

ZWS15B

RELIABILITY DATA

信頼性データ

DWG No. CA791-57-01		
APPD	CHK	DWG
Jackson 9-Feb-2012	P. Clark 9-Feb-2012	Ang 9 Feb 12'

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※ 試験結果は、代表データであります。全ての製品はほぼ同等な特性を示します。
従いまして、以下の結果は実力値とお考え願います。

Test results are typical data. Nevertheless the following results are considered to be
actual capability data because all units have nearly the same characteristics.

1. MTBF計算値 Calculated Values of MTBF

MODEL : ZWS15B-5

(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>

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

λ_{equip} : 全機器故障率 (故障数/10⁶時間)
 Total Equipment Failure Rate (Failure/10⁶Hours)

λ_G : i番目の同属部品に対する故障率 (故障数/10⁶時間)
 Generic Failure Rate for The ith Generic Part (Failure/10⁶Hours)

n_i : i番目の同属部品の個数
 Quantity of ith Generic Part

n : 異なった同属部品のカテゴリーの数
 Number of Different Generic Part Categories

π_Q : i番目の同属部品に対する品質ファクタ ($\pi_Q=1$)
 Generic Quality Factor for The ith Generic Part ($\pi_Q=1$)

(2) MTBF値 MTBF Values

G_F : 地上固定 (Ground, Fixed)

RCR-9102B

MTBF ≒ 399,466 時間 (Hours)

2. 部品デレーティング Components Derating

MODEL : ZWS15B-5

(1) 算出方法 Calculating Method

(a) 測定方法 Measuring method

・取付方法 Mounting method	: 標準取付 : A Standard mounting : A	・周囲温度 Ambient temperature	: 50°C
・入力電圧 Input voltage	: 100, 200VAC	・出力電圧、電流 Output voltage & current	: 5V, 3A(100%)

(b) 半導体 Semiconductors

ケース温度、消費電力、熱抵抗より使用状態の接合点温度を求め
最大定格、接合点温度との比較を求めました。

Compared with maximum junction temperature and actual one which is calculated
based on case temperature, power dissipation and thermal impedance.

(c) IC、抵抗、コンデンサ等 IC, Resistors, Capacitors, etc.

周囲温度、使用状態、消費電力など、個々の値は設計基準内に入っています。

Ambient temperature, operating condition, power dissipation and so on are within
derating criteria.

(d) 熱抵抗算出方法 Calculating method of thermal impedance

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

T_c : デレーティングの始まるケース温度 一般に25°C
Case Temperature at Start Point of Derating; 25°C in General

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

T_l : デレーティングの始まるリード温度 一般に25°C
Lead Temperature at Start Point of Derating; 25°C in General

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

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

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

θ_{j-a} : 接合点から周囲までの熱抵抗
Thermal Impedance between Junction and air

θ_{j-l} : 接合点からリードまでの熱抵抗
Thermal Impedance between Junction and Lead

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

部品番号 Location No.	$V_{in} = 100VAC$	Load = 100%	$T_a = 50^{\circ}C$
A1 ICE3A1065ELJ INFINEON	$T_{ch} (max) = 150^{\circ}C$ $P_{ch} = 0.84 W$ $T_{ch} = T_c + ((\theta_{ch-c}) \times P_{ch}) = 117.2^{\circ}C$ D.F. = 78.1 %	$\theta_{ch-c} = 15^{\circ}C/W$ $\Delta T_c = 54.6^{\circ}C$	$P_{ch} (max) = 8.33 W$ $T_c = 104.6^{\circ}C$
D101 S1WB(A)60B-7072 SHINDENGEN	$T_j (max) = 150^{\circ}C$ $P_d = 0.29 W$ $T_j = T_c + ((\theta_{j-c}) \times P_d) = 82.7^{\circ}C$ D.F. = 55.1 %	$\theta_{j-c} = 10^{\circ}C/W$ $\Delta T_c = 29.8^{\circ}C$	$T_c = 79.8^{\circ}C$
D51 D3S6M-5004P15 SHINDENGEN	$T_j (max) = 150^{\circ}C$ $P_d = 0.85 W$ $T_j = T_l + ((\theta_{j-l}) \times P_d) = 125.0^{\circ}C$ D.F. = 83.3 %	$\theta_{j-l} = 6.5^{\circ}C/W$ $\Delta T_l = 69.5^{\circ}C$	$T_l = 119.5^{\circ}C$
PC101 PS2861B-1Y-F3-A(L) RENESAS	$T_j (max) = 125^{\circ}C$ $P_d = 0.9 mW$ $T_j = T_c + ((\theta_{j-c}) \times P_d) = 72.3^{\circ}C$ D.F. = 57.8 %	$\theta_{j-c} = 330^{\circ}C/W$ $\Delta T_c = 22.0^{\circ}C$	$T_c = 72.0^{\circ}C$

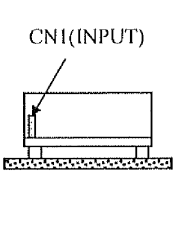
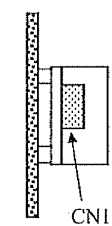
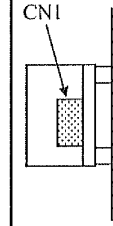
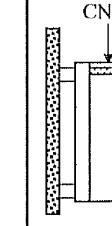
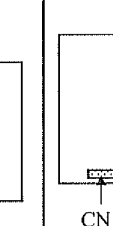
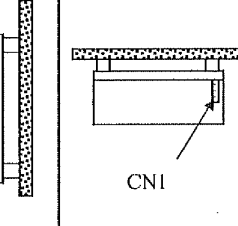
(2) 部品ダイレーティング表 Component Derating List

部品番号 Location No.	$V_{in} = 200VAC$	Load = 100%	$T_a = 50^{\circ}C$
A1 ICE3A1065ELJ INFINEON	$T_{ch} (max) = 150^{\circ}C$ $P_{ch} = 0.83 W$ $T_{ch} = T_c + ((\theta_{ch-c}) \times P_{ch}) = 105.0^{\circ}C$ D.F. = 70.0 %	$\theta_{ch-c} = 15^{\circ}C/W$ $\Delta T_c = 42.5^{\circ}C$	$P_{ch} (max) = 8.33 W$ $T_c = 92.5^{\circ}C$
D101 S1WB(A)60B-7072 SHINDENGEN	$T_j (max) = 150^{\circ}C$ $P_d = 0.14 W$ $T_j = T_c + ((\theta_{j-c}) \times P_d) = 70.4^{\circ}C$ D.F. = 46.9 %	$\theta_{j-c} = 10^{\circ}C/W$ $\Delta T_c = 19.0^{\circ}C$	$T_c = 69.0^{\circ}C$
D51 D3S6M-5004P15 SHINDENGEN	$T_j (max) = 150^{\circ}C$ $P_d = 0.84 W$ $T_j = T_l + ((\theta_{j-l}) \times P_d) = 124.4^{\circ}C$ D.F. = 82.9 %	$\theta_{j-l} = 6.5^{\circ}C/W$ $\Delta T_l = 68.9^{\circ}C$	$T_l = 118.9^{\circ}C$
PC101 PS2861B-1Y-F3-A(L) RENESAS	$T_j (max) = 125^{\circ}C$ $P_d = 0.9 mW$ $T_j = T_c + ((\theta_{j-c}) \times P_d) = 69.0^{\circ}C$ D.F. = 55.2 %	$\theta_{j-c} = 330^{\circ}C/W$ $\Delta T_c = 18.7^{\circ}C$	$T_c = 68.7^{\circ}C$

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

MODEL : ZWS15B-5

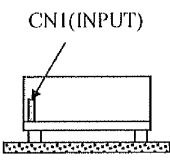
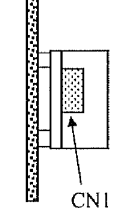
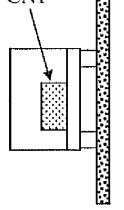
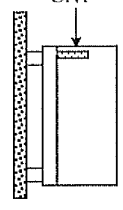
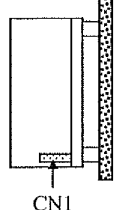
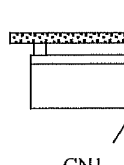
(1) 測定条件 Measuring Conditions

取付方法 Mounting Method (標準取付 : A) (Standard Mounting : A)	Mounting A	Mounting B	Mounting C	Mounting D	Mounting E	Mounting F
						
入力電圧 V_{in} Input Voltage	100VAC					
出力電圧 V_o Output Voltage	5VDC					
出力電流 I_o Output Current	3A(100%)					

(2) 測定結果 Measuring Results

出力デレーティング Output Derating		ΔT Temperature Rise ($^{\circ}C$)					
		$I_o=100\%$					
		Ta=50 $^{\circ}C$	Ta=50 $^{\circ}C$	Ta=50 $^{\circ}C$	Ta=50 $^{\circ}C$	Ta=45 $^{\circ}C$	Ta=45 $^{\circ}C$
部品番号 Location No.	部品名 Part name	取付方向 Mounting A	取付方向 Mounting B	取付方向 Mounting C	取付方向 Mounting D	取付方向 Mounting E	取付方向 Mounting F
A1	IC	55	48	46	48	50	57
A201	CHIP IC	21	21	15	16	28	24
C3	E.CAP.	22	15	23	29	19	22
C4	E.CAP.	27	21	20	24	25	27
C51	E.CAP.	32	30	24	26	33	31
D101	BRIDGE DIODE	30	22	30	35	26	30
D51	S.B.D	70	57	71	66	67	73
D52	S.B.D	75	59	63	64	67	70
L1	BALUN COIL	41	32	40	43	35	39
L51	CHOKE COIL	56	50	45	52	54	57
PC101	PHOTO COUPLER	22	24	14	16	25	29
T1 WIRE	TRANSFORMER WIRE	57	48	53	57	55	59

(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 V_{in} Input Voltage	200VAC					
出力電圧 V_o Output Voltage	5VDC					
出力電流 I_o Output Current	3A(100%)					

(2) 測定結果 Measuring Results

出力デレーティング Output Derating		ΔT Temperature Rise ($^{\circ}C$)					
		$I_o=100\%$					
		$T_a=50^{\circ}C$	$T_a=50^{\circ}C$	$T_a=50^{\circ}C$	$T_a=50^{\circ}C$	$T_a=45^{\circ}C$	$T_a=45^{\circ}C$
部品番号 Location No.	部品名 Part name	取付方向 Mounting A	取付方向 Mounting B	取付方向 Mounting C	取付方向 Mounting D	取付方向 Mounting E	取付方向 Mounting F
A1	IC	43	39	35	40	38	45
A201	CHIP IC	20	22	14	16	25	23
C3	E.CAP.	16	12	15	26	14	16
C4	E.CAP.	21	18	15	21	19	22
C51	E.CAP.	31	32	23	27	32	31
D101	BRIDGE DIODE	19	14	17	28	16	19
D51	S.B.D	69	59	70	67	67	73
D52	S.B.D	75	62	62	65	67	70
L1	BALUN COIL	20	14	17	28	17	19
L51	CHOKE COIL	56	52	43	53	53	56
PC101	PHOTO COUPLER	19	22	12	15	21	25
T1 WIRE	TRANSFORMER WIRE	57	50	51	56	53	58

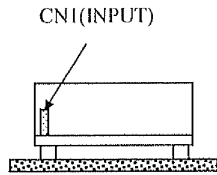
4. 電解コンデンサ推定寿命計算値 Electrolytic Capacitor Lifetime

MODEL : ZWS15B-5

空冷条件 : 自然空冷

Cooling condition : Convection cooling

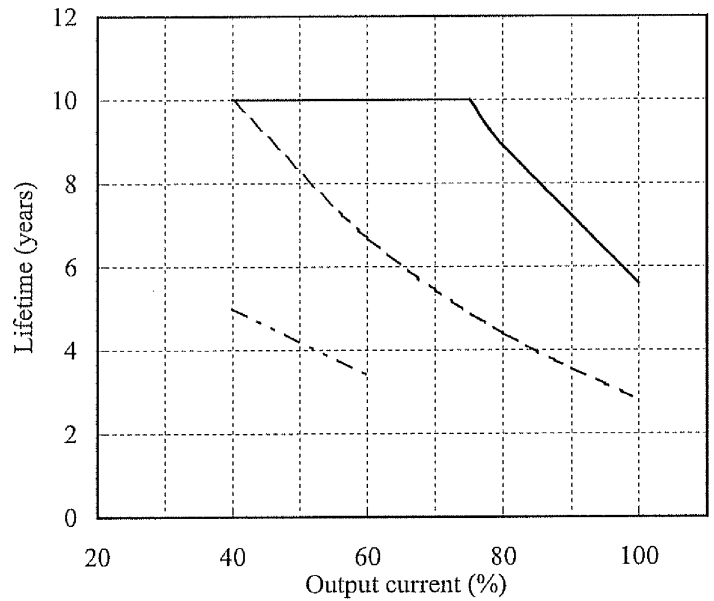
取付方向 A
Mounting A



Vin=100VAC

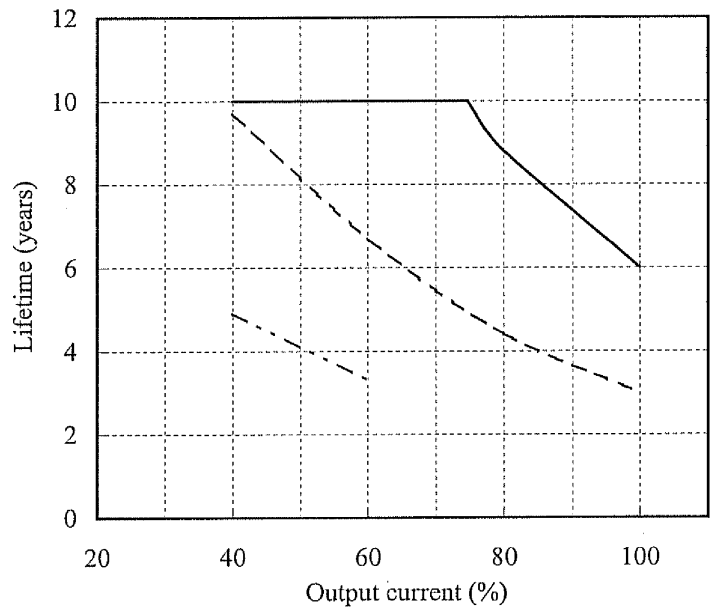
Load (%)	Lifetime (years)		
	Ta=40°C	Ta=50°C	Ta=60°C
40	10.0	10.0	5.0
60	10.0	6.7	3.4
80	8.9	4.4	-
100	5.6	2.8	-

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

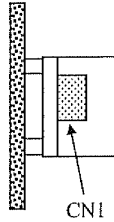


Vin=200VAC

Load (%)	Lifetime (years)		
	Ta=40°C	Ta=50°C	Ta=60°C
40	10.0	9.7	4.9
60	10.0	6.7	3.3
80	8.8	4.4	-
100	6.0	3.0	-



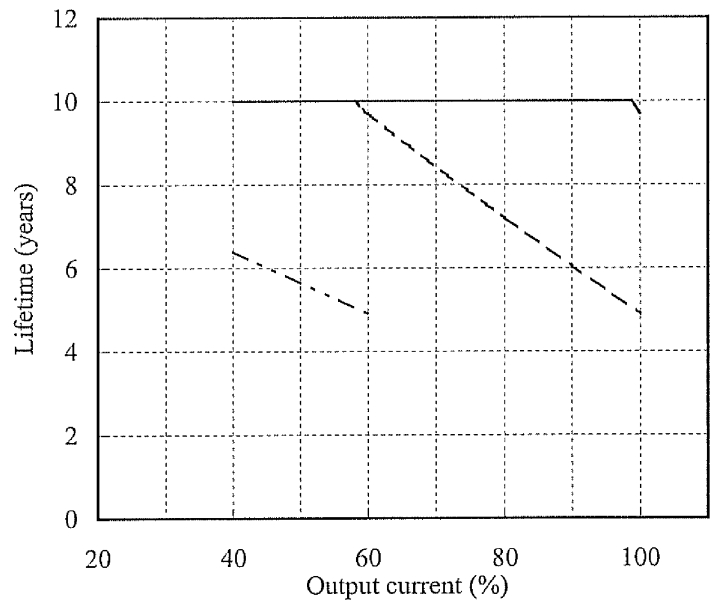
取付方向 B
Mounting B



V_{in}=100VAC

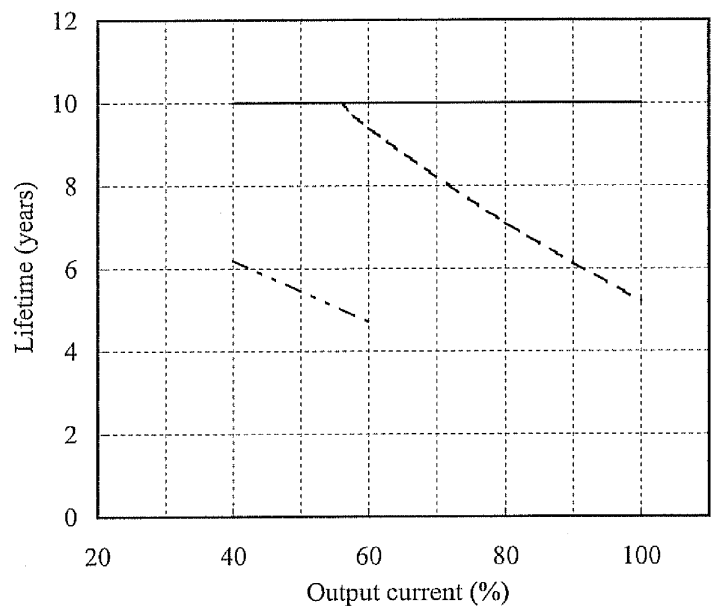
Load (%)	Lifetime (years)		
	T _a = 40°C	T _a = 50°C	T _a = 60°C
40	10.0	10.0	6.4
60	10.0	9.7	4.9
80	10.0	7.2	-
100	9.7	4.9	-

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

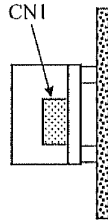


V_{in}=200VAC

Load (%)	Lifetime (years)		
	T _a = 40°C	T _a = 50°C	T _a = 60°C
40	10.0	10.0	6.2
60	10.0	9.4	4.7
80	10.0	7.1	-
100	10.0	5.2	-



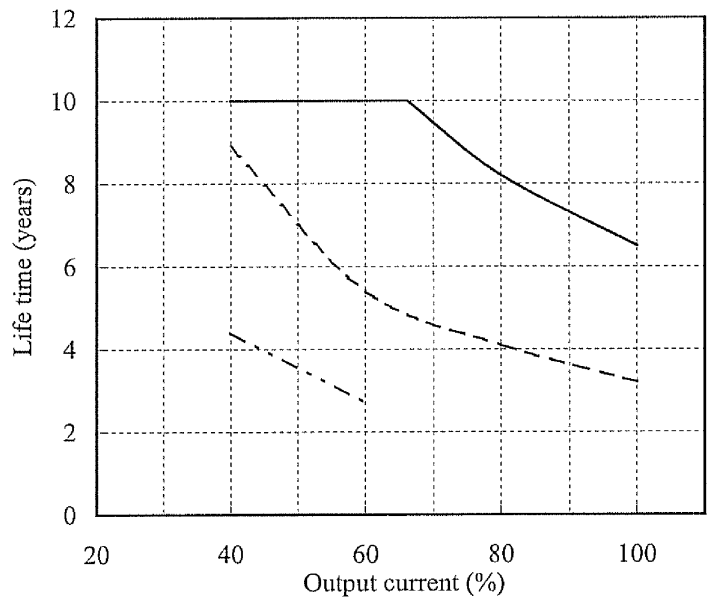
取付方向 C
Mounting C



Vin=100VAC

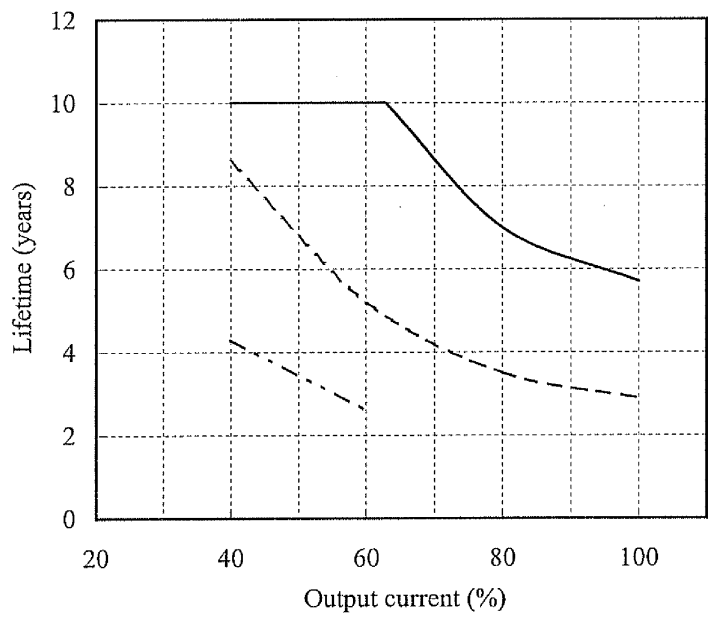
Load (%)	Lifetime (years)		
	Ta=40°C	Ta=50°C	Ta=60°C
40	10.0	8.9	4.4
60	10.0	5.4	2.7
80	8.2	4.1	-
100	6.5	3.2	-

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

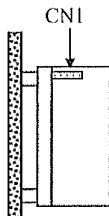


Vin=200VAC

Load (%)	Lifetime (years)		
	Ta=40°C	Ta=50°C	Ta=60°C
40	10.0	8.6	4.3
60	10.0	5.2	2.6
80	7.0	3.5	-
100	5.7	2.9	-



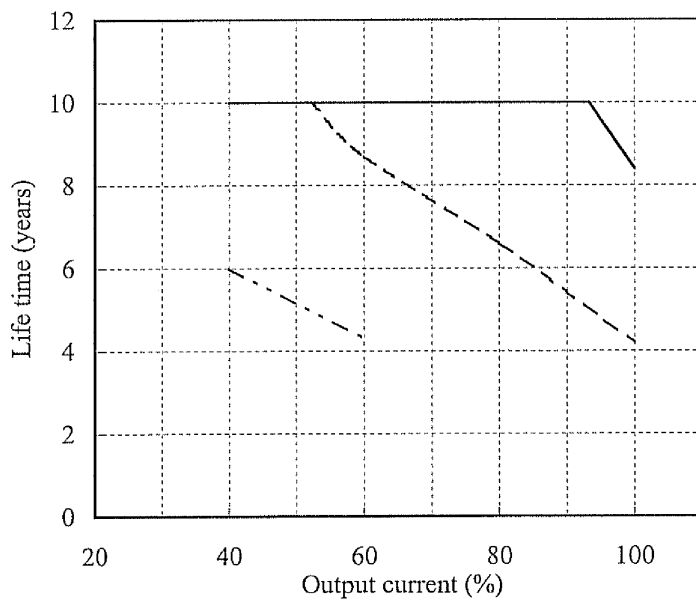
取付方向 D
Mounting D



Vin=100VAC

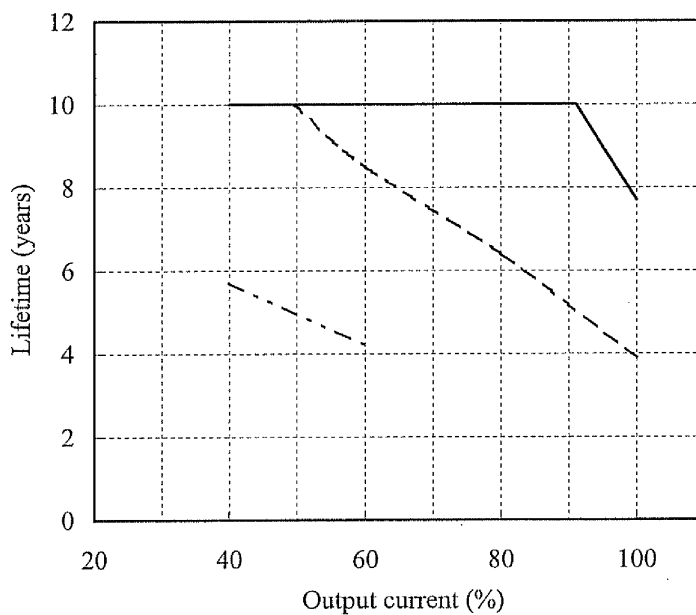
Load (%)	Lifetime (years)		
	Ta=40°C	Ta=50°C	Ta=60°C
40	10.0	10.0	6.0
60	10.0	8.7	4.3
80	10.0	6.6	-
100	8.4	4.2	-

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

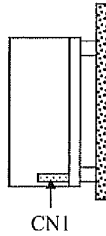


Vin=200VAC

Load (%)	Lifetime (years)		
	Ta=40°C	Ta=50°C	Ta=60°C
40	10.0	10.0	5.7
60	10.0	8.5	4.2
80	10.0	6.4	-
100	7.7	3.9	-



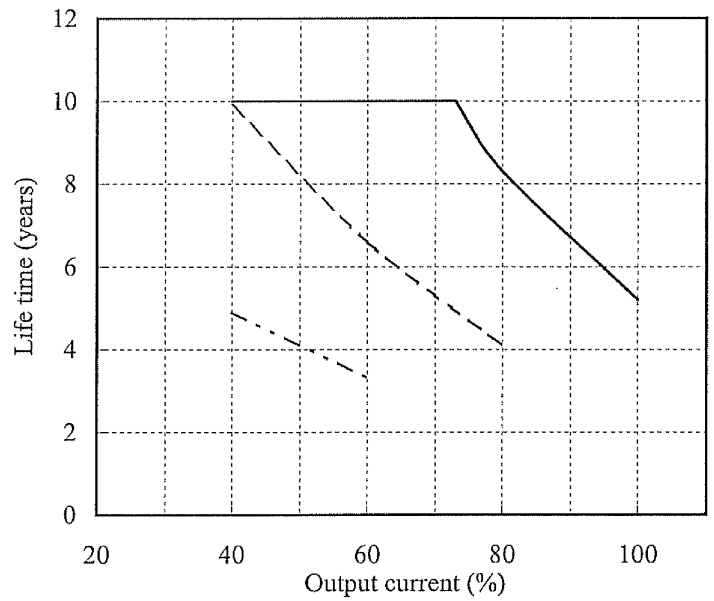
取付方向 E
Mounting E



Vin=100VAC

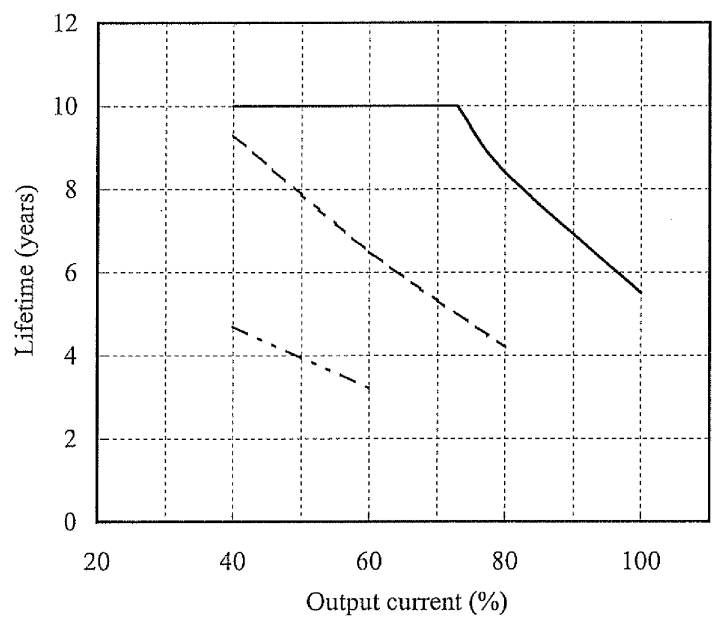
Load (%)	Lifetime (years)		
	Ta=40°C	Ta=50°C	Ta=60°C
40	10.0	9.9	4.9
60	10.0	6.6	3.3
80	8.3	4.1	-
100	5.2	-	-

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

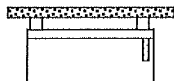


Vin=200VAC

Load (%)	Lifetime (years)		
	Ta=40°C	Ta=50°C	Ta=60°C
40	10.0	9.3	4.7
60	10.0	6.5	3.2
80	8.4	4.2	-
100	5.5	-	-



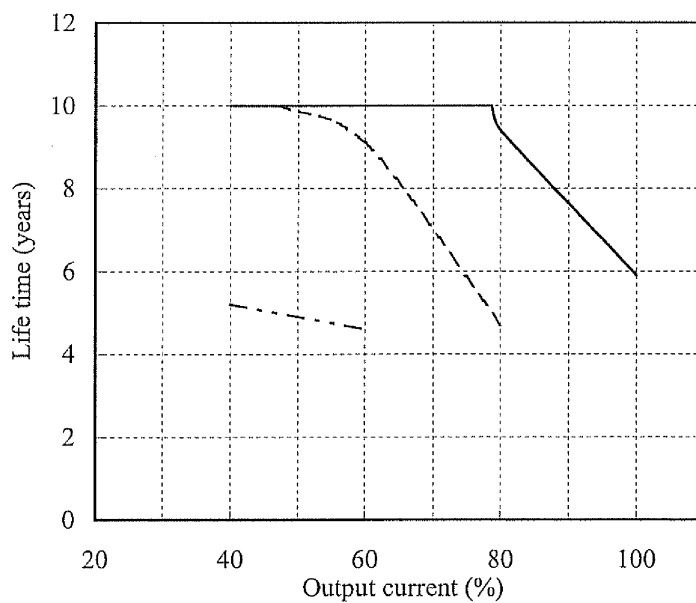
取付方向 F
Mounting F



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

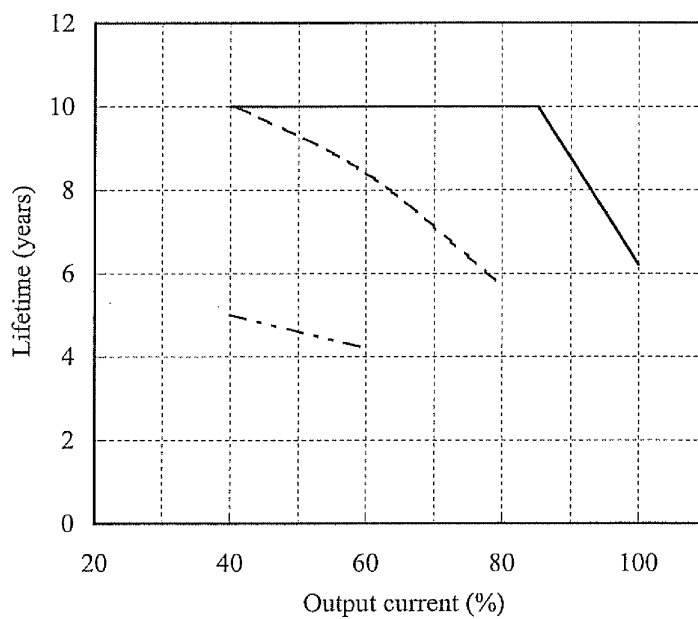
V_{in}=100VAC

Load (%)	Lifetime (years)		
	Ta=40°C	Ta=50°C	Ta=60°C
40	10.0	10.0	5.2
60	10.0	9.1	4.6
80	9.4	4.7	-
100	5.9	-	-



V_{in}=200VAC

Load (%)	Lifetime (years)		
	Ta=40°C	Ta=50°C	Ta=60°C
40	10.0	10.0	5.0
60	10.0	8.4	4.2
80	10.0	5.7	-
100	6.2	-	-



5. アブノーマル試験 Abnormal Test

MODEL :ZWS15B-5

(1) 試験条件 Test Conditions

Input : 230VAC Output : 5V, 3A Ta : 25°C

(2) 試験結果 Test Results

(Da : Damaged)

No.	Test position		Test mode		Test result											記事 Note		
	部品No. Location No.	試験端子 Test point	ショート Short	オープン Open	a 発火 Fire	b 発煙 Smoke	c 破裂 Burst	d 異臭 Smell	e 赤熱 Red hot	f 破損 Damaged	g ヒューズ断 Fuse blown	h OVP	I OCP	j 出力断 No output	k 変化なし No change		l その他 Others	
1	A1	1~2	○													○	Output hiccup	
2		2~3	○											○				
3		3~4, 5~6	○							○	○			○				Da:Z102
4		6~7	○											○				
5		7~8	○											○				
6		1		○												○		
7		2		○								○		○				
8		3		○										○				
9		4,5,6		○											○			
10		7		○										○				
11		8		○										○				
12	D51(D52)	-	○									○	○					
13		-		○												○	Input power increase	
14	T1	3~4	○													○	Output hiccup	
15		4~5	○							○			○					
16		7~10	○										○	○				
17		1,5		○										○				
18		3,4		○												○	Output hiccup	
19	7,8,9,10		○												○	Input power increase		
20	C3	-	○							○			○					
21		-		○												○	Output ripple & input power increase	
22	D101	AC-AC	○							○			○					
23		DC-DC	○							○			○					
24		AC-DC	○							○			○					
25		AC		○										○				
26		DC		○										○				

6. 振動試験 Vibration Test

MODEL : ZWS15B-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

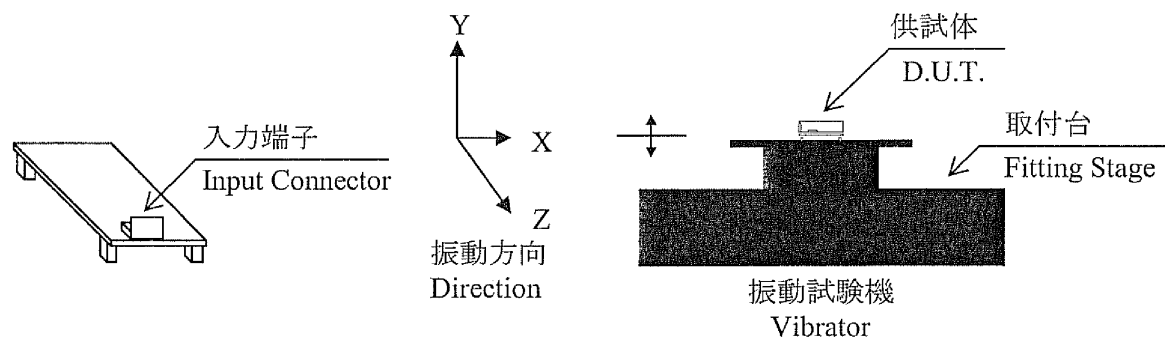
・制御部 : DP550
Controller DP CORP USA

・加振部 : V870
Vibrator LDS CORP. UK

(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.

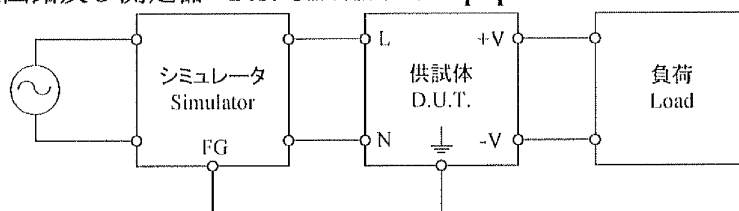
(6) 試験結果 Test Results

合格 OK

7. ノイズシミュレート試験 Noise Simulate Test

MODEL : ZWS15B-5

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



シミュレータ : INS-400L (ノイズ研究所)
 Simulator : (Noise Laboratory Co.,LTD)

(2) 試験条件 Test Conditions

・入力電圧 Input voltage	: 100, 230VAC	・ノイズ電圧 Noise level	: 0~2kV
・出力電圧 Output Voltage	: 定格 Rated	・位相 Phase	: 0~360 deg
・出力電流 Output current	: 0, 100%	・極性 Polarity	: +, -
・周囲温度 Ambient temperature	: 25°C	・印加モード Mode	: コモン、ノーマル Common, Normal
・パルス幅 Pulse width	: 50~1000ns	・トリガ選択 Trigger select	: Line

(3) 判定条件 Acceptable Conditions

- 1.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

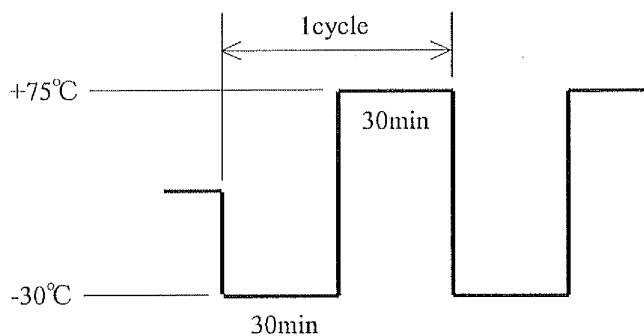
MODEL : ZWS15B-5

(1) 使用計測器 Equipment Used

TSA-101S-W : ESPEC

(2) 試験条件 Test Conditions

- ・電源周囲温度 : -30°C ⇔ 75°C +75°C
Ambient Temperature
- ・試験時間 : 図参照
Test Time Refer to Dwg.
- ・試験サイクル : 100 サイクル
Test Cycle 100 Cycles
- ・非動作
Not Operating



(3) 試験方法 Test Method

初期測定の後、供試品を試験槽に入れ、上記サイクルで試験を行う。100サイクル後に、供試品を常温常湿下に1時間放置し、出力に異常がない事を確認する。

Before testing, check if there is no abnormal output, then put the D.U.T. in testing chamber, and test it according to the above cycle. 100 cycles later, leave it for 1 hour at the room temperature, then check if there is no abnormal output.

(4) 判定条件 Acceptable Conditions

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