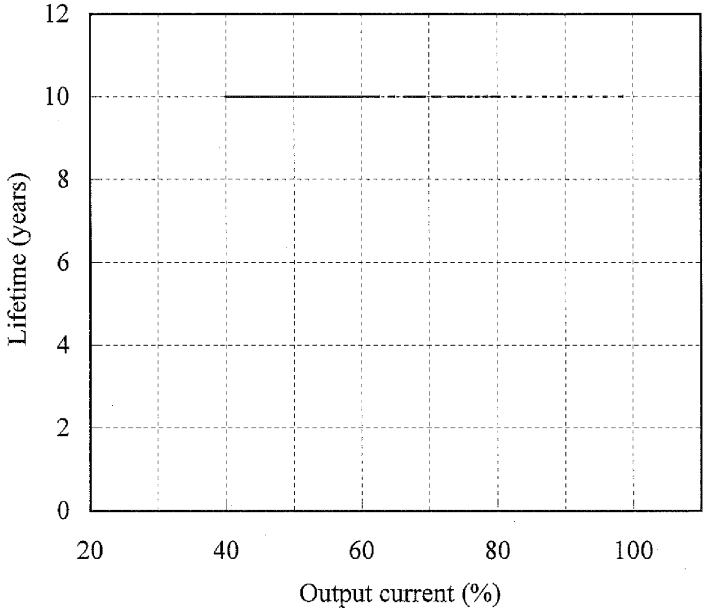
Load (%)	Lifetime (years)		
	Ta= 20℃	Ta= 30℃	Ta= 40℃
40	10.0	10.0	10.0
60	10.0	10.0	10.0
80	10.0	10.0	-
100	10.0	-	-

Conditions Ta 20℃ : - - - - -
30℃ : — · — ·
40℃ : ——

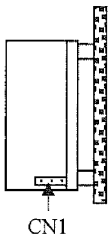


Vin=200VAC

Load (%)	Lifetime (years)		
	Ta= 20℃	Ta= 30℃	Ta= 40℃
40	10.0	10.0	10.0
60	10.0	10.0	10.0
80	10.0	10.0	-
100	10.0	-	-



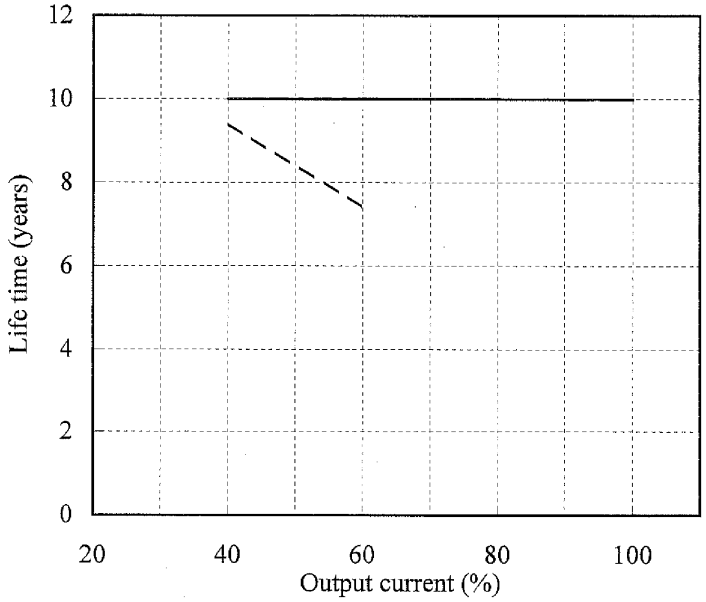
取付方向 E
Mounting E



Vin=100VAC

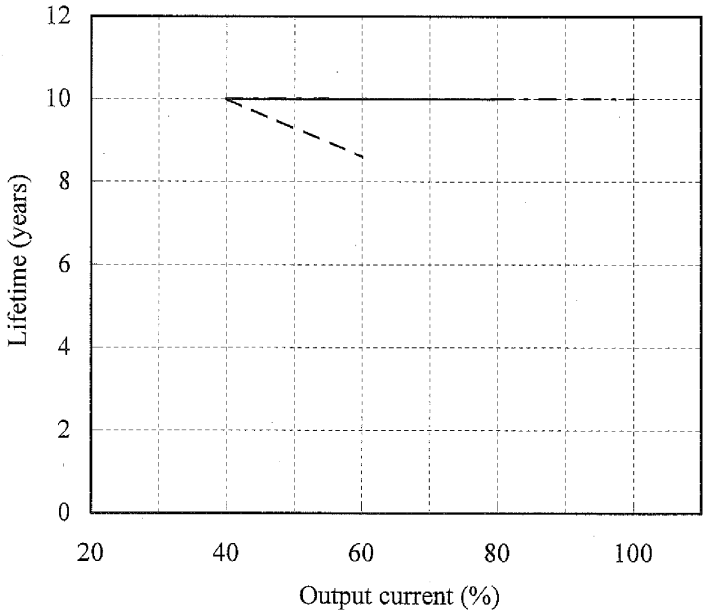
Load (%)	Lifetime (years)		
	Ta= 30℃	Ta= 40℃	Ta= 50℃
40	10.0	10.0	9.4
60	10.0	10.0	7.4
80	10.0	10.0	-
100	10.0	-	-

Conditions Ta 30℃ : —·—·
40℃ : ——
50℃ : — — —

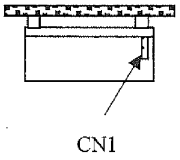


Vin=200VAC

Load (%)	Lifetime (years)		
	Ta= 30℃	Ta= 40℃	Ta= 50℃
40	10.0	10.0	10.0
60	10.0	10.0	8.6
80	10.0	10.0	-
100	10.0	-	-



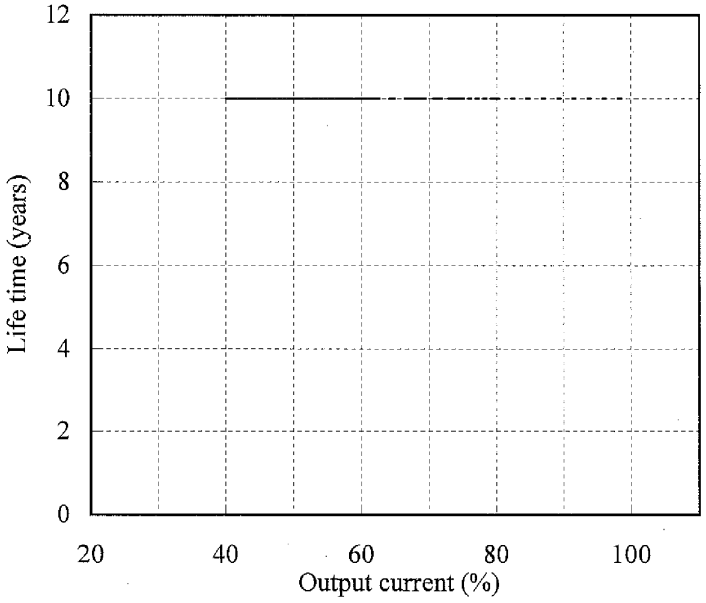
取付方向 F
Mounting F



Conditions Ta 20℃ : - - - - -
30℃ : — · — ·
40℃ : ——

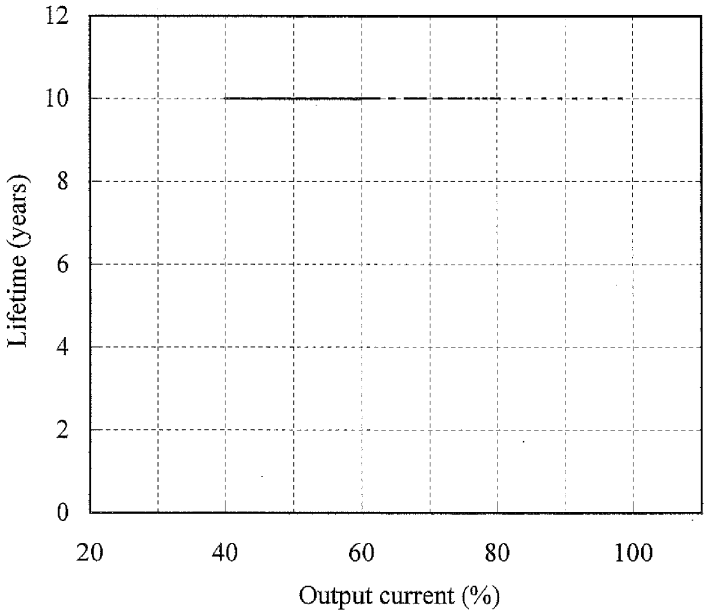
Vin=100VAC

Load (%)	Lifetime (years)		
	Ta= 20℃	Ta= 30℃	Ta= 40℃
40	10.0	10.0	10.0
60	10.0	10.0	10.0
80	10.0	10.0	-
100	10.0	-	-



Vin=200VAC

Load (%)	Lifetime (years)		
	Ta= 20℃	Ta= 30℃	Ta= 40℃
40	10.0	10.0	10.0
60	10.0	10.0	10.0
80	10.0	10.0	-
100	10.0	-	-



5. アブノーマル試験 Abnormal Test

MODEL : ZWS240BP-24

(1) 試験条件 Test Conditions

Input : 230VAC Output : 24V, 10A Ta : 25℃

(2) 試験結果 Test Results

(Da : Damaged)

No.	Test position		Test mode		Test result												記事
					a	b	c	d	e	f	g	h	I	j	k	l	
	部品No. Location No.	試験端子 Test point	ショート Short	オープン Open	発火 Fire	発煙 Smoke	破裂 Burst	異臭 Smell	赤熱 Red hot	破損 Damaged	ヒューズ断 Fuse blown	OVP	OCP	出力断 No output	変化なし No change	その他 Others	Note
1	Q1	D-S	○								○			○			
2		D-G	○							○	○			○			Da : Q1, D101, A101
3		G-S	○													○	Input Power Increase
4		D		○												○	Input Power Increase
5		S		○												○	Input Power Increase
6		G		○						○	○			○			Da : Q1, D101, A101
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	D51	A-K	○											○			
20		A		○										○			
21		K		○										○			
22	D52	A-K	○											○			
23		A		○											○		
24		K		○											○		
25	D53	A-K	○											○			
26		A		○											○		
27		K		○											○		

(Da : Damaged)

No.	Test position		Test mode		Test result												
					a	b	c	d	e	f	g	h	I	j	k	l	
	部品No. Location No.	試験端子 Test point	ショート Short	オープン Open	発火 Fire	発煙 Smoke	破裂 Burst	異臭 Smell	赤熱 Red hot	破損 Damaged	ヒューズ断 Fuse blown	OVP	OCP	出力断 No output	変化なし No change	その他 Others	記事 Note
28	C7		○								○			○			
29				○											○		
30	C52		○										○	○			
31				○												○	Output Ripple Increase
32	D1	AC-AC	○								○			○			
33		DC-DC	○							○	○			○			Da : D1
34		AC-DC	○								○			○			
35		AC		○										○			
36		DC		○										○			
37	D2	A-K	○							○	○			○			Da : Q1, D101
38		A		○						○	○			○			Da : Q1, D101, A101
39	D107	A-K	○										○	○			
40		A		○												○	Input Power Increase
41	D109	A-K	○										○	○			
42		A		○												○	Input Power Increase
43	T1	1-2	○											○			
44		3-4	○											○			
45		6-7	○											○			
46		1		○										○			
47		3		○										○			
48		6		○										○			
49	T2	1-2	○											○			
50		9-10	○											○			
51		1		○										○			
52		4		○										○			
53		9		○											○		
54		10		○											○		

6. 振動試験 Vibration Test

MODEL : ZWS240BP-24

(1) 振動試験種類 Vibration Test Class

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

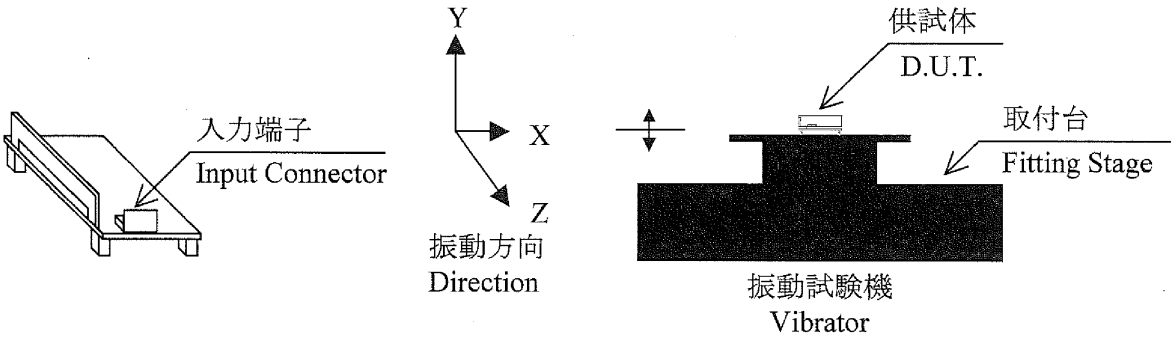
(2) 使用振動試験装置 Equipment Used

EMIC (株) 製 EMIC CORP	・制御部 Controller	: F-400-BM-E47	・加振部 Vibrator	: 905-FN

(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.試験後の特性は初期値から変動していない事
Characteristic to be within regulation specification after the test.

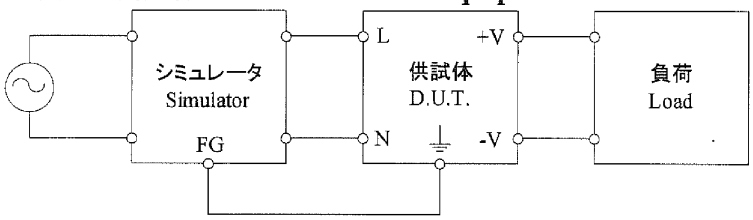
(6) 試験結果 Test Results

合格 OK

7. ノイズシミュレート試験 Noise Simulate Test

MODEL : ZWS240BP-24

(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.破壊しない事
Not to be broken
2.出力がダウンしない事
Not to be shut down output
3.その他異常のない事
No other out of orders

(4) 試験結果 Test Results

合格 OK

8. 熱衝撃試験 Thermal Shock Test

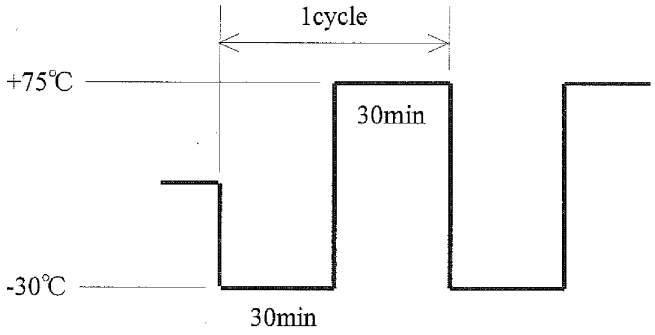
MODEL : ZWS240BP-24

(1) 使用計測器 Equipment Used

TSA-70H-W : ESPEC

(2) 試験条件 Test Conditions

・電源周囲温度 :-30℃ ⇔ 75℃
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

1.破壊しない事
Not to be broken
2.試験後の特性は初期値から変動していない事
Characteristic to be within regulation specification after the test.

(5) 試験結果 Test Results

合格 OK