

KWS5

RELIABILITY DATA

信頼性データ

No. RD-07T-239B		
承認	査閲	担当
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<i>31. Oct. '08</i>	<i>30. Oct. '08</i>	<i>30. Oct. '08</i>

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※信頼性試験は代表データであり、この値は実力値とお考え願います。

※本データに掲載してあります内蔵部品の名称は、本製品を開発した当初のものです。

これらは改善等の為に変更されている可能性もありますが、ご了承下さい。

The following data are typical values and the data to be considered as ability values.

The built-in components names on this data are the things the time of Development.

Please understand that it may be changed for an improvement etc.

1. MTBF 計算値 CALCULATED VALUES OF MTBF

MODEL : KWS5

(1) 算出方法 Part count reliability projection

(社)日本電子機械工業会 直流安定化電源(スイッチング方式)委員会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。 λ_G は、MIL-HDBK-217Dに準じて定められています。

Calculated based on part count reliability projection by the Technical Committee on Stabilized Power Supplies of EIAJ.

Fixed failure rate λ_G is given to each individual part and MTBF is determined by the count of each part.

λ_G is determined based on MIL-HDBK-217D.

<算出式>

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

λ_{equip} : 全機器故障率 (故障数/10⁶時間)

Total Equipment Failure Rate (Failure/10⁶Hour)

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

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

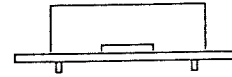
Number of Different Generic Part Categories

(2) MTBF 値

$$MTBF = \frac{1 \times 10^6}{4.7817} \approx 209,130 \text{ 時間 (Hours)}$$

2. 部品ディレーティング COMPONENT DERATING

MODEL : KWS5-5



(i) 算出方法 Calculating method

(a) 測定条件 Condition

- ・入力 : 100VAC ・出力 : 5V1A (100%)
Input Output
- ・周囲温度 : 50℃ ・取付方法 : 標準取付(A)
Ambient temperature Mounting Method : Standard Mounting Method (A)

(b) 半導体 Semiconductors

周囲温度, 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 ambient temperature, power dissipation and thermal impedance.

(c) IC, 抵抗, コンデンサー等 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

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

- 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
- $P_{c(max)}$: 最大コレクタ損失
Maximum Collector Dissipation
- $T_{j(max)}$: 最大接合点温度
Maximum Junction Temperature
- θ_{j-c} : 接合点からケースまでの熱抵抗
Thermal Impedance between Junction and Case
- θ_{j-a} : 接合点から周囲までの熱抵抗
Thermal Impedance between Junction and Air

SEMICONDUCTOR DERATING

DWG. NO. PA766-56-03

DATE : 21-MAY-1992

MODEL : KWS5-5

VIN = AC 100V LOAD = 100% Ta = 50°C

Q1 2SK1533-4100 SHINDENGEN	Tchmax = 150 °C $\Theta_{ch-c} = 12.5 \text{ }^\circ\text{C/W}$ Pd(max) = 10.0 W
	Pd = 0.570 W $\Delta T_c = 36.0 \text{ }^\circ\text{C}$ Tc = 86.0 °C
	Tch = Tc + (Θ_{ch-c}) * Pd = 93.13 °C
	D.F. = 62.1 %
A1 UC2842ADW UNITRODE	Tjmax = 150 °C $\Theta_{j-c} = 70.0 \text{ }^\circ\text{C/W}$ Pd(max) = 0.725 W
	Pd = 0.299 W $\Delta T_c = 30.2 \text{ }^\circ\text{C}$ Tc = 80.2 °C
	Tj = Tc + (Θ_{j-c}) * Pd = 97.23 °C
	D.F. = 64.48 %
A2 HA17431FPA HITACHI	Tjmax = 125 °C $\Theta_{j-c} = 259.74 \text{ }^\circ\text{C/W}$ Pd(max) = 0.385 W
	Pd = 0.12 mW $\Delta T_c = 26.3 \text{ }^\circ\text{C}$ Tc = 76.3 °C
	Tj = Tc + (Θ_{j-c}) * Pd = 76.33 °C
	D.F. = 61.1 %
PC1 (LED) TLP121GR TOSHIBA	Tjmax = 125 °C $\Theta_{j-c} = \text{-- }^\circ\text{C/W}$ Pd(max) = 50 mW
	If = 0.07 mA $\Delta T_c = 22.7 \text{ }^\circ\text{C}$ Tc = 72.7 °C
	Allowable If(max) = 38 mA (at Tc = 72.7°C)
	D.F. = 0.18 %
PC1 (TRANSISTOR) TLP121GR TOSHIBA	Tjmax = 125 °C $\Theta_{j-c} = 400 \text{ }^\circ\text{C/W}$ Pd(max) = 150 mW
	Pd = 0.15 mW $\Delta T_c = 22.7 \text{ }^\circ\text{C}$ Tc = 72.7 °C
	Tj = Tc + (Θ_{j-c}) * Pd = 72.76 °C
	D.F. = 58.21 %
D1 S1WB(A)60B SHINDENGEN	Tjmax = 150 °C $\Theta_{j-l} = 10.0 \text{ }^\circ\text{C/W}$ Pd(max) = 12.5 W
	Pd = 0.27 W $\Delta T(\text{lead}) = 21.5 \text{ }^\circ\text{C}$ T(lead) = 71.5 °C
	Tj = Tl + (Θ_{j-l}) * Pd = 74.2 °C
	D.F. = 49.5 %
D2 1SS184TE85L TOSHIBA	Tjmax = 125 °C $\Theta_{j-l} = 100 \text{ }^\circ\text{C/W}$ Pd(max) = 150 mW
	Pd = 17.0 mW $\Delta T(\text{lead}) = 24.2 \text{ }^\circ\text{C}$ T(lead) = 74.2 °C
	Tj = Tl + (Θ_{j-l}) * Pd = 75.9 °C
	D.F. = 60.72 %

dT TEMPERATURE RISE

DWG. NO. PA766-66-02

MODEL : KWS5-5

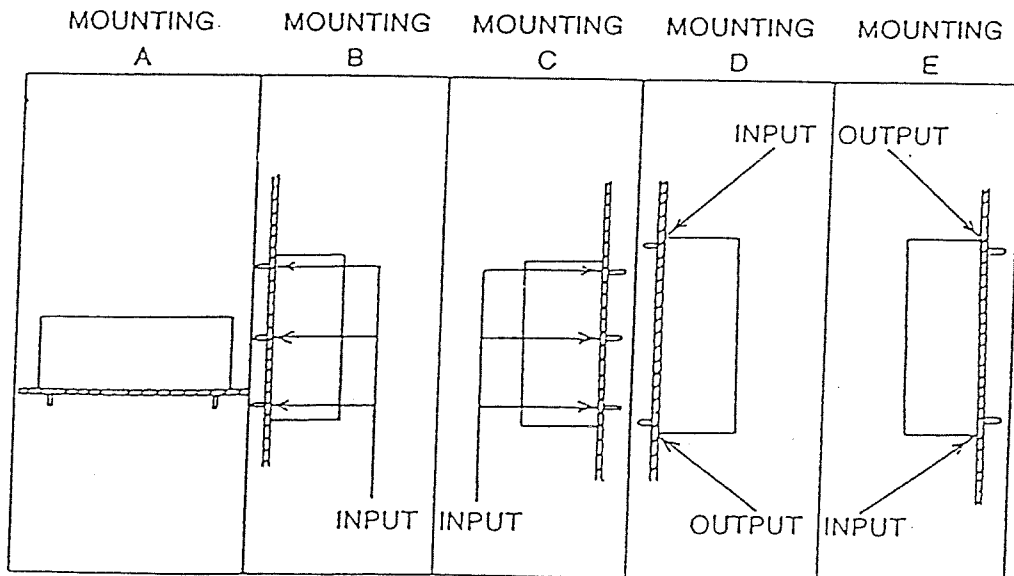
DATE : 15-MAY-1992

INPUT VOLTAGE = 100VAC

Ta = 50°C		dT TEMPERATURE RISE (°C)				
OUTPUT DERATING (%)		100%	100%	100%	100%	100%
SYMBOL	PARTS NAME	MOUNTING A	MOUNTING B	MOUNTING C	MOUNTING D	MOUNTING E
Q1	MOSFET	36.0	35.1	35.1	35.9	32.6
A1	PWM IC	30.2	29.9	29.0	30.6	26.8
D5	SBD	38.2	36.6	38.2	36.8	35.8
T1	X'TMER	31.4	30.3	31.2	30.8	29.0
C5	E.CAP	24.0	24.2	23.0	23.9	21.4
C16	OS CAP.	27.8	27.3	27.0	27.0	26.3

INPUT VOLTAGE = 200VAC

Ta = 50°C		dT TEMPERATURE RISE (°C)				
OUTPUT DERATING (%)		100%	100%	100%	100%	100%
SYMBOL	PARTS NAME	MOUNTING A	MOUNTING B	MOUNTING C	MOUNTING D	MOUNTING E
Q1	MOSFET	52.5	51.4	51.3	51.9	48.6
A1	PWM IC	38.7	38.2	37.0	38.8	34.6
D5	SBD	43.1	41.0	42.9	41.1	40.5
T1	X'TMER	38.4	36.9	38.1	37.2	35.7
C5	E.CAP	31.4	31.8	29.9	31.0	28.5
C16	OS CAP.	33.2	32.6	32.1	31.8	31.7



ELECTROLYTIC CAPACITOR LIFETIME VERSUS LOAD

MODEL : KWS5-5

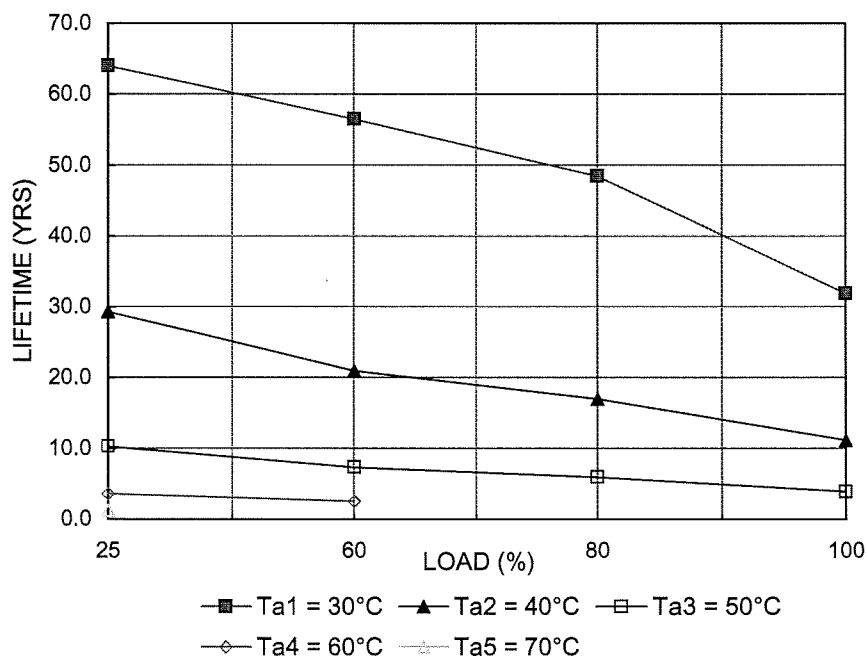
MOUNTING : A

VIN : 100VAC

DATE: SEPT 12, 2008

LOAD (%)	LIFETIME (YRS)				
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C	Ta = 70°C
25	64.0	29.4	10.3	3.6	1.3
60	56.5	21.0	7.4	2.6	
80	48.5	17.0	6.0		
100	31.9	11.2	3.9		

GRAPH OF ELECTROLYTIC CAPACITOR LIFETIME VS LOAD
MOUNTING A KWS5-5



計算式 FORMULA

- | | |
|---|--|
| <p>1. アルミ電解コンデンサ
AL. Electrolytic capacitor
$L = L_0 \times 2^{(105-T_c)/10}$ (year)</p> | <p>L : 電解コンデンサ推定寿命計算値
Elec. Capacitor computed life.
(24時間連続稼動、365日)
(24 hrs per day, 365 days per year)</p> |
| <p>2. OSコンデンサ
O.S capacitor
$L = L_0 \times 10^{(105-T_c)/20}$ (year)</p> | <p>L₀ : 電解コンデンサ保証寿命値
Guarantee life for Elec. cap.
T_c : 電解コンデンサのケース温度
Case temperature of Elec. cap.</p> |

ELECTROLYTIC CAPACITOR LIFETIME VERSUS LOAD

MODEL : KWS5-5

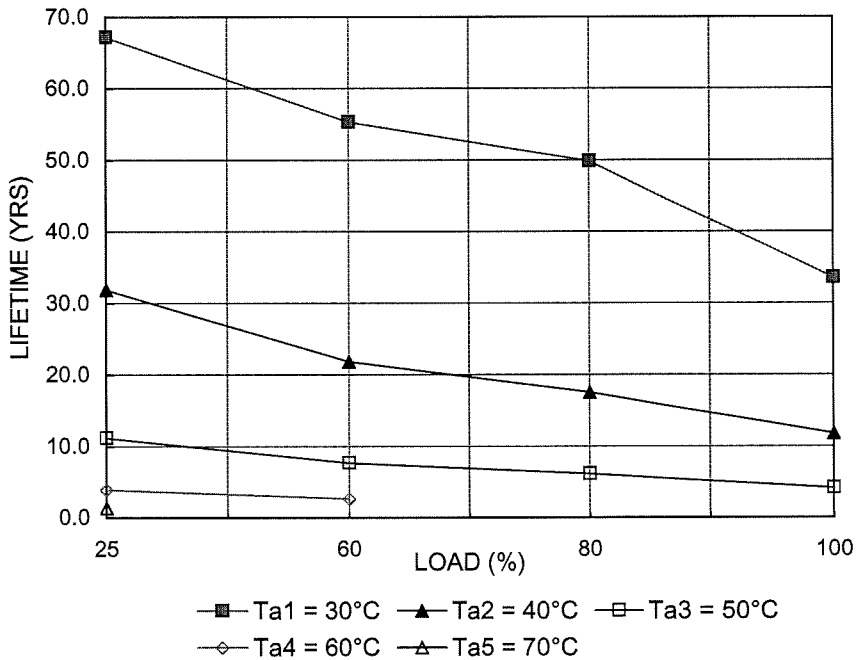
MOUNTING : B

VIN : 100VAC

DATE: SEPT 12, 2008

LOAD (%)	LIFETIME (YRS)				
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C	Ta = 70°C
25	67.2	31.9	11.2	3.9	1.4
60	55.4	21.9	7.7	2.7	
80	49.9	17.6	6.2		
100	33.6	11.8	4.1		

GRAPH OF ELECTROLYTIC CAPACITOR LIFETIME VS LOAD
MOUNTING B KWS5-5



計算式 **FORMULA**

- | | |
|---|--|
| <p>1. アルミ電解コンデンサ
AL. Electrolytic capacitor
$L = L_o \times 2^{(105-T_c)/10}$ (year)</p> | <p>L : 電解コンデンサ推定寿命計算値
Elec. Capacitor computed life.
(24時間連続稼動、365日)
(24 hrs per day, 365 days per year)</p> |
| <p>2. OSコンデンサ
O.S capacitor
$L = L_o \times 10^{(105-T_c)/20}$ (year)</p> | <p>L_o : 電解コンデンサ保証寿命値
Guarantee life for Elec. cap.
T_c : 電解コンデンサのケース温度
Case temperature of Elec. cap.</p> |

ELECTROLYTIC CAPACITOR LIFETIME VERSUS LOAD

MODEL : KWS5-5

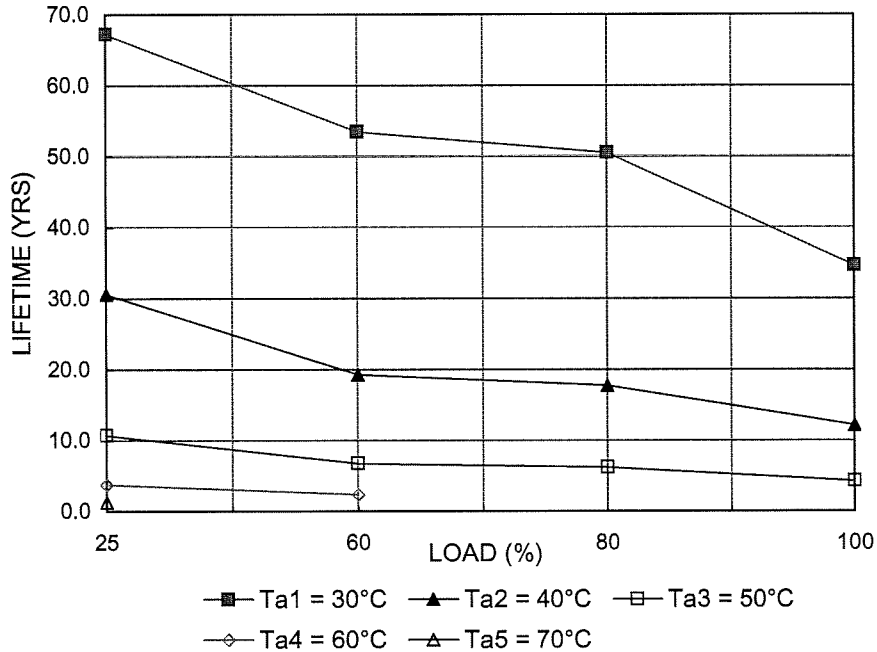
MOUNTING : C

VIN : 100VAC

DATE: SEPT 12, 2008

LOAD (%)	LIFETIME (YRS)				
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C	Ta = 70°C
25	67.2	30.6	10.7	3.8	1.3
60	53.5	19.3	6.8	2.4	
80	50.6	17.8	6.2		
100	34.7	12.2	4.3		

GRAPH OF ELECTROLYTIC CAPACITOR LIFETIME VS LOAD
MOUNTING C KWS5-5



計算式 **FORMULA**

<p>1. アルミ電解コンデンサ AL. Electrolytic capacitor $L = L_0 \times 2^{(105-T_c)/10}$ (year)</p>	L	:	<p>電解コンデンサ推定寿命計算値 Elec. Capacitor computed life. (24時間連続稼動、365日) (24 hrs per day, 365 days per year)</p>
<p>2. OSコンデンサ O.S capacitor $L = L_0 \times 10^{(105-T_c)/20}$ (year)</p>	L ₀	:	<p>電解コンデンサ保証寿命値 Guarantee life for Elec. cap.</p>
	T _c	:	<p>電解コンデンサのケース温度 Case temperature of Elec. cap.</p>

ELECTROLYTIC CAPACITOR LIFETIME VERSUS LOAD

MODEL : KWS5-5

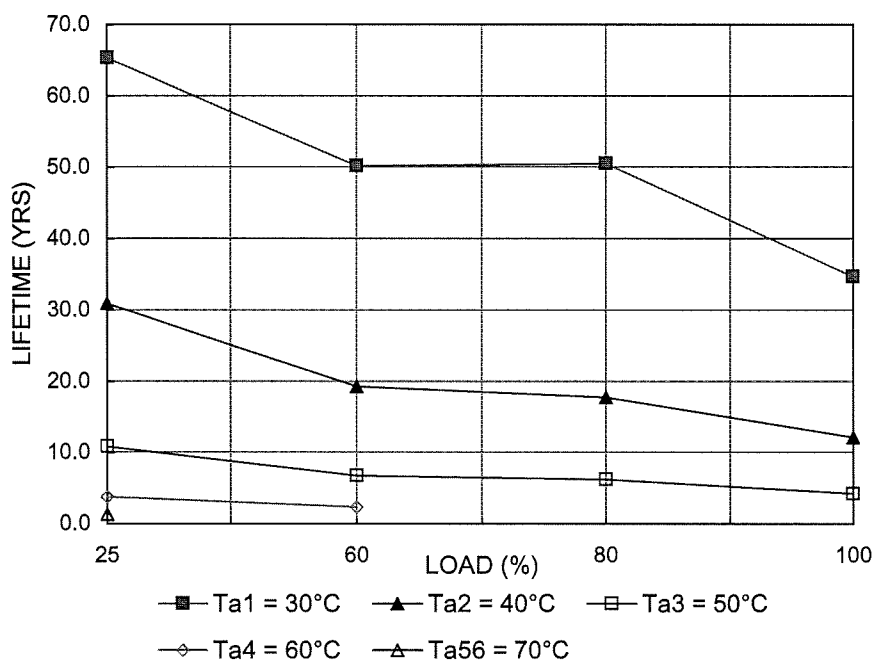
MOUNTING : D

VIN : 100VAC

DATE: SEPT 12, 2008

LOAD (%)	LIFETIME (YRS)				
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C	Ta = 70°C
25	65.4	30.9	10.9	3.8	1.3
60	50.2	19.3	6.8	2.4	
80	50.6	17.8	6.2		
100	34.7	12.2	4.3		

GRAPH OF ELECTROLYTIC CAPACITOR LIFETIME VS LOAD
MOUNTING D KWS5-5



計算式 FORMULA

- | | |
|---|--|
| <p>1. アルミ電解コンデンサ
AL. Electrolytic capacitor
$L = L_o \times 2^{(105-T_c)/10}$ (year)</p> | <p>L : 電解コンデンサ推定寿命計算値
Elec. Capacitor computed life.
(24時間連続稼動、365日)
(24 hrs per day, 365 days per year)</p> |
| <p>2. OSコンデンサ
O.S capacitor
$L = L_o \times 10^{(105-T_c)/20}$ (year)</p> | <p>L_o : 電解コンデンサ保証寿命値
Guarantee life for Elec. cap.
T_c : 電解コンデンサのケース温度
Case temperature of Elec. cap.</p> |

ELECTROLYTIC CAPACITOR LIFETIME VERSUS LOAD

MODEL : KWS5-5

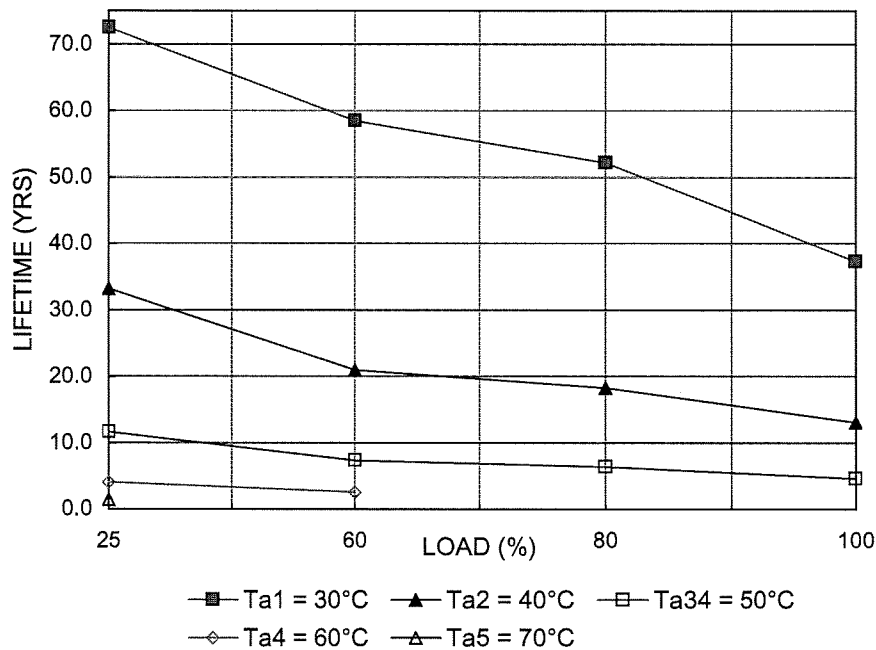
MOUNTING : E

VIN : 100VAC

DATE: SEPT 12, 2008

LOAD (%)	LIFETIME (YRS)				
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C	Ta = 70°C
25	72.6	33.3	11.7	4.1	1.4
60	58.5	21.0	7.4	2.6	
80	52.2	18.3	6.4		
100	37.3	13.1	4.6		

GRAPH OF ELECTROLYTIC CAPACITOR LIFETIME VS LOAD
MOUNTING E KWS5-5



計算式 FORMULA

- | | |
|---|--|
| <p>1. アルミ電解コンデンサ
AL. Electrolytic capacitor
$L = L_0 \times 2^{(105-T_c)/10}$ (year)</p> | <p>L : 電解コンデンサ推定寿命計算値
Elec. Capacitor computed life.
(24時間連続稼動、365日)
(24 hrs per day, 365 days per year)</p> |
| <p>2. OSコンデンサ
O.S capacitor
$L = L_0 \times 10^{(105-T_c)/20}$ (year)</p> | <p>L₀ : 電解コンデンサ保証寿命値
Guarantee life for Elec. cap.
T_c : 電解コンデンサのケース温度
Case temperature of Elec. cap.</p> |

ELECTROLYTIC CAPACITOR LIFETIME VERSUS LOAD

MODEL : KWS5-5

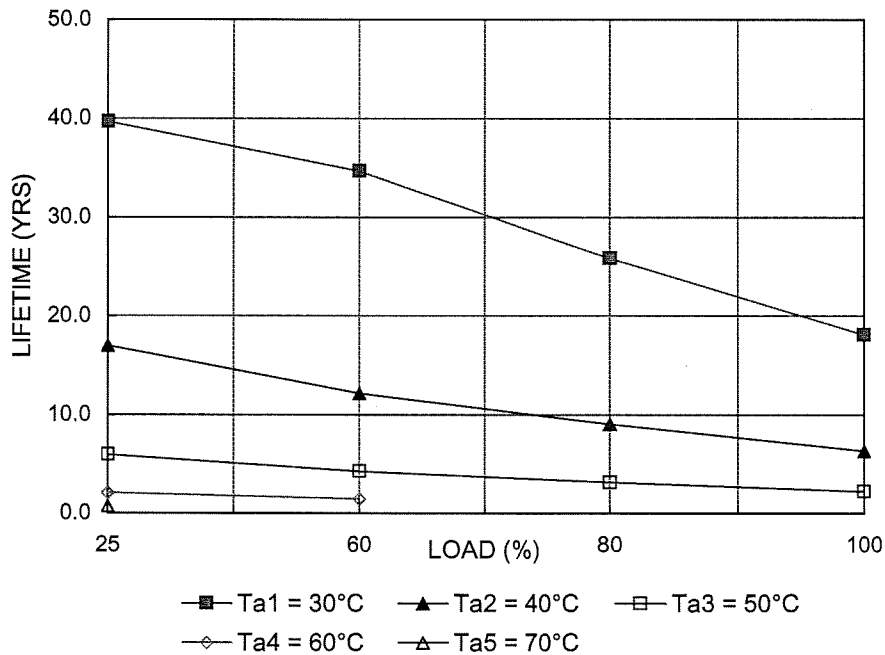
MOUNTING : A

VIN : 200VAC

DATE: SEPT 12, 2008

LOAD (%)	LIFETIME (YRS)				
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C	Ta = 70°C
25	39.7	17.0	6.0	2.1	0.7
60	34.7	12.2	4.3	1.5	
80	25.9	9.1	3.2		
100	18.1	6.4	2.2		

GRAPH OF ELECTROLYTIC CAPACITOR LIFETIME VS LOAD
MOUNTING A KWS5-5



計算式 **FORMULA**

<p>1. アルミ電解コンデンサ AL. Electrolytic capacitor $L = L_o \times 2^{(105-T_c)/10}$ (year)</p>	L :	<p>電解コンデンサ推定寿命計算値 Elec. Capacitor computed life. (24時間連続稼働、365日) (24 hrs per day, 365 days per year)</p>
<p>2. OSコンデンサ O.S capacitor $L = L_o \times 10^{(105-T_c)/20}$ (year)</p>	L _o :	<p>電解コンデンサ保証寿命値 Guarantee life for Elec. cap.</p>
	T _c :	<p>電解コンデンサのケース温度 Case temperature of Elec. cap.</p>

ELECTROLYTIC CAPACITOR LIFETIME VERSUS LOAD

MODEL : KWS5-5

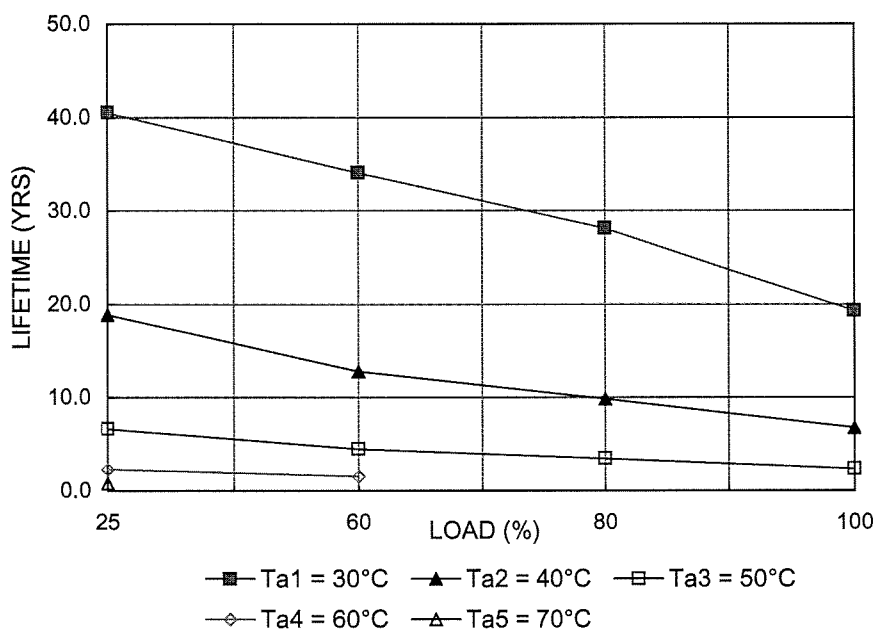
MOUNTING : B

VIN : 200VAC

DATE: SEPT 12, 2008

LOAD (%)	LIFETIME (YRS)				
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C	Ta = 70°C
25	40.5	18.9	6.6	2.3	0.8
60	34.1	12.8	4.5	1.6	
80	28.1	9.9	3.5		
100	19.3	6.8	2.4		

GRAPH OF ELECTROLYTIC CAPACITOR LIFETIME VS LOAD
MOUNTING B KWS5-5



計算式 FORMULA

- | | |
|---|--|
| <p>1. アルミ電解コンデンサ
AL. Electrolytic capacitor
$L = L_0 \times 2^{(105-T_c)/10}$ (year)</p> | <p>L : 電解コンデンサ推定寿命計算値
Elec. Capacitor computed life.
(24時間連続稼動、365日)
(24 hrs per day, 365 days per year)</p> |
| <p>2. OSコンデンサ
O.S capacitor
$L = L_0 \times 10^{(105-T_c)/20}$ (year)</p> | <p>L₀ : 電解コンデンサ保証寿命値
Guarantee life for Elec. cap.
T_c : 電解コンデンサのケース温度
Case temperature of Elec. cap.</p> |

ELECTROLYTIC CAPACITOR LIFETIME VERSUS LOAD

MODEL : KWS5-5

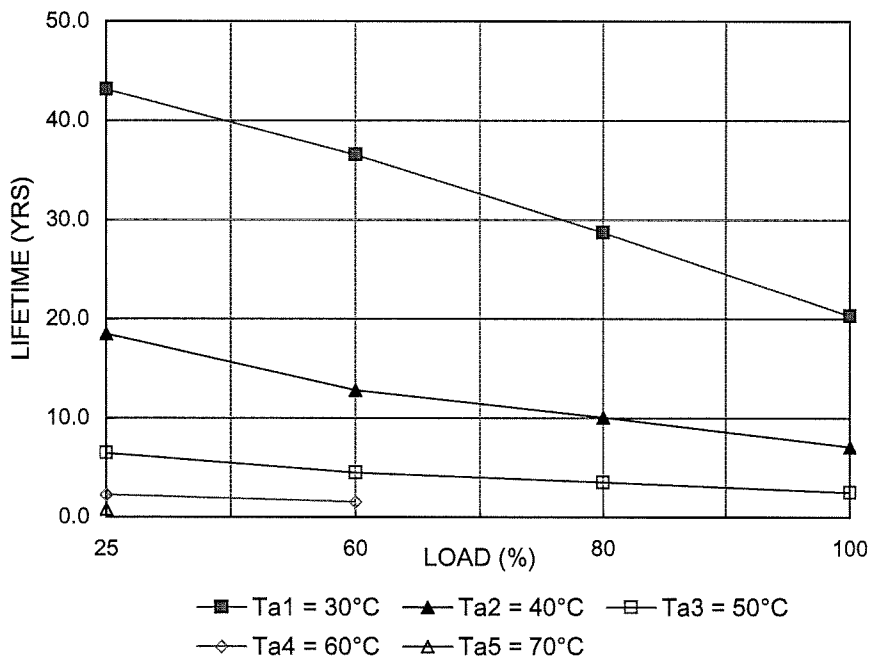
MOUNTING : C

VIN : 200VAC

DATE: SEPT 12, 2008

LOAD (%)	LIFETIME (YRS)				
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C	Ta = 70°C
25	43.1	18.5	6.5	2.3	0.8
60	36.6	12.8	4.5	1.6	
80	28.7	10.1	3.5		
100	20.3	7.1	2.5		

GRAPH OF ELECTROLYTIC CAPACITOR LIFETIME VS LOAD
MOUNTING C KWS5-5



計算式 FORMULA

1. アルミ電解コンデンサ
AL. Electrolytic capacitor

$$L = L_o \times 2^{(105-T_c)/10} \quad (\text{year})$$

2. OSコンデンサ
O.S capacitor

$$L = L_o \times 10^{(105-T_c)/20} \quad (\text{year})$$

L : 電解コンデンサ推定寿命計算値
Elec. Capacitor computed life.
(24時間連続稼動、365日)
(24 hrs per day, 365 days per year)

L_o : 電解コンデンサ保証寿命値
Guarantee life for Elec. cap.

T_c : 電解コンデンサのケース温度
Case temperature of Elec. cap.

ELECTROLYTIC CAPACITOR LIFETIME VERSUS LOAD

MODEL : KWS5-5

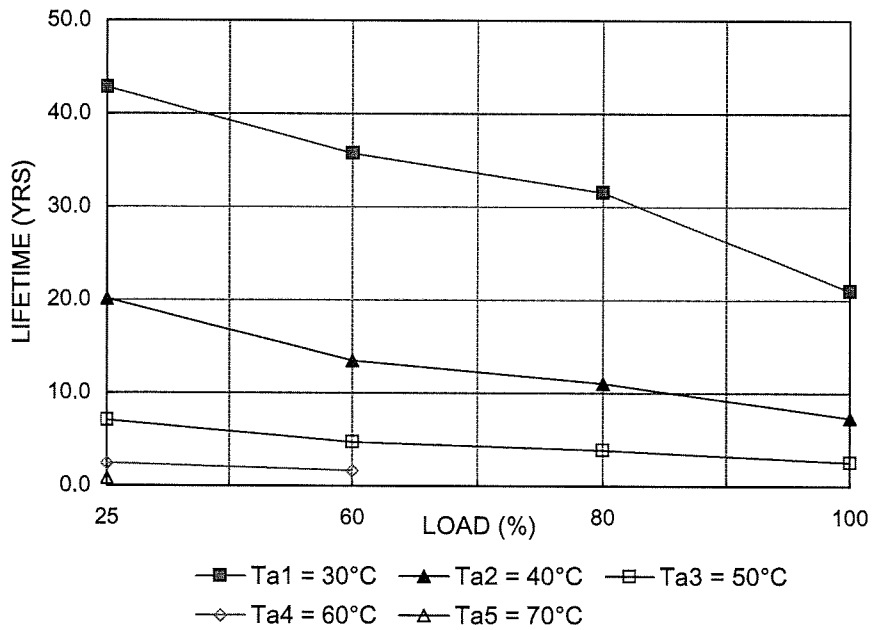
MOUNTING : D

VIN : 200VAC

DATE: SEPT 12, 2008

LOAD (%)	LIFETIME (YRS)				
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C	Ta = 70°C
25	42.8	20.1	7.1	2.5	0.9
60	35.8	13.5	4.8	1.7	
80	31.6	11.1	3.9		
100	21.0	7.4	2.6		

GRAPH OF ELECTROLYTIC CAPACITOR LIFETIME VS LOAD
MOUNTING D KWS5-5



計算式 **FORMULA**

<p>1. アルミ電解コンデンサ AL. Electrolytic capacitor $L = L_0 \times 2^{(105-T_c)/10}$ (year)</p>	L :	<p>電解コンデンサ推定寿命計算値 Elec. Capacitor computed life. (24時間連続稼動、365日) (24 hrs per day, 365 days per year)</p>
<p>2. OSコンデンサ O.S capacitor $L = L_0 \times 10^{(105-T_c)/20}$ (year)</p>	L ₀ :	<p>電解コンデンサ保証寿命値 Guarantee life for Elec. cap.</p>
	T _c :	<p>電解コンデンサのケース温度 Case temperature of Elec. cap.</p>

ELECTROLYTIC CAPACITOR LIFETIME VERSUS LOAD

MODEL : KWS5-5

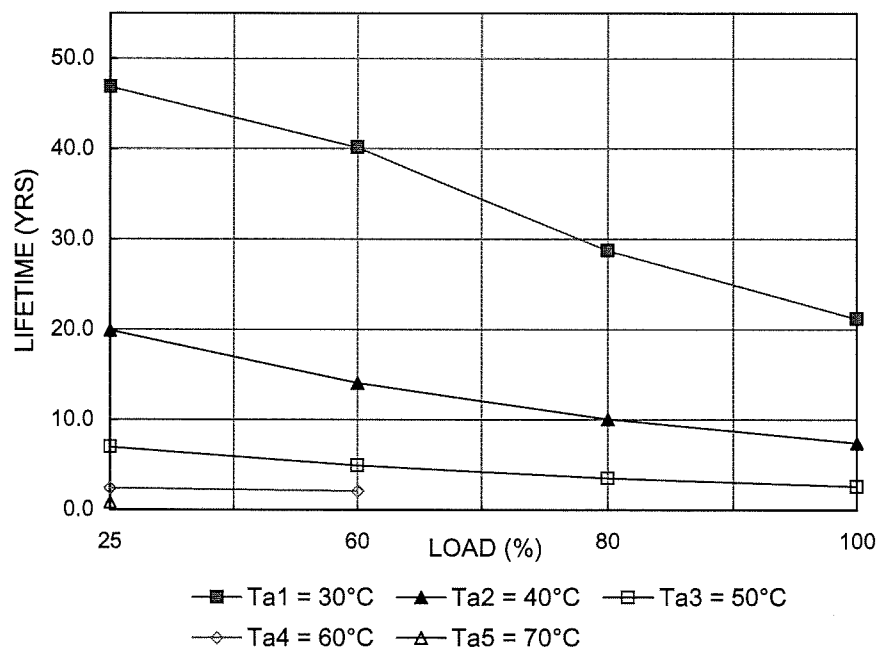
MOUNTING : E

VIN : 200VAC

DATE: SEPT 12, 2008

LOAD (%)	LIFETIME (YRS)				
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C	Ta = 70°C
25	46.9	19.9	7.0	2.5	0.9
60	40.2	14.1	5.0	2.1	
80	28.7	10.1	3.5		
100	21.2	7.5	2.6		

GRAPH OF ELECTROLYTIC CAPACITOR LIFETIME VS LOAD
MOUNTING E KWS5-5



計算式 FORMULA

- | | | | | |
|---|------------------------------------|--------|------------------|--|
| 1. アルミ電解コンデンサ
AL. Electrolytic capacitor | $L = L_0 \times 2^{(105-T_c)/10}$ | (year) | L : | 電解コンデンサ推定寿命計算値
Elec. Capacitor computed life.
(24時間連続稼動、365日)
(24 hrs per day, 365 days per year) |
| 2. OSコンデンサ
O.S capacitor | $L = L_0 \times 10^{(105-T_c)/20}$ | (year) | L ₀ : | 電解コンデンサ保証寿命値
Guarantee life for Elec. cap. |
| | | | T _c : | 電解コンデンサのケース温度
Case temperature of Elec. cap. |

MODEL : KWS5-5		ABNORMAL TESTING										TEST CONDITIONS		APPROVED BY		TESTED BY					
PARTS NAME		TEST MODE		FIRE	SMOKE (a)(b)	BURST	SMELL	RED HOT	DAMAGE	FUSE BLOWN	O : C : P .	O : V : P .	NO OUTPUT	NO CHANGE	OTHERS	NOTE	OK	RETEST	NO	GOOD	
		SHORT	OPEN																		
PART NO.																					
1	UF1717H-103YR25-01	L1	*										*	*			*				
2	UF1717H-103YR25-01	L1		*													*				
3																					
4	SIWB(A)60B	D1	*	AC				*					*				*				
5	SIWB(A)60B	D1	*	AC				*					*				*				
6	SIWB(A)60B	D1	*	DC				*					*				*				
7	SIWB(A)60B	D1	*	DC				*					*				*				
8																					
9	ISS184TE85L	D2	*	A-K										*			*				
10	ISS184TE85L	D2	*	A-K										*			*				
11																					
12	D1FL20U	D3	*	A-K									*				*				
13	D1FL20U	D3	*	A-K									*				*				
14																					
15	EC8FS6	D4	*	A-K										*			*				
16	EC8FS6	D4	*	A-K										*			*				
17																					
18	DE5SC4M	D5	*	A-K										*			*				
19	DE5SC4M	D5	*	A-K										*			*				
20																					
21	IN4735A	ZD1	*	A-K										*			*				
22	IN4735A	ZD1	*	A-K										*			*				
23																					
24																					

*** a : slight b : prolonged

TDK-Lambda

DWG NO : PA766-57-04

APPROVED BY

TESTED BY

WILLIAM

2/4/93

CONDITIONS

Vin = 200VAC

Ta = 25°C

TEST

LOAD = 100 %

ABNORMAL TESTING

TEST MODE

MODEL : KWS5-5

PARTS NAME

PART NO.

OPEN

SHORT

FIRE

SMOKE

BURST

SMELL

RED HOT

DAMAGE

FUSE BLOWN

0 : C : P .

0 : V : P .

NO OUTPUT

NO CHANGE

OTHERS

NOTE

OK

RETEST

NO GOOD

1

C55Y5U1E186Z-TE12

C6

*

*** a : slight b : prolonged

TDK-Lambda

18/32

DWG NO : PA766-57-05

APPROVED BY

TESTED BY

WILLIAM
2/4/93

TEST CONDITIONS

LOAD = 100 %

TEST = 100 %

OTHERS

NO CHANGES

NO OUTPUT

0 : V : P :

0 : C : P :

R U S E B L O W N

D A M A G E

R E D H O T

S M E L L

B U R S T

S M O K E

P I R E

O P E N

S H O R T

P A R T N O .

ABNORMAL TESTING

TEST MODE

NOTE

O K

R E T E S T

N O G O O D

MODEL : KWS5-5

CONDITIONS

LOAD = 100 %

TEST = 100 %

OTHERS

NO CHANGES

NO OUTPUT

0 : V : P :

0 : C : P :

R U S E B L O W N

D A M A G E

R E D H O T

S M E L L

B U R S T

S M O K E

P I R E

O P E N

S H O R T

P A R T N O .

ABNORMAL TESTING

TEST MODE

NOTE

O K

R E T E S T

N O G O O D

TEST CONDITIONS

LOAD = 100 %

TEST = 100 %

OTHERS

NO CHANGES

NO OUTPUT

0 : V : P :

0 : C : P :

R U S E B L O W N

D A M A G E

R E D H O T

S M E L L

B U R S T

S M O K E

P I R E

O P E N

S H O R T

P A R T N O .

ABNORMAL TESTING

TEST MODE

NOTE

O K

R E T E S T

N O G O O D

TEST CONDITIONS

LOAD = 100 %

TEST = 100 %

OTHERS

NO CHANGES

NO OUTPUT

0 : V : P :

0 : C : P :

R U S E B L O W N

D A M A G E

R E D H O T

S M E L L

B U R S T

S M O K E

P I R E

O P E N

S H O R T

P A R T N O .

ABNORMAL TESTING

TEST MODE

NOTE

O K

R E T E S T

N O G O O D

TEST CONDITIONS

LOAD = 100 %

TEST = 100 %

OTHERS

NO CHANGES

NO OUTPUT

0 : V : P :

0 : C : P :

R U S E B L O W N

D A M A G E

R E D H O T

S M E L L

B U R S T

S M O K E

P I R E

O P E N

S H O R T

P A R T N O .

ABNORMAL TESTING

TEST MODE

NOTE

O K

R E T E S T

N O G O O D

TEST CONDITIONS

LOAD = 100 %

TEST = 100 %

OTHERS

NO CHANGES

NO OUTPUT

0 : V : P :

0 : C : P :

R U S E B L O W N

D A M A G E

R E D H O T

S M E L L

B U R S T

S M O K E

P I R E

O P E N

S H O R T

P A R T N O .

ABNORMAL TESTING

TEST MODE

NOTE

O K

R E T E S T

N O G O O D

TEST CONDITIONS

LOAD = 100 %

TEST = 100 %

OTHERS

NO CHANGES

NO OUTPUT

0 : V : P :

0 : C : P :

R U S E B L O W N

D A M A G E

R E D H O T

S M E L L

B U R S T

S M O K E

P I R E

O P E N

S H O R T

P A R T N O .

ABNORMAL TESTING

TEST MODE

NOTE

O K

R E T E S T

N O G O O D

TEST CONDITIONS

LOAD = 100 %

TEST = 100 %

OTHERS

NO CHANGES

NO OUTPUT

0 : V : P :

0 : C : P :

R U S E B L O W N

D A M A G E

R E D H O T

S M E L L

B U R S T

S M O K E

P I R E

O P E N

S H O R T

P A R T N O .

ABNORMAL TESTING

TEST MODE

NOTE

O K

R E T E S T

N O G O O D

DWG NO : PA766-57-06

APPROVED BY

TESTED BY

WILLYAM

21/4/93

TEST CONDITIONS

LOAD = 100 %

Vin = 200VAC

Ta = 25°C

ABNORMAL TESTING

TEST MODE

TEST

OTHERS

NO CHANGE

NO OUTPUT

0 : V : P :

0 : C : P :

FUSE BLOWN

DAMAGE

RED HOT

SMELL

BURST

SHOKE

FIRE

OPEN

SHORT

PART NO.

PARTS NAME

NOTE

OK

RETEST

NO

GOOD

MODEL : KWS5-5

TEST MODE

TEST

OTHERS

NO CHANGE

NO OUTPUT

0 : V : P :

0 : C : P :

FUSE BLOWN

DAMAGE

RED HOT

SMELL

BURST

SHOKE

FIRE

OPEN

SHORT

PART NO.

PARTS NAME

NOTE

OK

RETEST

NO

GOOD

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

***light b : prolonged

TDK-Lambda

DWG NO : PA766-57-07

APPROVED BY

TESTED BY

WILLIAM
2-14-93

CONDITIONS

Vin = 200VAC

Ta = 25°C

TEST

LOAD = 100 %

OTHERS

ABNORMAL TESTING

TEST MODE

TESTED BY

TEST

LOAD = 100 %

OTHERS

MODEL : KWS5-5

ABNORMAL TESTING

TESTED BY

PARTS NAME	PART NO.	TEST MODE		FIRE	SMOKE (a)(b)	BURST	SMELL	RED HOT	DAMAGE	FUSE BLOWN	O : C : P :	O : V : P :	NO OUTPUT	NO CHANGE	OTHERS	NOTE	OK	RETEST	NO GOOD	
		SHORT	OPEN																	
1	CR1/10WI83JV	*											*				*			
2	CR1/10WI83JV		*											*				*		
3																				
4	ERJ8GEYJ7R5V	*									*			*				*		
5	ERJ8GEYJ7R5V		*															*		
6																				
7	ERJ8GEYJ7R5V	*									*			*				*		
8	ERJ8GEYJ7R5V		*															*		
9																				
10	ERJ8GEYJ8R2V	*									*			*				*		
11	ERJ8GEYJ8R2V		*															*		
12																				
13	ERJ8GEYJ270V	*												*				*		
14	ERJ8GEYJ270V		*								*			*				*		
15																				
16	ERJ8GEYJ270V	*												*				*		
17	ERJ8GEYJ270V		*											*				*		
18																				
19	ERJ8GEYJ823V	*												*				*		
20	ERJ8GEYJ823V		*											*				*		
21																				
22	ERJ8GEYJ823V	*												*				*		
23	ERJ8GEYJ823V		*											*				*		
24																				

*** a: prolonged b: prolonged

TDK-Lambda

MODEL : KWS5-5		ABNORMAL TESTING										TEST CONDITIONS		APPROVED BY		TESTED BY				
PARTS NAME		TEST MODE		FIRE	SMOKE	BURST	SMELL	RED HOT	DAMAGE	FUSE BLOWN	O.V.P.	O.C.P.	NO OUTPUT	NO CHANGE	OTHERS	NOTE	OK	RETEST	NO GOOD	
		SHORT	OPEN																	
PART N O.					(a)(b)															
1	ERJ8GEYJ823V		*											*			*			
2	ERJ8GEYJ823V			*										*			*			
3																				
4	ERJ8GEYJ823V		*											*			*			
5	ERJ8GEYJ823V			*										*			*			
6																				
7	ERJ8GEYJ150V		*											*			*			
8	ERJ8GEYJ150V			*										*			*			
9																				
10	ERJ8GEYJ150V		*											*			*			
11	ERJ8GEYJ150V			*										*			*			
12																				
13	ERJ8GEYJ150V		*											*			*			
14	ERJ8GEYJ150V			*										*			*			
15																				
16	ERJ8GEYJ150V		*											*			*			
17	ERJ8GEYJ150V			*										*			*			
18																				
19	ERJ8GEYJ241V		*									*					*			
20	ERJ8GEYJ241V			*										*			*			
21																				
22	ERJ8GEYJ241V		*									*					*			
23	ERJ8GEYJ241V			*										*			*			
24																				

*** a : slight b : prolonged

TDK-Lambda

DWG NO : PA766-57-09

APPROVED BY *[Signature]* TESTED BY WILLIAM
 2/14/93

TEST CONDITIONS
 Vin = 200VAC
 Ta = 25°C

TEST LOAD = 100 %

ABNORMAL TESTING

MODEL : KWS5-5

PARTS NAME	PART NO.	TEST MODE										NOTE	OK	RETEST	NO GOOD			
		SHORT	OPEN	FIRE	SMOKE (a)(b)	BURST	SMELL	RED HOT	DAMAGE	FUSE BLOWN	0 : C : P .					0 : V : P .	NO OUTPUT	NO CHANGE
ERJ8GEYJ241V	R29	*																
ERJ8GEYJ241V	R29		*											*				
CR1/10W2001DV	R30	*									*							
CR1/10W2001DV	R30		*															
CR1/10W2051DV	R31	*																
CR1/10W2051DV	R31		*								*							
CR1/10W7681DV	R32	*																
CR1/10W7681DV	R32		*										*	*				
CR1/10W222JV	R33	*																
CR1/10W222JV	R33		*											*				
ERJ8GEYJ511V	R34	*																
ERJ8GEYJ511V	R34		*											*				
														*				

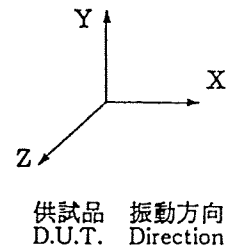
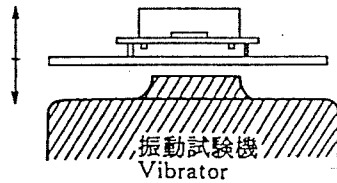
*** a : slight b : prolonged

TDK-Lambda

振動試験 VIBRATION TEST

MODEL : KWS5-12

- (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
 新日本測器株式会社 制御部 F-400-BM-E47
 SHIN-NIPPON Controller
 SOKKI Co., LTD
 加振部 905-FN
 Vibrator
- (3) 試験方法 Testing method



- 可変周波数振動試験
- ・周波数範囲 10~55Hz
 Sweep frequency
 - ・掃引時間 1分間
 Sweep time 1 min.
 - ・振幅 一定 (1.65mm)
 Amplitude const.
 - ・振幅方向 X, Y, Z.
 Direction
 - ・試験時間 各方向共 1H
 Test time 1H each

(4) 試験結果 Result

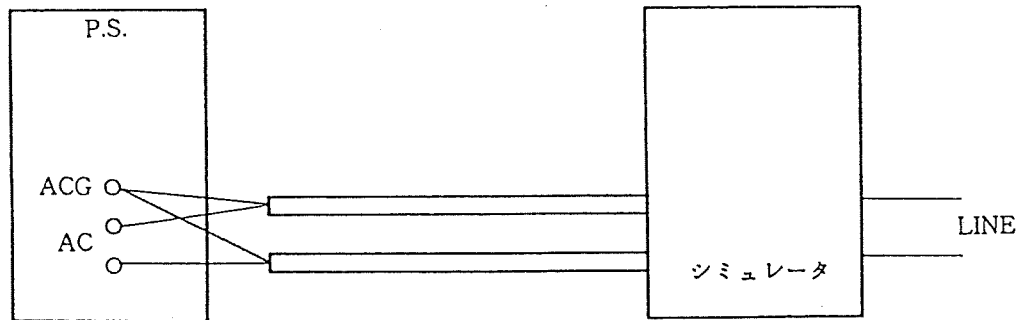
合格 不合格
OK NG

測定確認項目 Check item	出力電圧 (V) Vout	リップル (mVp-p) Ripple (mVp-p)	機能・実装状態 D. U. T. state	備考 Note
試験前 Initial 振動方向 Directions	11.98	75.5	異常なし OK	
X	11.98	75.5	異常なし OK	
Y	11.98	75.5	異常なし OK	
Z	11.98	75.0	異常なし OK	

ノイズシミュレート試験 NOISE SIMULATE TEST

MODEL : KWS5

(1) 測定回路及び測定機 Test circuit and equipment

シミュレータ : ENS-24X (三基電子工業株)
simulator (SANKI E. IND)

(2) 測定条件 Measuring Conditions

- ・入力電圧：定格
Input voltage Rated
- ・出力電圧：定格
Output voltage Rated
- ・出力電流：0%, 100%
Output Current
- ・電源周囲温度：25℃
Ambient temperature
- ・パルス幅：50ns~1000ns
Pulse width
- ・ノイズ電圧：0~2kV
Noise level
- ・位相：0~360°
Phase shift
- ・極性：+, -
Polarity
- ・MODE : NORMAL, COMMON
- ・TRIG 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 Results

- 合格 不合格
 OK NG

静電気シミュレーション試験 ELECTRO-STATIC DISCHARGE TEST

MODEL : KWS5

(1) 使用計測器 Equipment used

SET-30E (三基電子工業(株))

(SANKI. E. IND.)

放電抵抗 : 250Ω 静電容量 : 200pF

Discharge resistance Capacity

(2) 測定条件 Measuring conditions

・入力電圧 : 定格 ・出力電圧 : 定格 ・出力電流 : 定格

Input voltage : Rated Output voltage : Rated Output current : Rated

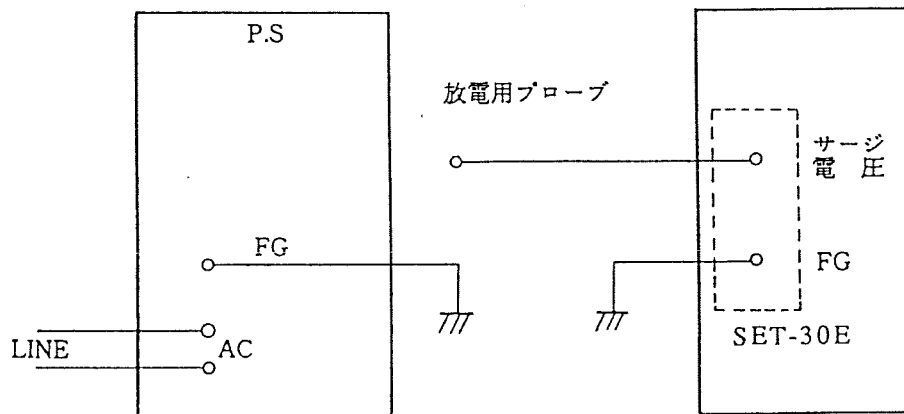
・電源周囲温度 : 25℃ ・印加電圧 : ±3KV, ±5KV, ±10KV, ±15KV

Ambient temperature Test voltage

(3) 試験方法 Testing method

被試験電源を稼働状態にしておき、露出部分で人体がふれる可能性のある部分（ケース，入力端子，出力端子，FG端子，ACG端子）に放電をさせ、出力に異常の無い事を確認する。

尚，試験回数は，+，-各3回とし，引加電圧は3KVから15KVまで順次上げていくものとする。Check if there is no abnormal output when the testing voltage is applied to operating D. U. T. (Device Under Test) on its case, input terminal, output terminal, FG terminal and ACG terminal which are exposed parts to human body. Testing cycle is at +, - for three times each, and the applied voltage to be gradually increased from 3KV to 15KV.



(4) 判定条件 Acceptable conditions

- | | |
|-----------------|----------------------------|
| 1. 破壊しない事 | Not to be broken |
| 2. 出力電圧がダウンしない事 | Not to be shut down output |
| 3. その他異常の無いこと | No other out of orders |

(5) 試験結果 Result

合格 不合格
OK NG

雷サージ試験 IMPULSE TEST

MODEL : KWS5

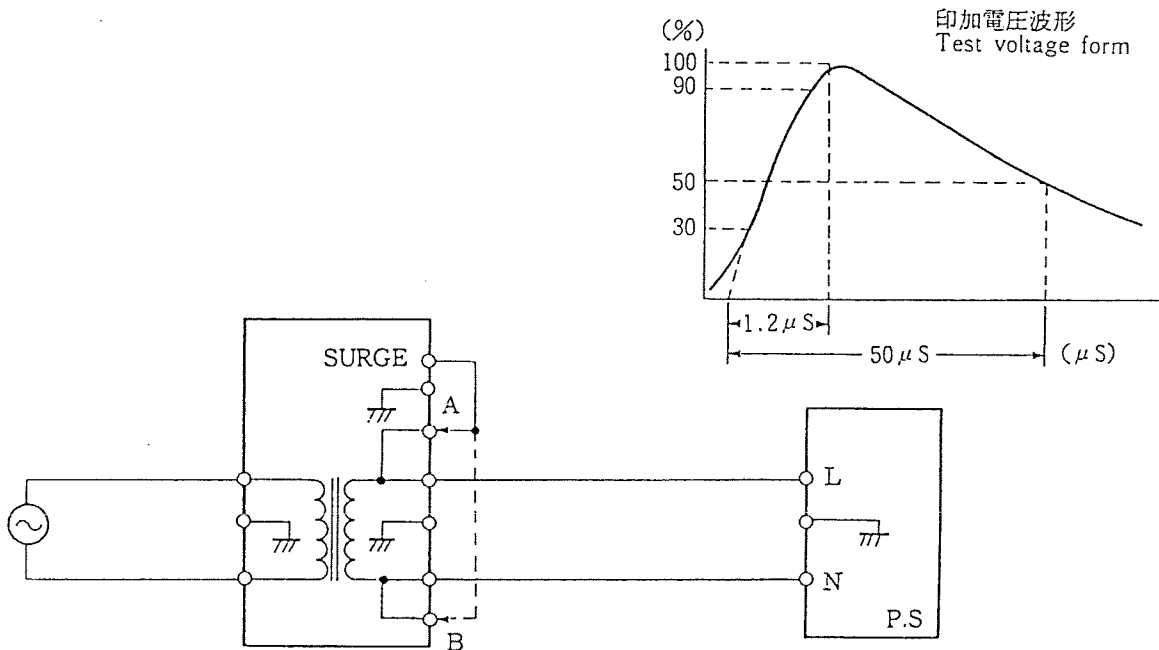
(1) 使用計測器 Equipment used

LSG-12K-E (三基電子工業(株))
(SANKI. E. IND.)

(2) 測定条件 Measuring conditions

- | | |
|---------------------------------------|--|
| ・入力電圧：定格
Input voltage : Rated | ・印加電圧：5kV
Test voltage |
| ・出力電圧：定格
Output voltage : Rated | ・印加箇所：FG-AC間
Test point : Between FG-AC |
| ・出力電流：無負荷
Output current : No load | ・試験回数：3回
Test time : 3 times |
| ・電源周囲温度：25℃
Ambient temperature | ・極性：+, -
Polarity |

(3) 試験方法 Testing method



(4) 判定条件 Acceptable conditions

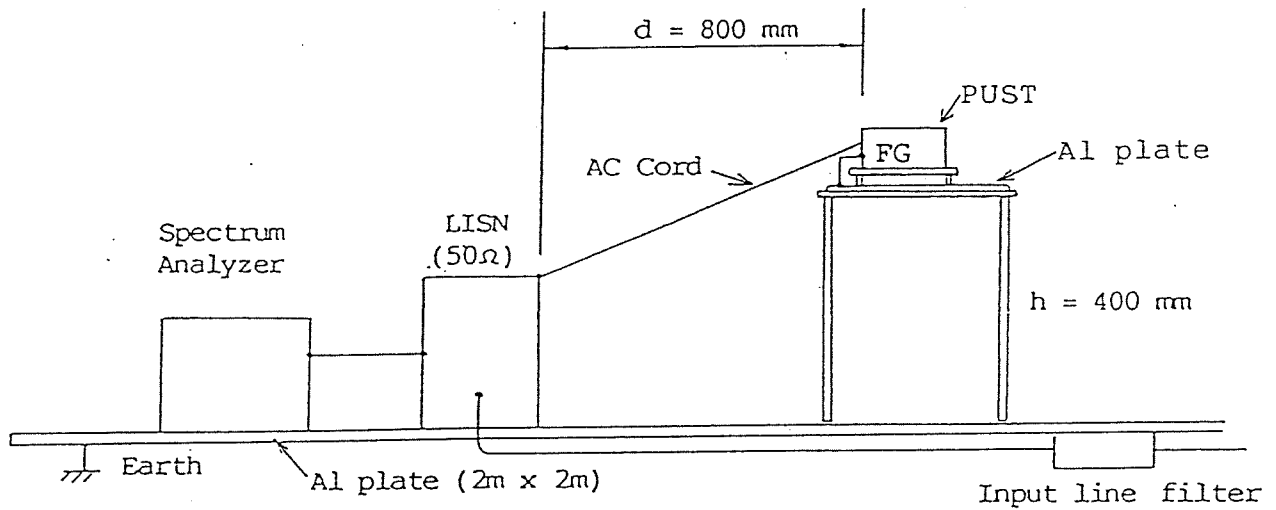
- | | |
|-----------------|----------------------------|
| 1. 破壊しない事 | Not to be broken |
| 2. 出力電圧がダウンしない事 | Not to be shut down output |
| 3. その他異常の無いこと | No other out of orders |

(5) 試験結果 Result

合格 不合格
OK NG

EMI TEST

TEST CIRCUIT :



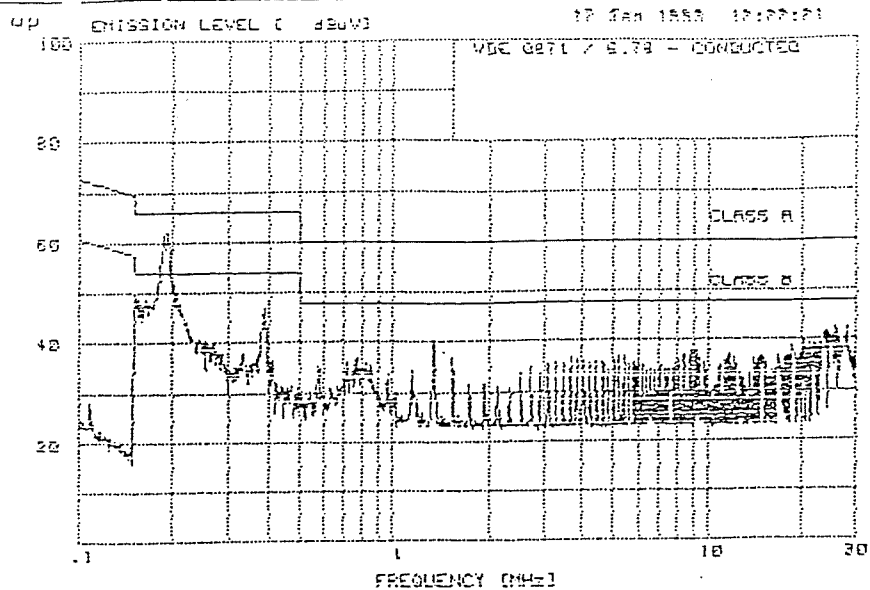
TEST EQUIPMENTS :

SPECTRUM ANALYZER	8568B	HEWLETT PACKARD
QUASI-PEAK ADAPTER	85650A	HEWLETT PACKARD
RF PRESELECTOR	85685A	HEWLETT PACKARD
LISN	3825/2	ENCO

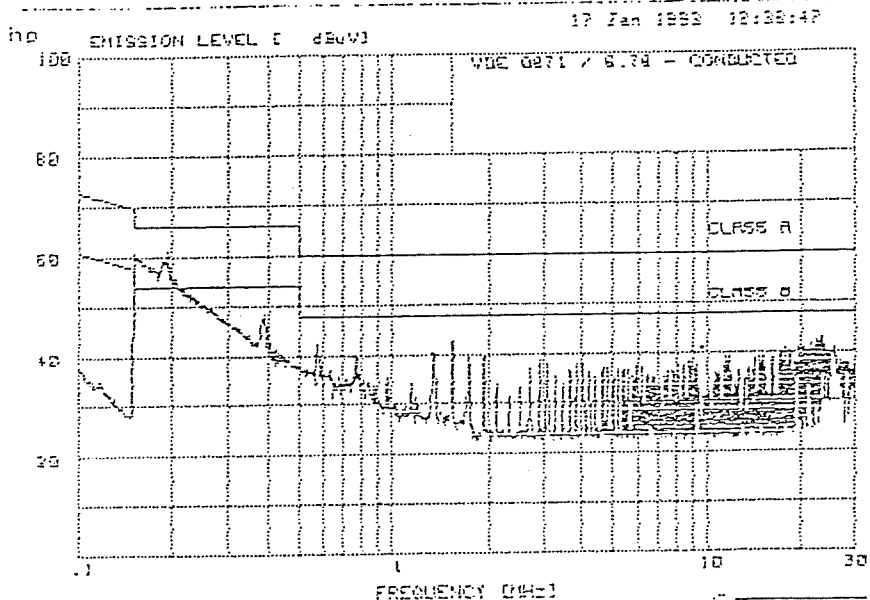
CONDITIONS :

INPUT VOLTAGE	: AC100V, AC200V
OUTPUT VOLTAGE	: RATED
OUTPUT CURRENT	: RATED
AMBIENT TEMP.	: 25°C

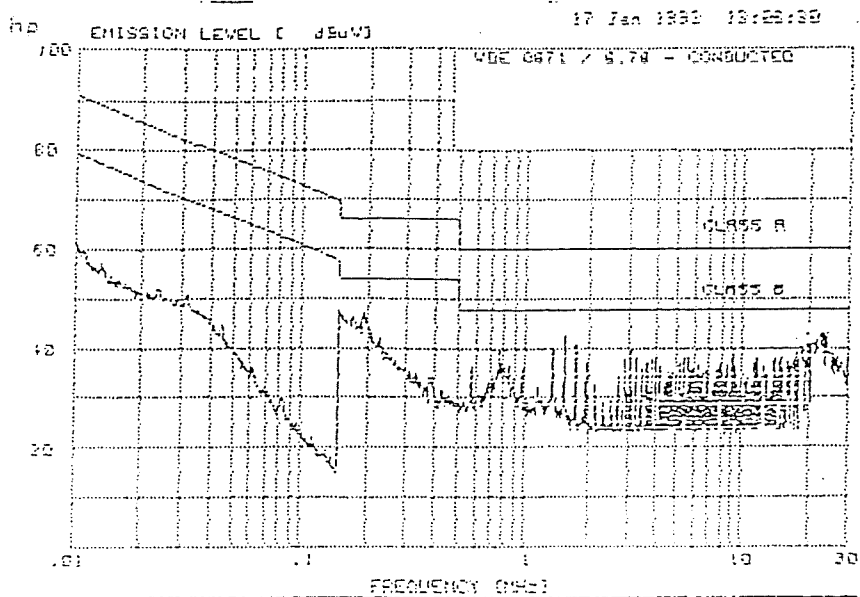
認 APPD		設 計 ENGR		図面番号 DWG-No.	PA766-71-02-	<input type="checkbox"/>
検 査 CHK		製 図 DWG				



Vin = 100Vac

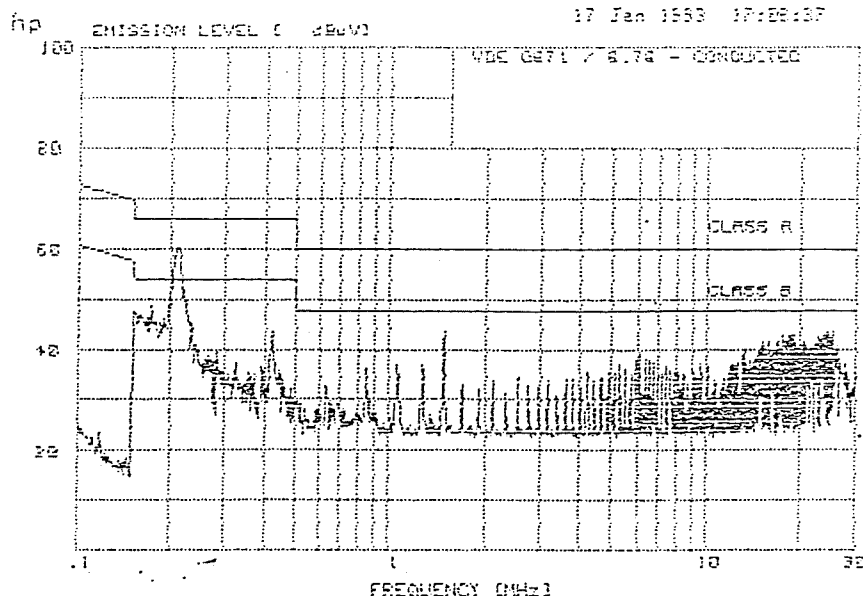


Vin = 200Vac

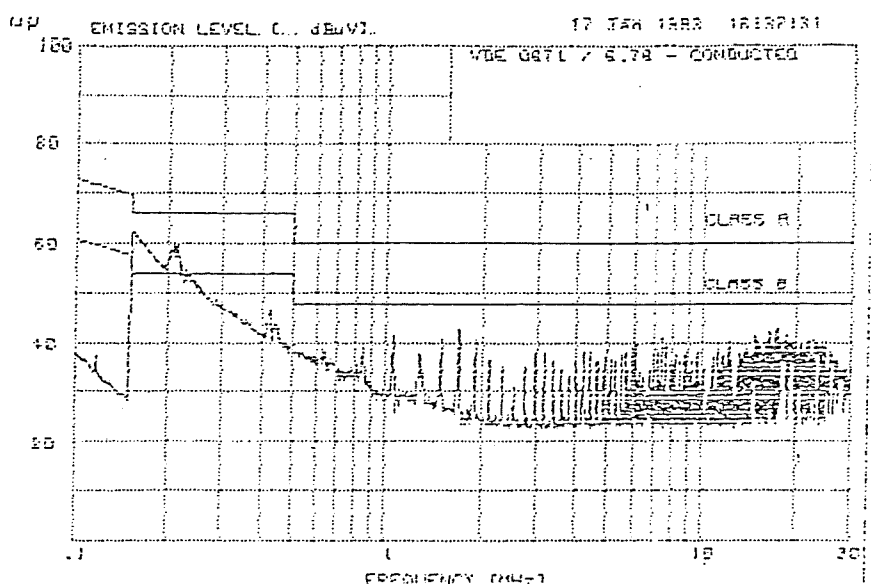


V D E
With external cap.
0.22 μ F between
Ac(L) and Ac(N)

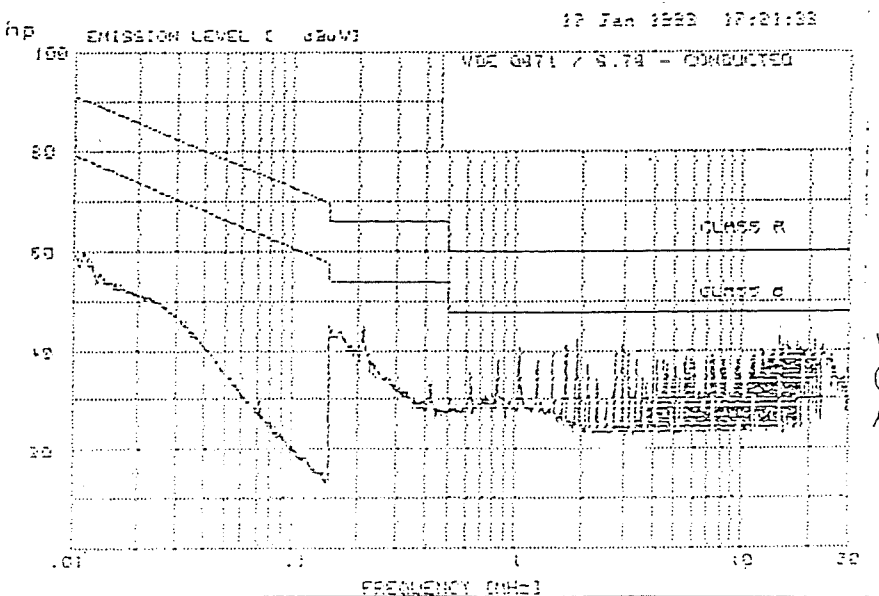
認 APPD		設 計 ENGR		図面番号 DWG - No.	PA766-71-03	-	<input type="checkbox"/>
検 査 CHK		製 作 DWG					



Vin = 100Vac



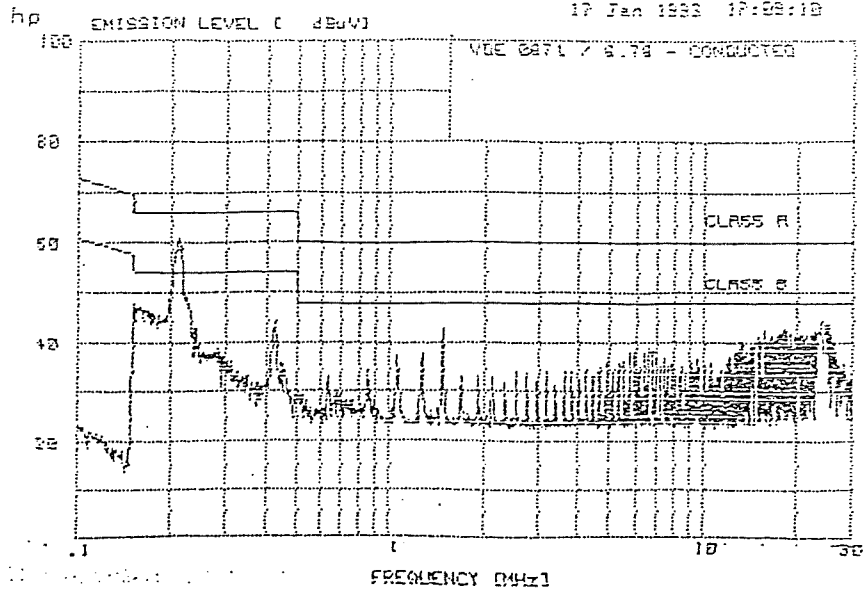
Vin = 200Vac



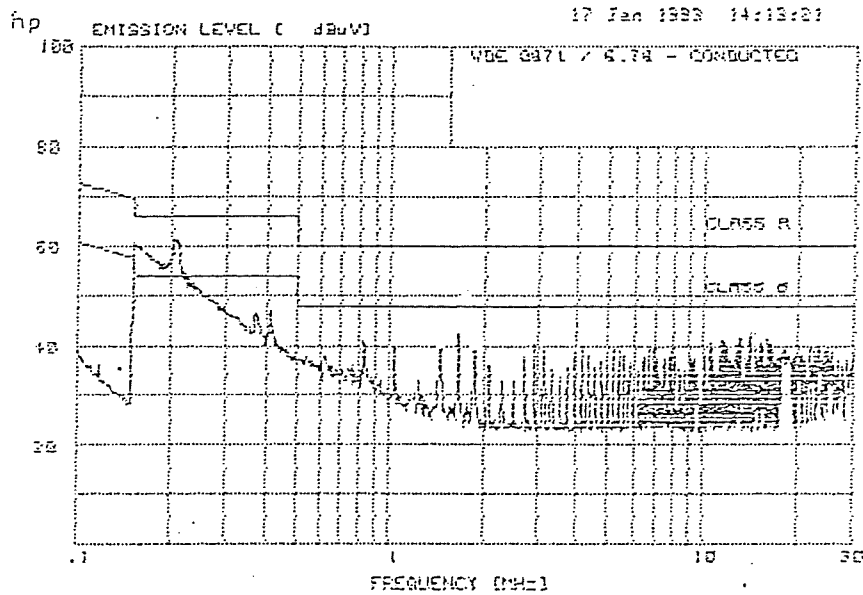
Vin = 200Vac

V D E
With external cap.
0.22μF between
Ac(L) and Ac(N).

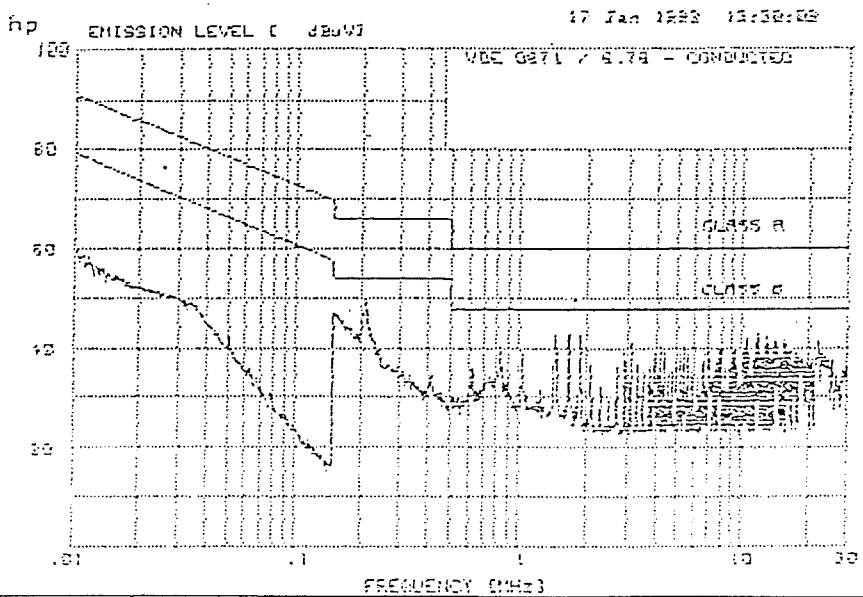
認 APPD		設 計 ENGR		面番号 DWG - No.	PA766-71-04 -
検 CHK		製 DWG			



Vin = 100Vac



Vin = 200Vac



Vin = 20CVac

V D E
With external cap.
0.22μF between
Ac(L) and Ac(N).

認 APPD		設 計 ENGR		図面番号 D WG - No.	PA766-71-05-	<input type="checkbox"/>
検 <input checked="" type="checkbox"/> C H K		製 <input checked="" type="checkbox"/> D W G				