

HWS300P

RELIABILITY DATA

信頼性データ

DWG No. A237-57-01A		
APPD	CHK	DWG
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使用記号 Terminology used

FGフレームグラウンド Frame GND

※ 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 : HWS300P-24

(1) 算出方法 Calculating method

JEITA (RCR-9102, 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-9102, 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-9102

$MTBF \doteq \frac{179,597}{1} \text{ 時間 (hours)}$
 (但し、MTBFにファンは含まれておりません。)
 However MTBF Calculation for FAN isn't Included.

RCR-9102B

$MTBF \doteq \frac{98,218}{1} \text{ 時間 (hours)}$
 (但し、MTBFにファンは含まれておりません。)
 However MTBF Calculation for FAN isn't Included.

2. 部品デイレートイング Component Derating

MODEL : HWS300P-24

(1) 算出方法 Calculating method

(a) 測定条件 Measuring Condition

・入力 Input	: 100, 200VAC	・周囲温度 Ambient temperature	: 50°C
・出力 Output	: 24V 12.5A(100%)	・取付け方法 Mounting method	: 標準取付け(A) Standard mounting (A)

(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

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

T _c	: デイレートイ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 _l	: デイレートイ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
T _a	: デイレートイ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
P _c (max) (P _{ch} (max))	: 最大コレクタ(チャネル)損失 Maximum collector (channel) dissipation
T _j (max) (T _{ch} (max))	: 最大接合点(チャネル)温度 Maximum junction (channel) temperature
θ _{j-c} (θ _{ch-c})	: 接合点(チャネル)からケースまでの熱抵抗 Thermal impedance between junction (channel) and case
θ _{j-l} (θ _{ch-l})	: 接合点(チャネル)からリードまでの熱抵抗 Thermal impedance between junction (channel) and lead
θ _{j-a} (θ _{ch-a})	: 接合点(チャネル)から周囲までの熱抵抗 Thermal impedance between junction (channel) and air

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

部品番号 Location No.	Vin = 100VAC Load=100% Ta = 50°C		
Q1 F20W60C3 SHINDENGEN	Tch (max) = 150°C Pch = 11.7 W Tch = Tc + ((θch-c) × Pch) = 85.9 °C D.F. = 57.3 %	θch-c = 0.6 °C/W ΔTc = 28.9 °C	Pch (max) = 75W Tc = 78.9 °C
Q31 F20W60C3 SHINDENGEN	Tch (max) = 150°C Pch = 2.5 W Tch = Tc + ((θch-c) × Pch) = 79.9 °C D.F. = 53.3 %	θch-c = 0.6 °C/W ΔTc = 28.4 °C	Pch (max) = 75W Tc = 78.4 °C
Q32 F20W60C3 SHINDENGEN	Tch (max) = 150°C Pch = 3.8 W Tch = Tc + ((θch-c) × Pch) = 81.7 °C D.F. = 54.5 %	θch-c = 0.6 °C/W ΔTc = 29.4 °C	Pch (max) = 75W Tc = 79.4 °C
Q103 2SA1213-Y TOSHIBA	Tj (max) = 150°C Pc = 24.0 mW Tj = Ta + ((θj-a) × Pc) = 72.7 °C D.F. = 48.5 %	θj-a = 250 °C/W ΔTa = 16.7 °C	Pc (max) = 0.5W Ta = 66.7 °C
Q201 2SK1334BY RENESAS	Tch (max) = 150°C Pch = 22.0 mW Tch = Ta + ((θch-a) × Pch) = 66.5 °C D.F. = 44.3 %	θch-a = 125 °C/W ΔTa = 13.7 °C	Pch (max) = 1.0W Ta = 63.7 °C
Q203 2SA1213-Y TOSHIBA	Tj (max) = 150°C Pc = 30.0 mW Tj = Ta + ((θj-a) × Pc) = 73.4 °C D.F. = 48.9 %	θj-a = 250 °C/W ΔTa = 15.9 °C	Pc (max) = 0.5W Ta = 65.9 °C
Q304 2SA1213-Y TOSHIBA	Tj (max) = 150°C Pc = 90.0 mW Tj = Ta + ((θj-a) × Pc) = 83.2 °C D.F. = 55.5 %	θj-a = 250 °C/W ΔTa = 10.7 °C	Pc (max) = 0.5W Ta = 60.7 °C
Q308 2SA1244-Y TOSHIBA	Tj (max) = 150°C Pc = 680.0 mW Tj = Tc + ((θj-c) × Pc) = 73.0 °C D.F. = 48.6 %	θj-c = 6.25 °C/W ΔTc = 18.7 °C	Pc (max) = 20.0W Tc = 68.7 °C
Q331 2SC2712-Y TOSHIBA	Tj (max) = 150°C Pc = 50.3 mW Tj = Ta + ((θj-a) × Pc) = 101.4 °C D.F. = 67.6 %	θj-a = 833 °C/W ΔTa = 9.5 °C	Pc (max) = 0.15W Ta = 59.5 °C
D1 D25XB60 SHINDENGEN	Tj (max) = 150°C Pd = 7.5 W Tj = Tc + ((θj-c) × Pd) = 99.6 °C D.F. = 66.4 %	θj-c = 1 °C/W ΔTc = 42.1 °C	Tc = 92.1 °C
D2 RF2001TA6S ROHM	Tj (max) = 150°C Pd = 3.8 W Tj = Tc + ((θj-c) × Pd) = 88.6 °C D.F. = 59.1 %	θj-c = 2 °C/W ΔTc = 31.0 °C	Tc = 81.0 °C
D51-D54 YA865C15R FUJI ELECTRIC	Tj (max) = 150°C Pd = 2.8 W Tj = Tc + ((θj-c) × Pd) = 76.6 °C D.F. = 51.1 %	θj-c = 1.25 °C/W ΔTc = 23.1 °C	Tl = 73.1 °C
D101 CRH01 TOSHIBA	Tj (max) = 150°C Pd = 19.7 mW Tj = Tl + ((θj-l) × Pd) = 68.6 °C D.F. = 45.7 %	θj-l = 30 °C/W ΔTl = 18.0 °C	Tl = 68.0 °C

部品番号 Location No.	$V_{in} = 100VAC$	Load=100%	$T_a = 50^{\circ}C$
D102 CRH01 TOSHIBA	$T_j(\max) = 150^{\circ}C$ $P_d = 18.7 \text{ mW}$ $T_j = T_l + ((\theta_j - l) \times P_d) = 69.2^{\circ}C$ D.F. = 46.1 %	$\theta_j - l = 30^{\circ}C/W$ $\Delta T_l = 18.6^{\circ}C$	$T_l = 68.6^{\circ}C$
D203 NSU03A60 NIHON INTER	$T_j(\max) = 150^{\circ}C$ $P_d = 44.6 \text{ mW}$ $T_j = T_l + ((\theta_j - l) \times P_d) = 70.5^{\circ}C$ D.F. = 47.0 %	$\theta_j - l = 13^{\circ}C/W$ $\Delta T_l = 19.9^{\circ}C$	$T_l = 69.9^{\circ}C$
D204 NSU03A60 NIHON INTER	$T_j(\max) = 150^{\circ}C$ $P_d = 34.2 \text{ mW}$ $T_j = T_l + ((\theta_j - l) \times P_d) = 72.8^{\circ}C$ D.F. = 48.6 %	$\theta_j - l = 13^{\circ}C/W$ $\Delta T_l = 22.4^{\circ}C$	$T_l = 72.4^{\circ}C$
D301 CRH01 TOSHIBA	$T_j(\max) = 150^{\circ}C$ $P_d = 0.2 \text{ W}$ $T_j = T_l + ((\theta_j - l) \times P_d) = 71.2^{\circ}C$ D.F. = 47.5 %	$\theta_j - l = 30^{\circ}C/W$ $\Delta T_l = 15.2^{\circ}C$	$T_l = 65.2^{\circ}C$
D331 CRH01 TOSHIBA	$T_j(\max) = 150^{\circ}C$ $P_d = 80.0 \text{ mW}$ $T_j = T_l + ((\theta_j - l) \times P_d) = 61.3^{\circ}C$ D.F. = 40.9 %	$\theta_j - l = 30^{\circ}C/W$ $\Delta T_l = 8.9^{\circ}C$	$T_l = 58.9^{\circ}C$
D352 ISS184 TOSHIBA	$T_j(\max) = 150^{\circ}C$ $P_d = 2.0 \text{ mW}$ $T_j = T_a + ((\theta_j - a) \times P_d) = 65.8^{\circ}C$ D.F. = 43.8 %	$\theta_j - a = 833^{\circ}C/W$ $\Delta T_a = 14.1^{\circ}C$	$P(\max) = 0.15W$ $T_a = 64.1^{\circ}C$
D353 CRH01 TOSHIBA	$T_j(\max) = 150^{\circ}C$ $P_d = 0.2 \text{ W}$ $T_j = T_l + ((\theta_j - l) \times P_d) = 69.6^{\circ}C$ D.F. = 46.4 %	$\theta_j - l = 30^{\circ}C/W$ $\Delta T_l = 13.6^{\circ}C$	$T_l = 63.6^{\circ}C$
PC31 PS2581L1 (LED) NEC	$T_j(\max) = 125^{\circ}C$ $P_d = 4.7 \text{ mW}$ $T_j = T_c + ((\theta_j - c) \times P_d) = 66.2^{\circ}C$ D.F. = 53.0 %	$\theta_j - c = 150^{\circ}C/W$ $\Delta T_c = 15.5^{\circ}C$	$P_d(\max) = 0.15W$ $T_c = 65.5^{\circ}C$
PC31 PS2581L1 (TRANSISTOR) NEC	$T_j(\max) = 125^{\circ}C$ $P_c = 0.7 \text{ mW}$ $T_j = T_c + ((\theta_j - c) \times P_c) = 65.6^{\circ}C$ D.F. = 52.5 %	$\theta_j - c = 150^{\circ}C/W$ $\Delta T_c = 15.5^{\circ}C$	$P_c(\max) = 0.15W$ $T_c = 65.5^{\circ}C$
PC52 PS2581L1 (LED) NEC	$T_j(\max) = 125^{\circ}C$ $P_d = 5.1 \text{ mW}$ $T_j = T_c + ((\theta_j - c) \times P_d) = 64.8^{\circ}C$ D.F. = 51.8 %	$\theta_j - c = 150^{\circ}C/W$ $\Delta T_c = 14.0^{\circ}C$	$P_d(\max) = 0.15W$ $T_c = 64.0^{\circ}C$
PC52 PS2581L1 (TRANSISTOR) NEC	$T_j(\max) = 125^{\circ}C$ $P_c = 20.5 \text{ mW}$ $T_j = T_c + ((\theta_j - c) \times P_c) = 67.1^{\circ}C$ D.F. = 53.7 %	$\theta_j - c = 150^{\circ}C/W$ $\Delta T_c = 14.0^{\circ}C$	$P_c(\max) = 0.15W$ $T_c = 64.0^{\circ}C$
PC331 PS2801-1 (LED) NEC	$T_j(\max) = 125^{\circ}C$ $P_d = 7.7 \text{ mW}$ $T_j = T_c + ((\theta_j - c) \times P_d) = 60.4^{\circ}C$ D.F. = 48.3 %	$\theta_j - c = 150^{\circ}C/W$ $\Delta T_c = 9.2^{\circ}C$	$P_d(\max) = 0.12W$ $T_c = 59.2^{\circ}C$
PC331 PS2801-1 (TRANSISTOR) NEC	$T_j(\max) = 125^{\circ}C$ $P_c = 1.3 \text{ mW}$ $T_j = T_c + ((\theta_j - c) \times P_c) = 59.4^{\circ}C$ D.F. = 47.5 %	$\theta_j - c = 150^{\circ}C/W$ $\Delta T_c = 9.2^{\circ}C$	$P_c(\max) = 0.12W$ $T_c = 59.2^{\circ}C$
SR1 SMG12C60F SANREX	$T_j(\max) = 125^{\circ}C$ $P_c = 1.0 \text{ W}$ $T_j = T_c + ((\theta_j - c) \times P_c) = 78.6^{\circ}C$ D.F. = 62.9 %	$\theta_j - c = 3.3^{\circ}C/W$ $\Delta T_c = 25.3^{\circ}C$	$T_c = 75.3^{\circ}C$

部品番号 Location No.	Vin = 200VAC	Load = 100%	Ta = 50°C
Q1 F20W60C3 SHINDENGEN	Tch (max) = 150°C Pch = 4.6 W Tch = Tc + ((θch-c) × Pch) = 67.6 °C D.F. = 45.0 %	θch-c = 0.6 °C/W ΔTc = 14.8 °C	Pch (max) = 75W Tc = 64.8 °C
Q31 F20W60C3 SHINDENGEN	Tch (max) = 150°C Pch = 2.5 W Tch = Tc + ((θch-c) × Pch) = 79.5 °C D.F. = 53.0 %	θch-c = 0.6 °C/W ΔTc = 28.0 °C	Pch (max) = 75W Tc = 78.0 °C
Q32 F20W60C3 SHINDENGEN	Tch (max) = 150°C Pch = 3.8 W Tch = Tc + ((θch-c) × Pch) = 81.4 °C D.F. = 54.3 %	θch-c = 0.6 °C/W ΔTc = 29.1 °C	Pch (max) = 75W Tc = 79.1 °C
Q103 2SA1213-Y TOSHIBA	Tj (max) = 150°C Pc = 24.0 mW Tj = Ta + ((θj-a) × Pc) = 68.1 °C D.F. = 45.4 %	θj-a = 250 °C/W ΔTa = 12.1 °C	Pc (max) = 0.5W Ta = 62.1 °C
Q201 2SK1334BY RENESAS	Tch (max) = 150°C Pch = 22.0 mW Tch = Ta + ((θch-a) × Pch) = 65.5 °C D.F. = 43.6 %	θch-a = 125 °C/W ΔTa = 12.7 °C	Pch (max) = 1.0W Ta = 62.7 °C
Q203 2SA1213-Y TOSHIBA	Tj (max) = 150°C Pc = 30.0 mW Tj = Ta + ((θj-a) × Pc) = 72.8 °C D.F. = 48.5 %	θj-a = 250 °C/W ΔTa = 15.3 °C	Pc (max) = 0.5W Ta = 65.3 °C
Q304 2SA1213-Y TOSHIBA	Tj (max) = 150°C Pc = 90.0 mW Tj = Ta + ((θj-a) × Pc) = 82.2 °C D.F. = 54.8 %	θj-a = 250 °C/W ΔTa = 9.7 °C	Pc (max) = 0.5W Ta = 59.7 °C
Q308 2SA1244-Y TOSHIBA	Tj (max) = 150°C Pc = 680.0 mW Tj = Tc + ((θj-c) × Pc) = 72.4 °C D.F. = 48.2 %	θj-c = 6.25 °C/W ΔTc = 18.1 °C	Pc (max) = 20.0W Tc = 68.1 °C
Q331 2SC2712-Y TOSHIBA	Tj (max) = 150°C Pc = 50.3 mW Tj = Ta + ((θj-a) × Pc) = 100.6 °C D.F. = 67.1 %	θj-a = 833 °C/W ΔTa = 8.7 °C	Pc (max) = 0.15W Ta = 58.7 °C
D1 D25XB60 SHINDENGEN	Tj (max) = 150°C Pd = 3.9 W Tj = Tc + ((θj-c) × Pd) = 75.5 °C D.F. = 50.3 %	θj-c = 1 °C/W ΔTc = 21.6 °C	Tc = 71.6 °C
D2 RF2001TA6S ROHM	Tj (max) = 150°C Pd = 3.8 W Tj = Tc + ((θj-c) × Pd) = 75.3 °C D.F. = 50.2 %	θj-c = 2 °C/W ΔTc = 17.7 °C	Tc = 67.7 °C
D51-D54 YA865C15R FUJI ELECTRIC	Tj (max) = 150°C Pd = 2.8 W Tj = Tc + ((θj-c) × Pd) = 76.0 °C D.F. = 50.7 %	θj-c = 1.25 °C/W ΔTl = 22.5 °C	Tl = 72.5 °C
D101 CRH01 TOSHIBA	Tj (max) = 150°C Pd = 19.7 mW Tj = Tl + ((θj-l) × Pd) = 63.4 °C D.F. = 42.3 %	θj-l = 30 °C/W ΔTl = 12.8 °C	Tl = 62.8 °C

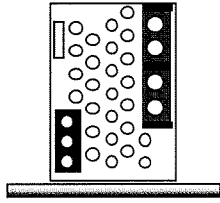
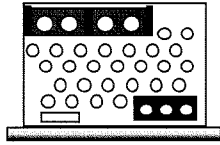
部品番号 Location No.	Vin = 200VAC	Load = 100%	Ta = 50°C
D102 CRH01 TOSHIBA	Tj (max) = 150°C Pd= 18.7 mW Tj= Tl+ ((θj-l) × Pd)= 63.7 °C D.F. = 42.4 %	θj-l = 30 °C/W ΔTl= 13.1 °C	Tl= 63.1 °C
D203 NSU03A60 NIHON INTER	Tj (max) = 150°C Pd= 44.6 mW Tj= Tl+ ((θj-l) × Pd)= 69.8 °C D.F. = 46.5 %	θj-l = 13 °C/W ΔTl= 19.2 °C	Tl= 69.2 °C
D204 NSU03A60 NIHON INTER	Tj (max) = 150°C Pd= 34.2 mW Tj= Tl+ ((θj-l) × Pd)= 71.7 °C D.F. = 47.8 %	θj-l = 13 °C/W ΔTl= 21.3 °C	Tl= 71.3 °C
D301 CRH01 TOSHIBA	Tj (max) = 150°C Pd= 0.2 W Tj= Tl+ ((θj-l) × Pd)= 70.2 °C D.F. = 46.8 %	θj-l = 30 °C/W ΔTl= 14.2 °C	Tl= 64.2 °C
D331 CRH01 TOSHIBA	Tj (max) = 150°C Pd= 80.0 mW Tj= Tl+ ((θj-l) × Pd)= 60.6 °C D.F. = 40.4 %	θj-l = 30 °C/W ΔTl= 8.2 °C	Tl= 58.2 °C
D352 1SS184 TOSHIBA	Tj (max) = 150°C Pd= 2.0 mW Tj= Ta+ ((θj-a) × Pd)= 64.8 °C D.F. = 43.2 %	θj-a = 833 °C/W ΔTa= 13.1 °C	P (max) = 0.15W Ta= 63.1 °C
D353 CRH01 TOSHIBA	Tj (max) = 150°C Pd= 0.2 W Tj= Tl+ ((θj-l) × Pd)= 68.4 °C D.F. = 45.6 %	θj-l = 30 °C/W ΔTl= 12.4 °C	Tl= 62.4 °C
PC31 PS2581L1 (LED) NEC	Tj (max) = 125°C Pd= 4.7 mW Tj= Tc+ ((θj-c) × Pd)= 65.9 °C D.F. = 52.7 %	θj-c = 150 °C/W ΔTc= 15.2 °C	Pd (max) = 0.15W Tc= 65.2 °C
PC31 PS2581L1 (TRANSISTOR) NEC	Tj (max) = 125°C Pc= 0.7 mW Tj= Tc+ ((θj-c) × Pc)= 65.3 °C D.F. = 52.2 %	θj-c = 150 °C/W ΔTc= 15.2 °C	Pc (max) = 0.15W Tc= 65.2 °C
PC52 PS2581L1 (LED) NEC	Tj (max) = 125°C Pd= 5.1 mW Tj= Tc+ ((θj-c) × Pd)= 64.5 °C D.F. = 51.6 %	θj-c = 150 °C/W ΔTc= 13.7 °C	Pd (max) = 0.15W Tc= 63.7 °C
PC52 PS2581L1 (TRANSISTOR) NEC	Tj (max) = 125°C Pc= 20.5 mW Tj= Tc+ ((θj-c) × Pc)= 66.8 °C D.F. = 53.4 %	θj-c = 150 °C/W ΔTc= 13.7 °C	Pc (max) = 0.15W Tc= 63.7 °C
PC331 PS2801-1 (LED) NEC	Tj (max) = 125°C Pd= 7.7 mW Tj= Tc+ ((θj-c) × Pd)= 59.9 °C D.F. = 47.9 %	θj-c = 150 °C/W ΔTc= 8.7 °C	Pd (max) = 0.12W Tc= 58.7 °C
PC331 PS2801-1 (TRANSISTOR) NEC	Tj (max) = 125°C Pc= 1.3 mW Tj= Tc+ ((θj-c) × Pc)= 58.9 °C D.F. = 47.1 %	θj-c = 150 °C/W ΔTc= 8.7 °C	Pc (max) = 0.12W Tc= 58.7 °C
SR1 SMG12C60F SANREX	Tj (max) = 125°C Pc= 1.0 W Tj= Tc+ ((θj-c) × Pc)= 73.3 °C D.F. = 58.6 %	θj-c = 3.3 °C/W ΔTc= 20.0 °C	Tc= 70.0 °C

3. 主要部品温度上昇値

Main Components Temperature Rise ΔT List

MODEL : HWS300P-24

・測定条件 Measuring Condition

取付方法 Mounting Method (標準取付 : A) (Standard Mounting Method : A)	Mounting A	Mounting B
		
入力電圧 Input Voltage	100VAC	
出力電圧 Output Voltage	24VDC	
出力電流 Output Current	12.5A	

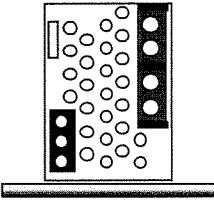
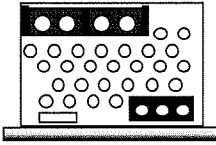
出力ディレーティング Output Derating Ta=50°C		ΔT Temperature Rise (°C)	
		Io=100%	
部品番号 Location No.	部品名 Part name	取付方向 Mounting A	取付方向 Mounting B
Q1	MOS FET	28.9	28.0
Q31	MOS FET	28.4	26.5
Q32	MOS FET	29.4	27.4
D1	BRIDGE DIODE	42.1	39.7
D2	F.R.D	31.0	30.2
D51-D54	S.B.D	23.1	21.4
SR1	THYRISTOR	25.3	22.3
A102	CHIP IC	30.0	28.2
A202	CHIP IC	25.4	23.6
A351	IPD	21.3	19.4
T21	TRANS PULSE	12.9	10.4
T31	DRIVE TRANS	15.5	14.1
T32	TRANS PULSE	30.8	28.9
L1	BALUN COIL	27.4	28.4
L2	BALUN COIL	33.7	33.0
L3	CHOKE COIL	44.3	43.6
L51	CHOKE COIL	42.2	41.4
C9	E.CAP.	12.3	12.4
C12	E.CAP.	12.3	9.9
C35	E.CAP.	12.3	11.9
C51	E.CAP.	3.8	3.2
C52	E.CAP.	7.4	6.2
C53	E.CAP.	2.4	1.9
C54	E.CAP.	8.0	5.8

3. 主要部品温度上昇値

Main Components Temperature Rise ΔT List

MODEL : HWS300P-24

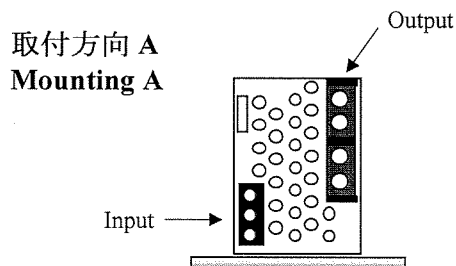
・測定条件 Measuring Condition

取付方法 Mounting Method (標準取付 : A) (Standard Mounting Method : A)	Mounting A	Mounting B
		
入力電圧 Input Voltage	200VAC	
出力電圧 Output Voltage	24VDC	
出力電流 Output Current	12.5A	

出力デレーティング Output Derating Ta=50°C		ΔT Temperature Rise (°C)	
		Io=100%	
部品番号 Location No.	部品名 Part name	取付方向 Mounting A	取付方向 Mounting B
Q1	MOS FET	14.8	13.9
Q31	MOS FET	28.0	26.5
Q32	MOS FET	29.1	27.4
D1	BRIDGE DIODE	21.6	20.2
D2	F.R.D	17.7	17.0
D51-D54	S.B.D	22.5	21.1
SR1	THYRISTOR	20.0	18.0
A102	CHIP IC	18.7	17.7
A202	CHIP IC	24.4	22.9
A351	IPD	19.8	18.4
T21	TRANS PULSE	11.4	9.6
T31	DRIVE TRANS	14.6	13.6
T32	TRANS PULSE	30.3	28.6
L1	BALUN COIL	9.8	9.5
L2	BALUN COIL	12.1	11.3
L3	CHOKE COIL	36.5	35.4
L51	CHOKE COIL	42.0	41.1
C9	E.CAP.	10.4	10.4
C12	E.CAP.	8.3	6.7
C35	E.CAP.	11.5	10.8
C51	E.CAP.	4.0	3.3
C52	E.CAP.	7.4	6.0
C53	E.CAP.	2.5	2.2
C54	E.CAP.	8.0	5.6

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

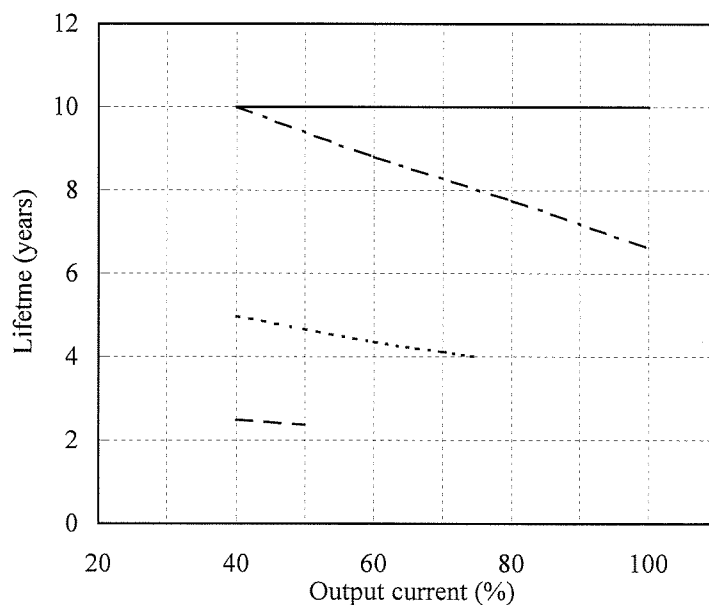
MODEL : HWS300P-24



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

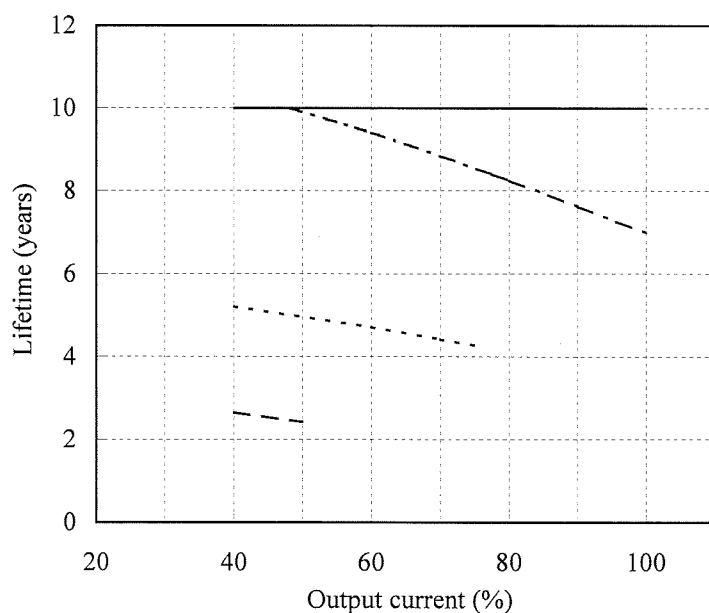
Vin=100VAC

Load	Lifetime (years)			
	Ta=40°C	Ta=50°C	Ta=60°C	Ta=70°C
40%	10.0	10.0	5.0	2.5
60%	10.0	8.8	4.4	-
80%	10.0	7.7	-	-
100%	10.0	6.6	-	-



Vin=200VAC

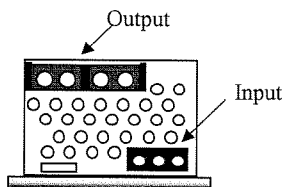
Load	Lifetime (years)			
	Ta=40°C	Ta=50°C	Ta=60°C	Ta=70°C
40%	10.0	10.0	5.2	2.6
60%	10.0	9.4	4.7	-
80%	10.0	8.2	-	-
100%	10.0	7.0	-	-



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

MODEL : HWS300P-24

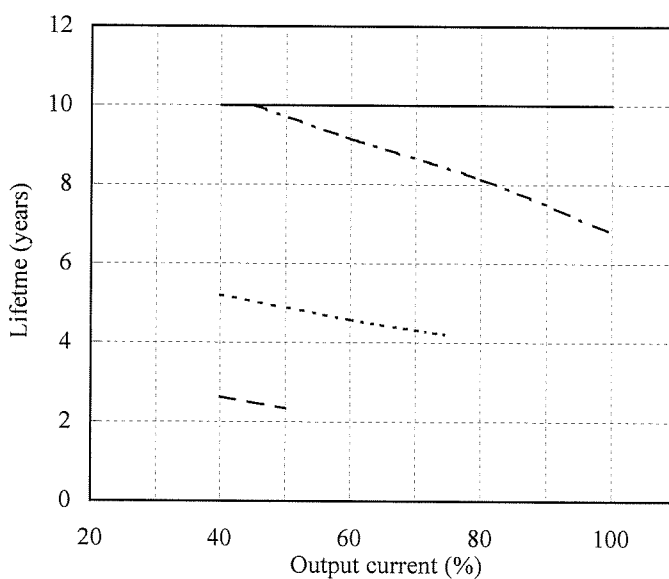
取付方向 B
Mounting B



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

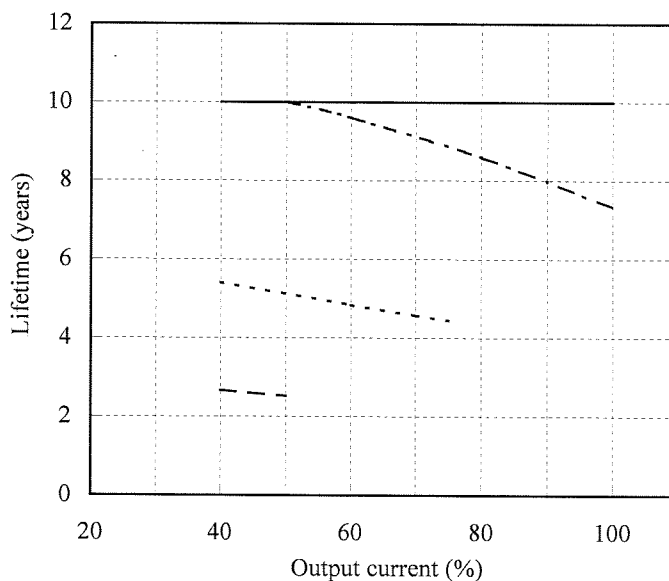
Vin=100VAC

Load	Lifetime (years)			
	Ta=40°C	Ta=50°C	Ta=60°C	Ta=70°C
40%	10.0	10.0	5.2	2.6
60%	10.0	9.2	4.6	-
80%	10.0	8.1	-	-
100%	10.0	6.8	-	-



Vin=200VAC

Load	Lifetime (years)			
	Ta=40°C	Ta=50°C	Ta=60°C	Ta=70°C
40%	10.0	10.0	5.4	2.7
60%	10.0	9.6	4.8	-
80%	10.0	8.6	-	-
100%	10.0	7.3	-	-



5. アブノーマル試験 Abnormal Test

MODEL : HWS300P-24

(1) 試験条件 Test conditions

Input : 200VAC Output : 24V 12.5A Ta : R.T.

(2) 試験結果 Test result

(Da : Damaged)

No.	Test position		Test mode		Test result											Note	
	Location No.	Test point	Short	Open	a	b	c	d	e	f	g	h	I	j	k		l
					Fire	Smoke	Burst	Smell	Red hot	Damaged	Fuse blown	O.V.P.	O.C.P.	No output	No change		Others
1	Q1	D-S	○								○			○			Fuse blown:F1
2		D-G	○							○	○			○			Fuse blown:F1 Da:Q1,D107,D108
3		G-S	○											○			
4		D		○										○			
5		S		○										○			
6		G		○							○	○			○		
7	Q31	D-S	○										○	○			
8		D-G	○										○	○			
9		G-S	○											○			
10		D		○										○			
11		S		○										○			
12	G		○										○				
13	Q32	D-S	○										○	○			
14		D-G	○										○	○			
15		G-S	○											○			
16		D		○										○			
17		S		○										○			
18	G		○										○				
19	D1	DC-DC	○								○			○			Fuse blown:F1
20		AC-"+"	○								○			○			Fuse blown:F1
21	D2	A-K	○							○	○			○			Fuse blown:F1 Da:Q1,D107,D108
22		A-K		○						○	○			○			Fuse blown:F1 Da:Q1,D107,D108
23	D51	A-K	○											○			
24	C9	-	○							○	○			○			Fuse blown:F1 Da:D1,SR1,D103,D104 D107,D108

(Da : Damaged)

No.	Test position		Test mode		Test result											Note			
	Location No.	Test point	Short	Open	a	b	c	d	e	f	g	h	I	j	k		l		
					Fire	Smoke	Burst	Smell	Red hot	Damaged	Fuse blown	O.V.P.	O.C.P.	No output	No change		Others		
25	SR1	A-K	<input type="radio"/>												<input type="radio"/>				
26		K-G	<input type="radio"/>							<input type="radio"/>	<input type="radio"/>				<input type="radio"/>			Fuse blown:F1 Da:Q1,TFR1,D2	
27		G-A	<input type="radio"/>													<input type="radio"/>			
28		A		<input type="radio"/>							<input type="radio"/>	<input type="radio"/>				<input type="radio"/>			Fuse blown:F1 Da:Q1,TFR1,D2
29		K		<input type="radio"/>							<input type="radio"/>	<input type="radio"/>				<input type="radio"/>			Fuse blown:F1 Da:Q1,TFR1,D2
30		G		<input type="radio"/>							<input type="radio"/>	<input type="radio"/>				<input type="radio"/>			Fuse blown:F1 Da:Q1,TFR1,D2
31	T21	1-2	<input type="radio"/>												<input type="radio"/>				
32		3-4	<input type="radio"/>												<input type="radio"/>				
33		5-6	<input type="radio"/>												<input type="radio"/>				
34		7-8	<input type="radio"/>												<input type="radio"/>				
35		1		<input type="radio"/>											<input type="radio"/>				
36		3		<input type="radio"/>											<input type="radio"/>				
37		5		<input type="radio"/>											<input type="radio"/>				
38	7		<input type="radio"/>											<input type="radio"/>					
39	T32	1-3	<input type="radio"/>												<input type="radio"/>				
40		8,9-10,11	<input type="radio"/>												<input type="radio"/>				
41		1		<input type="radio"/>											<input type="radio"/>				
42	8,9		<input type="radio"/>											<input type="radio"/>					
43	Q201	D-S	<input type="radio"/>												<input type="radio"/>				
44		D-G	<input type="radio"/>												<input type="radio"/>				
45		G-S	<input type="radio"/>												<input type="radio"/>				
46		D		<input type="radio"/>											<input type="radio"/>				
47		S		<input type="radio"/>											<input type="radio"/>				
48	G		<input type="radio"/>											<input type="radio"/>					

(Da : Damaged)

No.	Test position		Test mode		Test result													Note
	Location No.	Test point	Short	Open	a	b	c	d	e	f	g	h	I	j	k	l		
					Fire	Smoke	Burst	Smell	Red hot	Damaged	Fuse blown	O.V.P.	O.C.P.	No output	No change	Others		
49	Q202	C-E	○											○				
50		B-E	○							○				○		Da:Q31,Q32		
51		B-C	○											○				
52		C		○							○			○		Da:Q31		
53		E		○										○				
54		B		○										○				
55	Q203	C-E	○											○				
56		B-E	○							○				○		Da:Q31,Q32		
57		B-C	○											○				
58		C		○							○			○		Da:Q32		
59		E		○										○				
60		B		○										○				
61	A351	D-S	○								○			○		Fuse blown:F22		
62		D-CON	○							○	○			○		Fuse blown:F22 Da:A351		
63		CON-S	○							○	○			○		Fuse blown:F22 Da:A351		
64		D		○										○				
65		S		○										○				
66		CON		○										○				
67		D203	A-K	○										○	○			
68	A-K			○											○			
69	D204	A-K	○										○	○				
70		A-K		○											○			

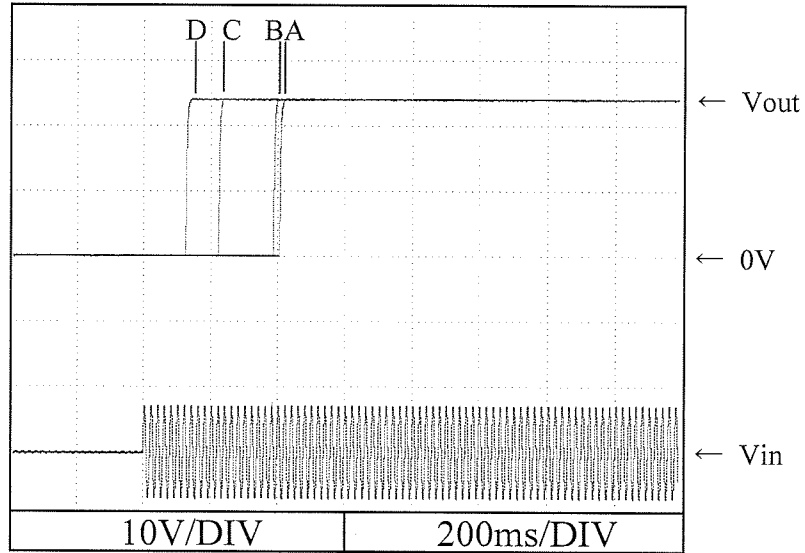
2.5 出力立ち上がり特性

Output rise characteristics

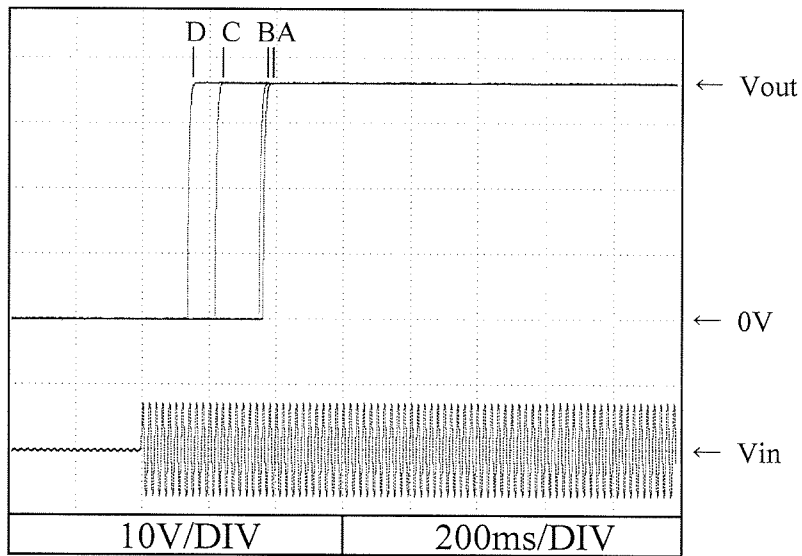
Conditions Vin : 85 VAC (A)
 100 VAC (B)
 200 VAC (C)
 265 VAC (D)

Iout : 0 %
 Ta : 25 °C

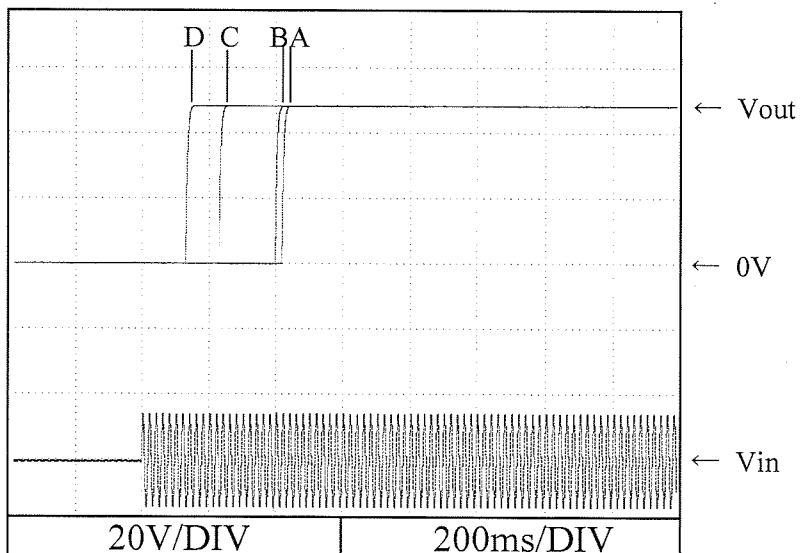
24V



36V



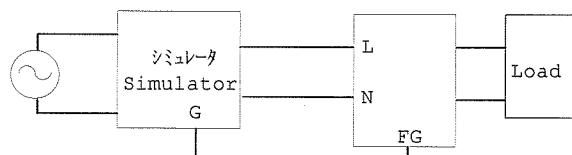
48V



7. ノイズシミュレート試験 Noise Simulate Test

MODEL : HWS300P-24

(1) 試験回路及び測定器 Test circuit and equipment



シミュレーター : 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	: 0V~2kV
・出力電圧 Output Voltage	: 定格 Rated	・位相 Phase	: 0°~360°
・出力電流 Output current	: 0%, 100%	・極性 Polarity	: +, -
・周囲温度 Ambient temperature	: 25℃	・印加モード Mode	: Normal Common
・パルス幅 Pulse width	: 50ns~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

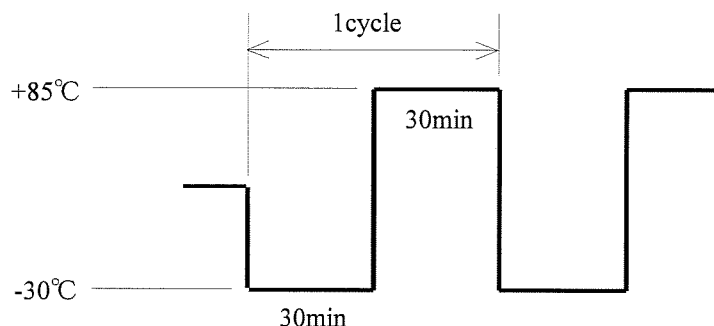
MODEL : HWS300P-24

(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°C ⇔ 85°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) 試験結果 Test Results

合格 OK

入力電圧 Vin:100VAC			24V			
出力電流 Io:100%			From		To	
リップル電圧 Ripple voltage	mVp-p		27		26	
スパイクノイズ Spike noise	mVp-p		121		138	
入力変動 Line regulation	MIN	V	23.955	2.0mV	24.054	2.0mV
	MAX	V	23.957		24.056	
負荷変動 Load regulation	0%	V	23.959	4.0mV	24.054	2.0mV
	100%	V	23.955		24.056	
効率 Efficiency	Pin	W	354.3	84.5%	355.8	84.5%
	Vout	V	23.955		24.056	
	Iout	A	12.5		12.5	
半田状態・その他 Solder condition・etc.			-		異常なし OK	

MODEL : HWS300P

(1) 使用製品名 Part name

9A0612S4D041 (SANYO DENKI CO.)

(2) 期待寿命 Life expectancy

メーカーによるファン単体の期待寿命データを示す(残存率90%)。
また、ファン排気温度測定箇所は、fig 1.に示す。

The data shows fan life expectancy for fan only by manufacture(90% survival rate).
Fig 1 shows measuring point of fan exhaust temperature.

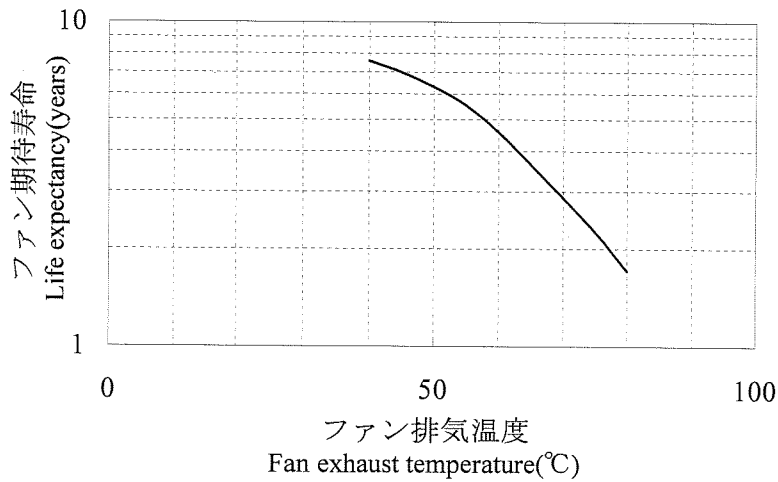
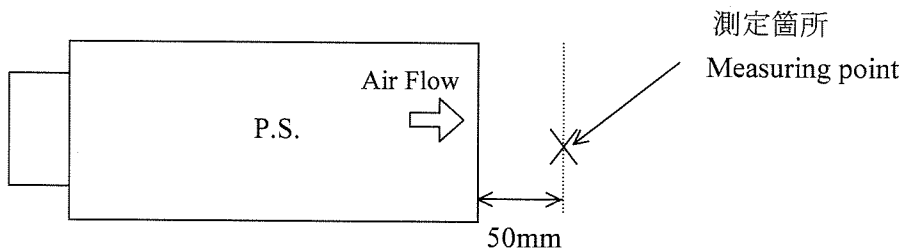


fig 1. ファン排気温度測定箇所
Measuring point of fan exhaust temperature.



※電源の吸排気温度差は $I_o=100\%$ で約 4°C です。

The difference between the intake temperature and the exhaust temperature of the power supply is about 4°C at $I_o=100\%$.