GUS1000

RELIABILITY DATA

TDK-Lambda

CA980-57-01

INDEX

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

Load conditions

Output derating is needed when input voltage is less than 90VAC.

Output voltage : 12V, 24V, 36V, 48V

Vin	Iout	12V	24V	36V	48V
85VAC	90%	60.03A	37.53A	25.02A	18.81A
90~265VAC	100% （Full load）	66.70A	41.70A	27.80A	20.90A
85~265VAC	Peak	83.40A	-	-	-

1. Calculated Values of MTBF

(1) Parts stress reliability prediction MTBF

MODEL : GUS1000-12

Calculating Method

Calculated based on parts stress reliability prediction of Telcordia (*1).
Individual failure rate λ_{SS} is calculated by the electric stress and temperature rise of the each part.

*1: Telcordia document “Reliability Prediction Procedure for Electronic Equipment”
(Document number SR-332,Issue3)

$$MTBF = \frac{1}{\lambda_{equip}} = \frac{1}{\pi_E \sum_{i=1}^{m} (N_i \cdot \lambda_{ssi})} \times 10^9 \qquad \text{(Hours)}$$

$$\lambda_{ssi} = \lambda_{Gi} \cdot \pi_{Qi} \cdot \pi_{Si} \cdot \pi_{Ti}$$

λ_{equip} : Total equipment failure rate (FITs = Failures in10^9 hours)

λ_{Gi} : Generic failure rate for the ith part

π_{Qi} : Quality factor for the ith part

π_{Si} : Stress factor for the ith part

π_{Ti} : Temperature factor for the ith part

m : Number of different part types

N_i : Quantity of ith part type

π_E : Equipment environmental factor

MTBF Values

Conditions
・Input voltage : 115VAC ・Output voltage & current : 12VDC, 66.7A

・Environmental factor : GB (Ground, Benign) ・Mounting method : Standard mounting A

SR-332,Issue3

MTBF(Ta=25°C) ≒ 815655 (Hours)

MTBF(Ta=40°C) ≒ 459207 (Hours)

1. Calculated Values of MTBF

(1) Parts stress reliability prediction MTBF

MODEL：GUS1000-24

Calculating Method

Calculated based on parts stress reliability prediction of Telcordia (*1).
Individual failure rate λ_{SS} is calculated by the electric stress and temperature rise of the each part.

*1: Telcordia document “Reliability Prediction Procedure for Electronic Equipment” (Document number SR-332,Issue3)

$$MTBF = \frac{1}{\lambda_{equip}} = \frac{1}{\pi_E \sum_{i=1}^{m} (N_i \cdot \lambda_{ssi})} \times 10^9 \quad \text{(Hours)}$$

$$\lambda_{ssi} = \lambda_{Gi} \cdot \pi_{Qi} \cdot \pi_{Si} \cdot \pi_{Ti}$$

λ_{equip} : Total equipment failure rate (FITs = Failures in10^9 hours)

λ_{Gi} : Generic failure rate for the ith part

π_{Qi} : Quality factor for the ith part

π_{Si} : Stress factor for the ith part

π_{Ti} : Temperature factor for the ith part

m : Number of different part types

N_i : Quantity of ith part type

π_E : Equipment environmental factor

MTBF Values

Conditions

・Input voltage	: 115VAC	・Output voltage & current	: 24VDC, 41.7A
・Environmental factor	: GB (Ground, Benign)	・Mounting method	: Standard mounting A

SR-332,Issue3

MTBF(Ta=25°C) ≒ 1193215 (Hours)

MTBF(Ta=40°C) ≒ 677584 (Hours)

MTBF(Ta=50°C) ≒ 462345 (Hours)

2. Components Derating

MODEL : GUS1000-12

(1) Calculating Method

(a) Measuring method

・Mounting method : Standard mounting : A	・Ambient temperature : 40°C
・Input voltage : 115 , 230VAC	・Output voltage & current : 12V, 66.7A

(b) Semiconductors

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

(c) IC, Resistors, Capacitors, etc.

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

(d) Calculating method of thermal impedance

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

Tc : Case Temperature at Start Point of Derating; 25°C in General

Tl : Lead Temperature at Start Point of Derating; 25°C in General

Pj(max) (Pch(max)) : Maximum Channel Dissipation

Tj(max) (Tch(max)) : Maximum Junction (channel) Temperature

θj-c (θch-c) : Thermal Impedance between Junction (channel) and Case

θj-l (θch-l) : Thermal Impedance between Junction (channel) and Lead

(2) Component Derating List

Location No.	Measurement condition Vin = 115VAC Iout = 66.7A		Ta = 40°C
BD1 D35XB80-7000 SHINDENGEN	Tch (max) = 150 °C Pch= 11.0 W Tch = Tc + ((θch-c) × Pch) = 86 °C D.F. = 57.3 %	θch-c = 0.8 °C/W ΔTc = 37.2 °C	 Tc = 77.2 °C
SCR1 TN3015H-6I STMICRO	Tch (max) = 150 °C Pch = 2.3 W Tch = Tc + ((θch-c) × Pch) = 65.3 °C D.F. = 43.5 %	θch-c = 1.9 °C/W ΔTc = 20.9 °C	 Tc = 60.9 °C
D1 YJD106510FQG2 YANGJIE ELEC.	Tch (max) = 175 °C Pch= 3.7 W Tch = Tc + ((θch-c) × Pch) = 84.8 °C D.F. = 48.4 %	θch-c = 3.5 °C/W ΔTc = 31.8 °C	 Tc = 71.8 °C
Q1 OSG60R060HT3F SUZHOU ORIENTAL	Tj (max) = 150 °C Pd = 12.4 W Tj = Tc + ((θj-c) × Pd) = 65.7 °C D.F. = 43.8 %	θj-c = 0.52 °C/W ΔTc = 19.3 °C	 Tc = 59.3 °C
Q103,Q104 NCE65NF068LL WUXI NCE	Tj (max) = 175 °C Pd = 1.9 W Tj = Tc + ((θj-c) × Pd) = 69.4 °C D.F. = 39.6 %	θj-c = 0.4 °C/W ΔTc = 28.6 °C	 Tc = 68.6 °C
Q301~ Q304 NCEP018N60GU WUXI NCE	Tj (max) = 150 °C Pd = 1.4 W Tj = Tc + ((θj-c) × Pd) = 100.6 °C D.F. = 67.1 %	θj-c = 0.57 °C/W ΔTc = 59.8 °C	 Tc = 99.8 °C

Terminology Used

Vin : Input Voltage   Iout : Output Current

Ta : Ambient Temperature

(2) Component Derating List

Location No.	Measurement condition Vin = 230VAC Iout = 66.7A		Ta = 40°C
BD1 D35XB80-7000 SHINDENGEN	Tch (max) = 150 °C Pch= 5.1 W Tch = Tc + ((θch-c) × Pch) = 62.6 °C D.F. = 41.7 %	θch-c = 0.8 °C/W ΔTc = 18.5 °C	 Tc = 58.5 °C
SCR1 TN3015H-6I STMICRO	Tch (max) = 150 °C Pch = 3.5 W Tch = Tc + ((θch-c) × Pch) = 59.2 °C D.F. = 39.4 %	θch-c = 1.9 °C/W ΔTc = 14.8 °C	 Tc = 54.8 °C
D1 YJD106510FQG2 YANGJIE ELEC.	Tch (max) = 175 °C Pch= 3.2 W Tch = Tc + ((θch-c) × Pch) = 74.8 °C D.F. = 42.7 %	θch-c = 3.5 °C/W ΔTc = 23.6 °C	 Tc = 63.6 °C
Q1 OSG60R060HT3F SUZHOU ORIENTAL	Tj (max) = 150 °C Pd = 4.4 W Tj = Tc + ((θj-c) × Pd) = 53.1 °C D.F. = 35.4 %	θj-c = 0.52 °C/W ΔTc = 10.8 °C	 Tc = 50.8 °C
Q103,Q104 NCE65NF068LL WUXI NCE	Tj (max) = 175 °C Pd = 1.9 W Tj = Tc + ((θj-c) × Pd) = 69.8 °C D.F. = 39.9 %	θj-c = 0.4 °C/W ΔTc = 29 °C	 Tc = 69 °C
Q301~ Q304 NCEP018N60GU WUXI NCE	Tj (max) = 150 °C Pd = 1.4 W Tj = Tc + ((θj-c) × Pd) = 99.6 °C D.F. = 66.4 %	θj-c = 0.57 °C/W ΔTc = 58.8 °C	 Tc = 98.8 °C

Terminology Used

Vin : Input Voltage

Iout : Output Current

Ta : Ambient Temperature

2. Components Derating

MODEL : GUS1000-24

(1) Calculating Method

(a) Measuring method

・Mounting method :Standard mounting : A	・Ambient temperature :50°C
・Input voltage :115 , 230VAC	・Output voltage & current :24V, 41.7A

(b) Semiconductors

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

(c) IC, Resistors, Capacitors, etc.

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

(d) Calculating method of thermal impedance

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

Tc	: Case Temperature at Start Point of Derating;25°C in General
Tl	: Lead Temperature at Start Point of Derating;25°C in General
Pj(max) (Pch(max))	: Maximum Channel Dissipation
Tj(max) (Tch(max))	: Maximum Junction (channel) Temperature
θj-c (θch-c)	: Thermal Impedance between Junction (channel) and Case
θj-l (θch-l)	: Thermal Impedance between Junction (channel) and Lead

(2) Component Derating List

Location No.	Measurement condition Vin = 115VAC Iout = 41.7A		Ta = 50°C
BD1 D35XB80-7000 SHINDENGEN	Tch (max) = 150 °C Pch= 14.5 W Tch = Tc + ((θch-c) × Pch) = 113.6 °C D.F. = 75.7 %	θch-c = 0.8 °C/W ΔTc = 52 °C	 Tc = 102 °C
SCR1 TN3015H-6I STMICRO	Tch (max) = 150 °C Pch = 2.9 W Tch = Tc + ((θch-c) × Pch) = 86.3 °C D.F. = 57.5 %	θch-c = 1.9 °C/W ΔTc = 30.8 °C	 Tc = 80.8 °C
D1 YJD106510FQG2 YANGJIE ELEC.	Tch (max) = 175 °C Pch= 4.7 W Tch = Tc + ((θch-c) × Pch) = 111.9 °C D.F. = 63.9%	θch-c = 3.5 °C/W ΔTc = 45.4 °C	 Tc = 95.4 °C
Q1 OSG60R060HT3F SUZHOU ORIENTAL	Tj (max) = 150 °C Pd = 15.5 W Tj = Tc + ((θj-c) × Pd) = 84 °C D.F. = 56 %	θj-c = 0.52 °C/W ΔTc = 25.9 °C	 Tc = 75.9 °C
Q103, Q104 NCE65NF068LL WUXI NCE	Tj (max) = 175 °C Pd = 2.2 W Tj = Tc + ((θj-c) × Pd) = 93.7 °C D.F. = 53.5 %	θj-c = 0.4 °C/W ΔTc = 42.8 °C	 Tc = 92.8 °C
Q301~ Q304 SFS08R024UGNF-F SUZHOU ORIENTAL	Tj (max) = 175 °C Pd = 0.7W Tj = Tc + ((θj-c) × Pd) = 90.8 °C D.F. = 51.9%	θj-c = 1.14 °C/W ΔTc = 40.4 °C	 Tc = 90.4 °C

Terminology Used

Vin : Input Voltage   Iout : Output Current

Ta : Ambient Temperature

(2) Component Derating List

Location No.	Measurement condition Vin = 230VAC Iout = 41.7A Ta = 50°C		
BD1 D35XB80-7000 SHINDENGEN	Tch (max) = 150 °C Pch= 6.67 W Tch = Tc + ((θch-c) × Pch) = 80.6 °C D.F. = 53.8 %	θch-c = 0.8 °C/W ΔTc = 25.3 °C	 Tc = 75.3 °C
SCR1 TN3015H-6I STMICRO	Tch (max) = 150 °C Pch = 2.9 W Tch = Tc + ((θch-c) × Pch) = 75.9 °C D.F. = 50.6 %	θch-c = 1.9 °C/W ΔTc = 20.4 °C	 Tc = 70.4 °C
D1 YJD106510FQG2 YANGJIE ELEC.	Tch (max) = 175 °C Pch= 3.8 W Tch = Tc + ((θch-c) × Pch) = 95.3 °C D.F. = 54.5%	θch-c = 3.5 °C/W ΔTc = 32 °C	 Tc = 82 °C
Q1 OSG60R060HT3F SUZHOU ORIENTAL	Tj (max) = 150 °C Pd = 5.5 W Tj = Tc + ((θj-c) × Pd) = 65.6 °C D.F. = 43.7 %	θj-c = 0.52 °C/W ΔTc = 12.7 °C	 Tc = 62.7 °C
Q103, Q104 NCE65NF068LL WUXI NCE	Tj (max) = 175 °C Pd = 2.2 W Tj = Tc + ((θj-c) × Pd) = 92.7 °C D.F. = 53.0 %	θj-c = 0.4 °C/W ΔTc = 41.8 °C	 Tc = 91.8 °C
Q301~ Q304 SFS08R024UGNF-F SUZHOU ORIENTAL	Tj (max) = 175 °C Pd = 0.7 W Tj = Tc + ((θj-c) × Pd) = 89.2 °C D.F. = 51.0%	θj-c = 1.14 °C/W ΔTc = 38.8 °C	 Tc = 88.8 °C

Terminology Used

Vin : Input Voltage

Iout : Output Current

Ta : Ambient Temperature

3. Main Components Temperature Rise △T List

MODEL : GUS1000-12

(1) Measuring Conditions

	Mounting A	
Mounting Method (Standard Mounting : A)		
Input Voltage	115VAC	230VAC
Output Voltage	12VDC	
Output Current	Full load (66.7A)	
Ambient Temperature	40°C	
Cooling Condition	Forced air cooling by Intake FAN	

(2) Measuring Results

		ΔT Temperature Rise (°C)	
Input Voltage		115VAC	230VAC
Location No.	Part name	Mounting A	
A104	IC	19.2	11.9
A108	IC	12.4	10.2
A109	IPD	20.0	15.0
A301	IC	54.1	52.8
BD1	BRIDGE DIODE	43.9	21.7
C9A~C9E	E.CAP.	4.4	3.1
C10A	Cap., FILM	9.2	8.2
C10B	Cap., FILM	9.1	8.2
C51A~C51E	E.CAP.	40.4	39.0
C52A~C52E	E.CAP.	38.9	37.0
D1	SBD	31.8	23.6
L1	BALUN	17.2	6.4
L2	BALUN	33.4	11.3
L3	CHOKE COIL	23.7	12.2
PC103	PHOTO COUPLER	11.6	9.5
Q1	MOS FET	19.3	10.8
Q103, Q104	MOS FET	34.6	33.7
Q301~Q304	MOS FET	59.8	58.8
R114	RESISTOR	28.8	12.5
SCR1	THYRISTOR	20.9	14.8
T1	TRANS	77.4	76.4
T2	TRANS	8.4	7.5

3. Main Components Temperature Rise △T List

MODEL : GUS1000-24

(1) Measuring Conditions

Mounting Method (Standard Mounting : A)	Mounting A 	
Input Voltage	115VAC	230VAC
Output Voltage	24VDC	
Output Current	Full load (41.7A)	
Ambient Temperature	50°C	
Cooling Condition	Forced air cooling by Intake FAN	

(2) Measuring Results

		ΔT Temperature Rise (°C)	
Input Voltage		115VAC	230VAC
Location No.	Part name	Mounting A	
A104	IC	22.0	12.9
A108	IC	15.6	12.2
A109	IPD	21.1	17.3
A301	IC	42.6	40.9
BD1	BRIDGE DIODE	47.2	23.2
C9A~C9E	E.CAP.	7.4	5.1
C10A	Cap., FILM	12.8	10.1
C10B	Cap., FILM	10.7	9.5
C51A~C51D	E.CAP.	26.2	24.0
C52A~C52E	E.CAP.	24.7	21.8
D1	SBD	45.4	32.0
L1	BALUN	33.1	11.6
L2	BALUN	45.6	14.0
L3	CHOKE COIL	31.0	14.6
PC103	PHOTO COUPLER	13.7	10.4
Q1	MOS FET	25.9	12.7
Q103, Q104	MOS FET	47.3	46.2
Q301~Q304	MOS FET	40.4	38.8
R114	RESISTOR	27.5	14.3
SCR1	THYRISTOR	30.8	20.4
T1	TRANS	58.2	56.7
T2	TRANS	9.0	8.0

4. Electrolytic Capacitor Lifetime

MODEL : GUS1000-12

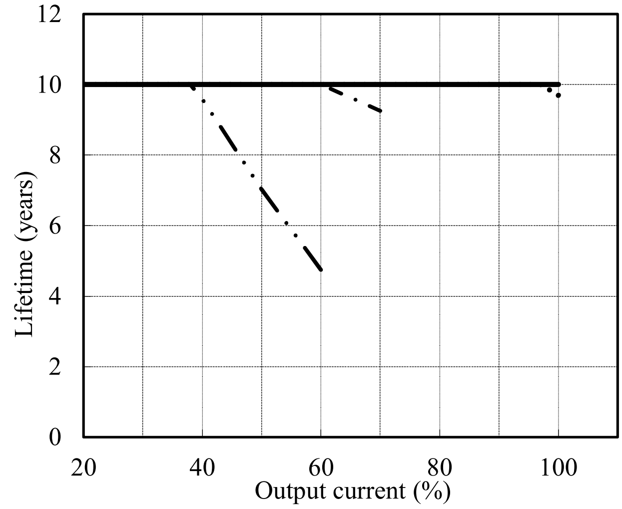
Cooling condition : Forced air cooling by Intake FAN

(STANDARD MOUNTING)

Ta 30°C :
40°C :
50°C :
60°C :
70°C :

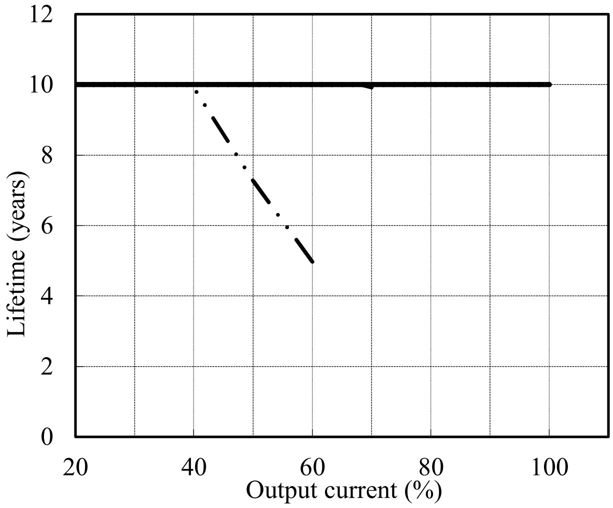
Vin=115VAC

Load (%)	Lifetime (years)				
	Ta= 30°C	Ta= 40°C	Ta= 50°C	Ta= 60°C	Ta= 70°C
100	10	9.7	-	-	-
80	10	10	10	-	-
70	10	10	10	9.3	
60	10	10	10	10	4.7
40	10	10	10	10	9.6
20	10	10	10	10	10



Vin=230VAC

Load (%)	Lifetime (years)				
	Ta= 30°C	Ta= 40°C	Ta= 50°C	Ta= 60°C	Ta= 70°C
100	10	10	-	-	-
80	10	10	10	-	-
70	10	10	10	9.9	-
60	10	10	10	10	5.0
40	10	10	10	10	9.9
20	10	10	10	10	10



4. Electrolytic Capacitor Lifetime

MODEL : GUS1000-24

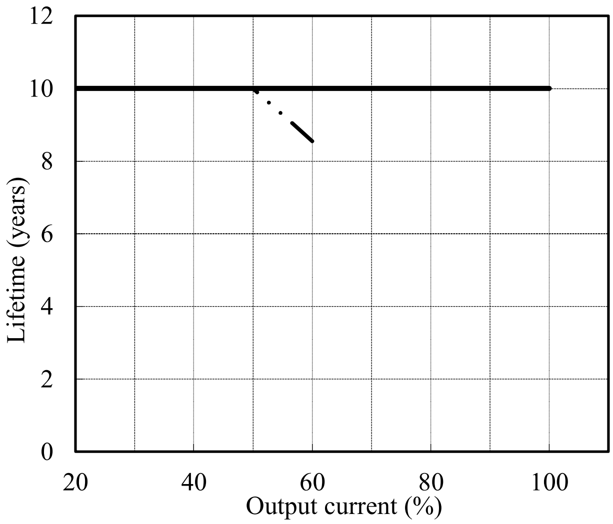
Cooling condition : Forced air cooling by Intake FAN

(STANDARD MOUNTING)

Ta 30°C : ———
40°C : ············
50°C : — — — -
60°C : — · — · —
70°C : — · · — · · ·

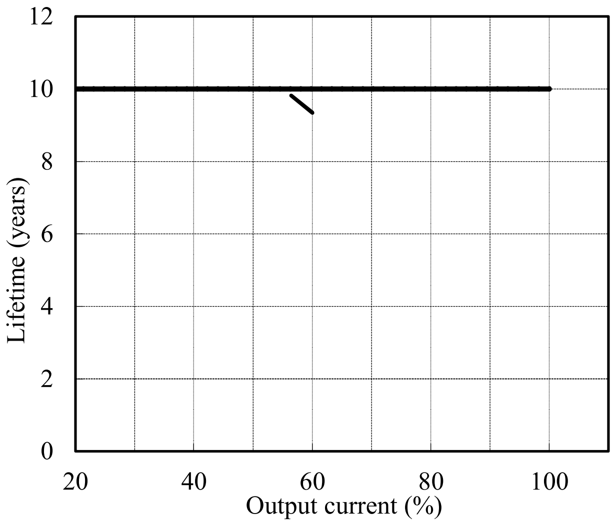
Vin=115VAC

Load (%)	Lifetime (years)				
	Ta= 30°C	Ta= 40°C	Ta= 50°C	Ta= 60°C	Ta= 70°C
100	10	10	10	-	-
80	10	10	10	10	-
60	10	10	10	10	8.5
40	10	10	10	10	10
20	10	10	10	10	10



Vin=230VAC

Load (%)	Lifetime (years)				
	Ta= 30°C	Ta= 40°C	Ta= 50°C	Ta= 60°C	Ta= 70°C
100	10	10	10	-	-
80	10	10	10	10	-
60	10	10	10	10	9.3
40	10	10	10	10	10
20	10	10	10	10	10



4. Electrolytic Capacitor Lifetime

MODEL : GUS1000-36

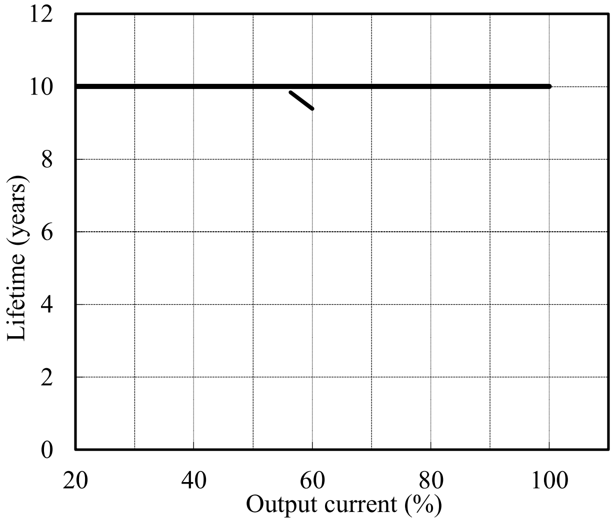
Cooling condition : Forced air cooling by Intake FAN

(STANDARD MOUNTING)

Ta 30°C :
40°C :
50°C :
60°C :
70°C :

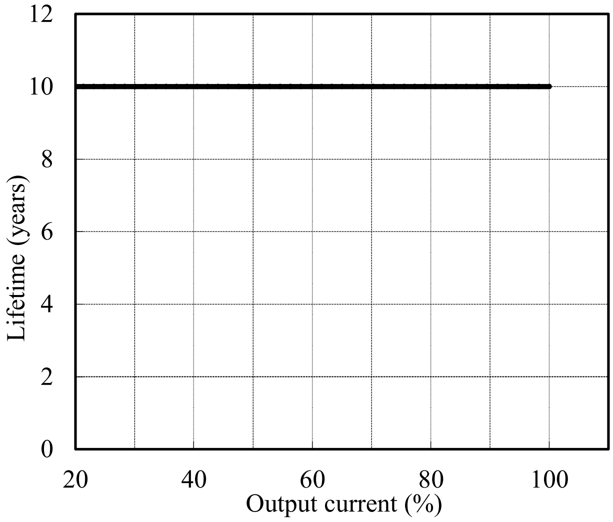
Vin=115VAC

Load (%)	Lifetime (years)				
	Ta= 30°C	Ta= 40°C	Ta= 50°C	Ta= 60°C	Ta= 70°C
100	10	10	10	-	-
80	10	10	10	10	-
60	10	10	10	10	9.4
40	10	10	10	10	10
20	10	10	10	10	10



Vin=230VAC

Load (%)	Lifetime (years)				
	Ta= 30°C	Ta= 40°C	Ta= 50°C	Ta= 60°C	Ta= 70°C
100	10	10	10	-	-
80	10	10	10	10	-
60	10	10	10	10	10
40	10	10	10	10	10
20	10	10	10	10	10



4. Electrolytic Capacitor Lifetime

MODEL : GUS1000-48

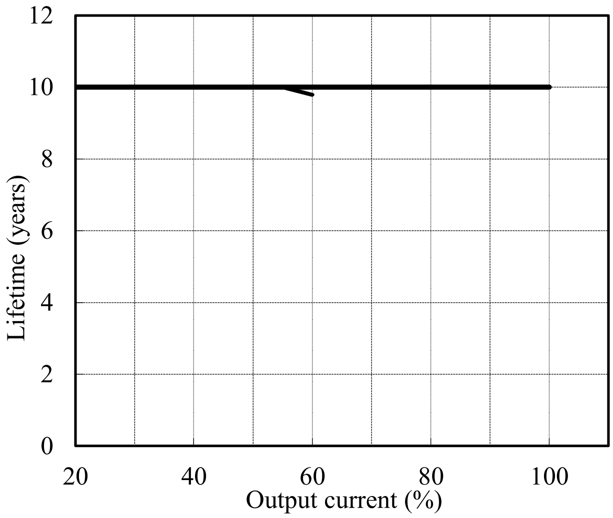
Cooling condition : Forced air cooling by Intake FAN

(STANDARD MOUNTING)

Ta 30°C :
40°C :
50°C :
60°C :
70°C :

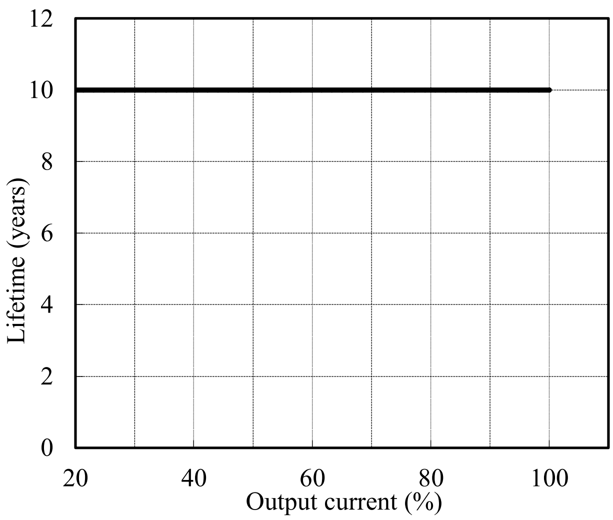
Vin=115VAC

Load (%)	Lifetime (years)				
	Ta= 30°C	Ta= 40°C	Ta= 50°C	Ta= 60°C	Ta= 70°C
100	10	10	10	-	-
80	10	10	10	10	-
60	10	10	10	10	9.8
40	10	10	10	10	10
20	10	10	10	10	10



Vin=230VAC

Load (%)	Lifetime (years)				
	Ta= 30°C	Ta= 40°C	Ta= 50°C	Ta= 60°C	Ta= 70°C
100	10	10	10	-	-
80	10	10	10	10	-
60	10	10	10	10	10
40	10	10	10	10	10
20	10	10	10	10	10



5. Abnormal Test

MODEL : GUS1000-24

(1) Test Conditions

Input : 230VAC   Output : 24V, Full load   Ta : 25°C

(2) Test Results

(Da : Damaged)

No.	Test position		Test mode		Test result												
					a	b	c	d	e	f	g	h	I	j	k	l	
	Location No.	Test point	Short	Open	Fire	Smoke	Burst	Smell	Red hot	Damaged	Fuse blown			No output	No change	Others	Note
1	Q1	G		○						○	○			○			Da: F1, Q1, R114, D102, D103
		D		○												○	Output ripple voltge increase, PF value decrease, Input power increase 10W
		S		○												○	Output ripple voltge increase, PF value decrease, Input power increase 10W
		G-S	○													○	Output ripple voltge increase, PF value decrease, Input power increase 10W
		G-D	○							○	○			○			Da: F1, Q1, R114, A102, R116, R226, Z101, Q102, D102, D103
		D-S	○							○	○			○			Da: F1, R114, D102, D103
2	D1		○							○	○			○			Da: F1, Q1, SCR1, R114, R110, R111, Q101, D102, D103
				○						○	○			○			Da: F1, Q1, R114, D102, D103
3	L3		○							○	○			○			Da: F1, Q1, R114, D102, D103
				○												○	Output ripple voltge increase, PF value decrease, Input power increase 10W
4	C3		○							○	○			○			Da: F1
				○											○		
5	SA1		○												○		
				○											○		
6	C8		○							○	○			○			Da: F1
				○												○	Input power increase 3W, PF value decrease
7	BD1	1		○										○			
		2		○										○			
		3		○										○			
		4		○										○			
		1~2	○							○	○			○			Da: F1
		2~3	○							○	○			○			Da: F1
		3~4	○							○	○			○			Da: F1
		1~4	○							○	○			○			Da: F1
8	Q103	G		○						○	○			○			Da: Q103, Q104, F2
		D		○										○			
		S		○						○	○			○			Da: Q103, Q104, F2, A106
		G-S	○											○			
		G-D	○							○	○			○			Da: Q103, Q104, F2, A106
		D-S	○							○	○			○			Da: Q104, F2

5. Abnormal Test

MODEL : GUS1000-24

(1) Test Conditions

Input : 230VAC Output : 24V, Full load Ta : 25℃

(2) Test Results

(Da : Damaged)

No.	Test position		Test mode		Test result												
					a	b	c	d	e	f	g	h	I	j	k	l	
	Location No.	Test point	Short	Open	Fire	Smoke	Burst	Smell	Red hot	Damaged	Fuse blown			No output	No change	Others	Note
9	Q104	G		○						○	○			○			Da: Q103, Q104, F2
		D		○										○			
		S		○										○			
		G-S	○											○			
		G-D	○							○	○			○			Da: Q103, Q104, F2
		D-S	○							○	○			○			Da: Q103, F2
10	T2	3		○										○			
		4		○										○			
		5		○										○			
		7		○										○			
		3~4	○											○			
		5~7	○											○			
11	Q301,Q302	D		○												○	Input power increase 1.5W
		S		○												○	Input power increase 1.5W
		G		○						○				○			Da: Q301 or Q302
		D~S	○										○	○			
		G~S	○													○	Input power increase 14W
		G~D	○							○				○			Da: A301
12	Q303,Q304	D		○												○	Input power increase 1.5W
		S		○												○	Input power increase 1.5W
		G		○						○				○			Da: Q303 or Q304
		D~S	○										○	○			
		G~S	○													○	Input power increase 14W
		G~D	○							○				○			Da: A301
13	T1	1		○									○	○			
		2		○									○	○			
		3		○									○	○			
		4		○									○	○			
		5、8		○										○			
		1~4	○										○	○			
		2~3	○										○	○			
		5~8	○										○	○			
14	SCR1	A		○												○	Input power increase 5W
		K		○												○	Input power increase 5W
		G		○												○	Input power increase 5W
		A-K	○													○	Input power decrease 3W
		A-G	○												○		
		G-K	○													○	Input power increase 5W

6. Vibration Test

MODEL : GUS1000-12/24/36/48

(1) Vibration Test Class

Frequency variable endurance test

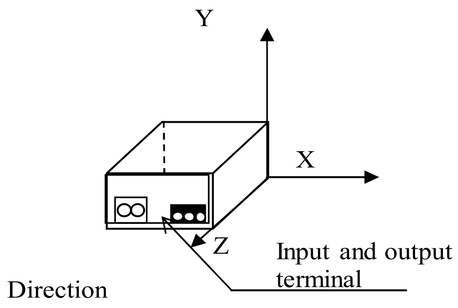
(2) Equipment Used

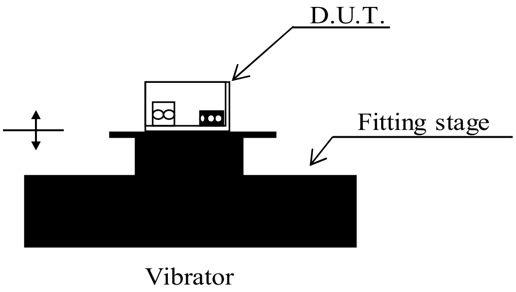
Unholtz Dickie Corp. DC-3200-36

(3) Test Conditions

･Sweep frequency	: 10～55Hz	･Direction	: X, Y, Z
･Sweep time	: 1.0min	･Sweep count	: 1 hour each
･Acceleration	: Constant 19.6m/s^2 (2G)		

(4) Test Method





(5) Acceptable Conditions

1. Not to be broken.
2. No abnormal output after test.

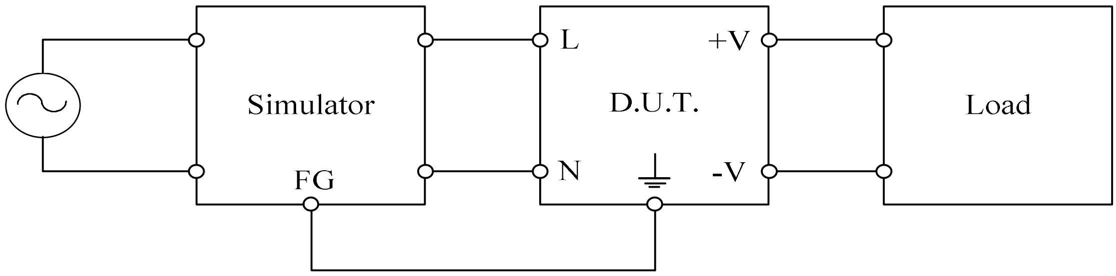
(6) Test Results

OK

7. Noise Simulate Test

MODEL : GUS1000-12/24/36/48

(1) Test Circuit and Equipment



Simulator : INS-4040 (Noise Laboratory Co.,LTD)

(2) Test Conditions

・Input voltage	: 100, 230VAC	・Noise level	: 0～2kV(Input Port) : 0～2kV(Output Port)
・Output Voltage	: Rated	・Phase	: 0～360 deg
・Output current	: 0%, 100%	・Polarity	: ＋,－
・Ambient temperature	: 25℃	・Mode	: Common, Normal
・Pulse width	: 50～1000ns	・Trigger select	: Line

(3) Acceptable Conditions

1. The regulation of output voltage must not exceed 5% of initial value during test.
2. The output voltage must be within the regulation of specification after the test.
3. Smoke and fire are not allowed.

(4) Test Results

OK

8. Thermal Shock Test

MODEL :　GUS1000-48

(1)　Equipment Used (Thermal Shock Chamber)

ESPEC CORP.　　: U3S-100-W

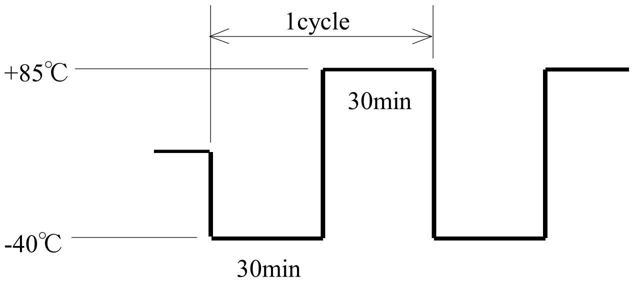
(2)　Test Conditions

・Ambient Temperature　: -40℃ ⇔ 85℃

・Test Time　: Refer to Dwg.

・Test Cycle　: 700 Cycles

・Not Operating



(3)　Test Method

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. 700 cycles later, leave it for 1 hour at the room temperature , then check if there is no abnormal output.

(4)　Acceptable Conditions

No abnormal output after test.

(5)　Test Results

OK

9. FAN Life Expectancy

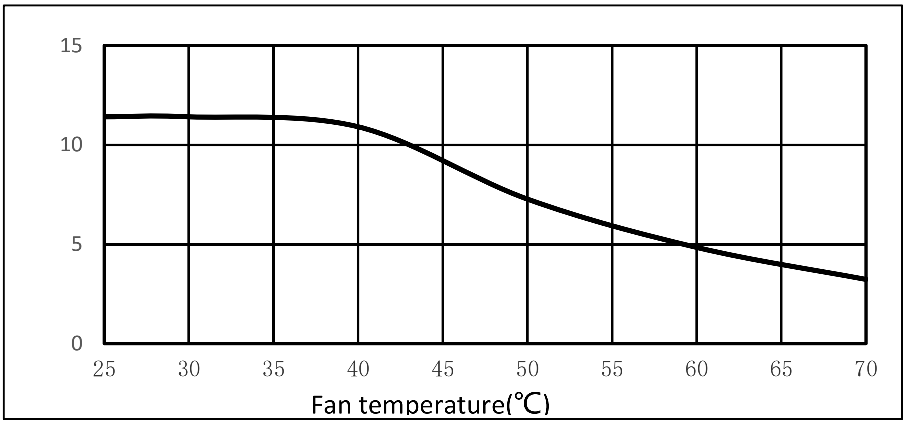
MODEL： GUS1000-12

(1) Part Name

04020VA-12P-AA-08 (Minebea)

(2) Life Expectancy

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



Temperature(℃)	Life(years)
30	11.4
40	10.9
50	7.3
60	4.8
70	3.2

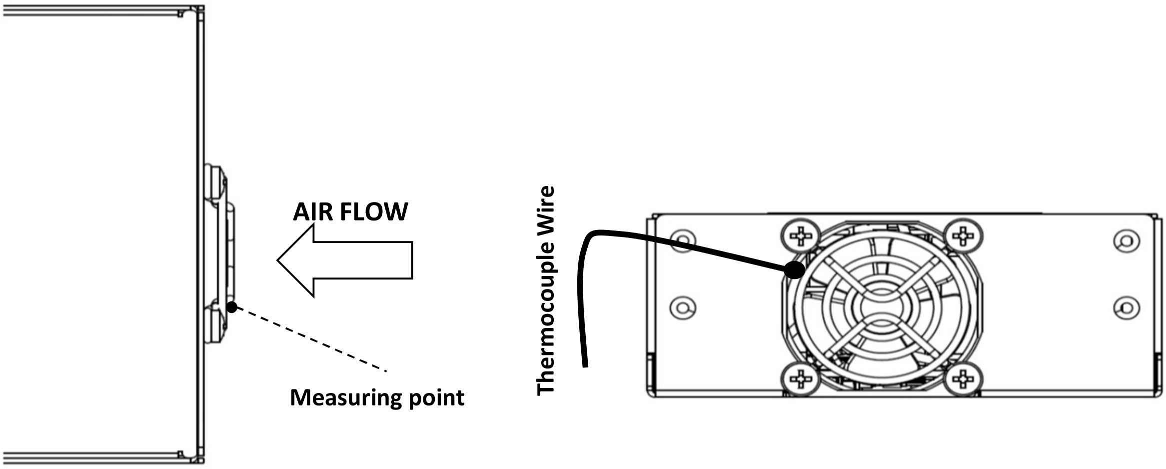


Fig.1 Measuring point of fan temperature.