

PH1200A280

RELIABILITY DATA

信頼性データ

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※ 信頼性試験は、代表データであり、全ての製品は、ほぼ同等な特性を示します。
従いまして、この値は実力値とお考え願います。

The following data are typical values. As all units have nearly the same characteristics,
the data to be considered as ability values.

1. MTBF計算値 Calculated Values of MTBF

MODEL : PH1200A280-48

(1) 算出方法 Calculating Method

Telcordiaの部品ストレス解析法(*1)で算出されています。

故障率 λ_{SS} は、それぞれの部品ごとに電気ストレスと動作温度によって計算されます。

Calculated based on parts stress reliability projection of Telcordia (*1).

Individual failure rate λ_{SS} is calculated by the electric stress and temperature rise of the each device.

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

$$\text{<算出式> } MTBF = \frac{1}{\lambda_{equip}} = \frac{1}{\pi_E \sum_{i=1}^m N_i \cdot \lambda_{ssi}} \times 10^9 \text{ 時間 (hours)}$$

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

- λ_{equip} : 全機器故障率 (FITs) Total Equipment failure rate (FITs = Failures in 10^9 hours)
- λ_{Gi} : i 番目の部品に対する基礎故障率 Generic failure rate for the i th device
- π_{Qi} : i 番目の部品に対する品質ファクタ Quality factor for the i th device
- π_{Si} : i 番目の部品に対するストレスファクタ Stress factor for the i th device
- π_{Ti} : i 番目の部品に対する温度ファクタ Temperature factor for the i th device
- m : 異なる部品の数 Number of different device types
- N_i : i 番目の部品の個数 Quantity of i th device type
- π_E : 機器の環境ファクタ Equipment environmental factor

(2) MTBF値 MTBF Values

- ・入力電圧 : 280VDC ・出力電流 : 25A (100%), 20A (80%)
- Input Voltage Output Current
- ・環境ファクタ : GF (Ground fixed)
- Environment

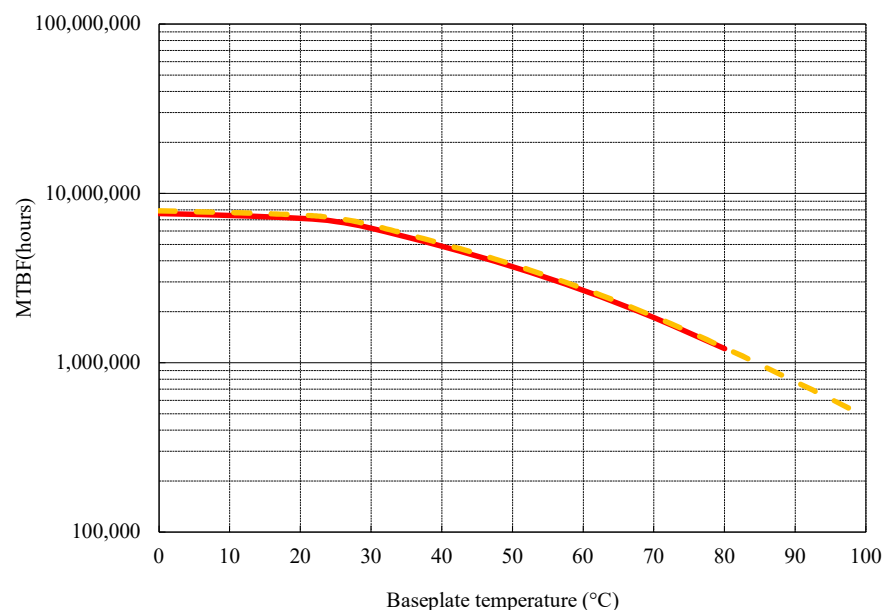
Io=100%

| Baseplate temperature | MTBF |
|-----------------------|-------------------|
| 25°C | 6,834,995 (hours) |
| 40°C | 4,870,826 (hours) |
| 80°C | 1,211,470 (hours) |

Io=80%

| Baseplate temperature | MTBF |
|-----------------------|-------------------|
| 25°C | 7,143,266 (hours) |
| 40°C | 5,055,927 (hours) |
| 80°C | 1,226,759 (hours) |
| 100°C | 480,750 (hours) |

MTBF vs. Baseplate temperature



- PH1200A280-48 Output Current: 25A (100%)
- - - - PH1200A280-48 Output Current: 20A (80%)

2. 部品ディレーティング Components Derating

MODEL : PH1200A280-12, PH1200A280-48

(1) 算出方法 Calculating Method

(a) 測定条件 Measuring Conditions

- ・入力電圧 : 280VDC
Input Voltage
- ・出力電流 : 100% (12V) , 80% (48V) *due to output derating
Output Current
- ・取付方法 : 標準取付(放熱器有)
Mounting Method Standard Mounting Method (with Heatsink)
- ・ベースプレート温度 : 100°C
Baseplate Temperature

(b) 半導体 Semiconductors

ケース温度、消費電力および熱抵抗より使用状態の接合点温度を求め、最大定格との比較を行いました。

The maximum rating temperature is compared with junction temperature 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, etc are within derating criteria.

(d) 熱抵抗算出方法 Calculating Method of Thermal Impedance

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

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

T_a : ディ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 : ディ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

$P_{c(\max)}$: 最大コレクタ(チャンネル)損失
($P_{ch(\max)}$) Maximum Collector(Channel) Dissipation

$T_{j(\max)}$: 最大接合点温度
($T_{ch(\max)}$) Maximum Junction(Channel) Temperature

θ_{j-c} : 接合点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
(θ_{ch-a}) Thermal Impedance between Junction(Channel) and Air

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

(2) 部品デイレートイング表 Components Derating List

(2)-1 PH1200A280-12

| 部品番号 Location No. | 部品名 Part Name | 最大定格 MAX Rating | 使用状態 Actual Rating | デイレートイング率 Derating Rate |
|----------------------|------------------|--------------------|-----------------------|----------------------------|
| Q301 | CHIP MOS FET | Tch(max): 150.0°C | Tch: 116.1°C | 77.4% |
| Q302 | CHIP MOS FET | Tch(max): 150.0°C | Tch: 109.1°C | 72.7% |
| Q303 | CHIP MOS FET | Tch(max): 150.0°C | Tch: 116.1°C | 77.4% |
| Q304 | CHIP MOS FET | Tch(max): 150.0°C | Tch: 114.3°C | 76.2% |
| D302 | CHIP DIODE | Tj(max): 150.0°C | Tj: 105.4°C | 70.3% |
| Q153 | CHIP MOS FET | Tch(max): 150.0°C | Tch: 111.3°C | 74.2% |
| Q158 | CHIP MOS FET | Tch(max): 150.0°C | Tch: 109.1°C | 72.7% |
| PC1 | CHIP COUPLER | Tj(max): 125.0°C | Tj: 100.5°C | 80.4% |
| PC2 | CHIP COUPLER | Tj(max): 125.0°C | Tj: 102.6°C | 82.1% |
| A301 | CHIP IC | Tj(max): 150.0°C | Tj: 130.4°C | 86.9% |
| A2 | CHIP IC | Tj(max): 150.0°C | Tj: 120.0°C | 80.0% |
| A5 | CHIP IC | Tj(max): 150.0°C | Tj: 118.5°C | 79.0% |
| A204 | CHIP IC | Tj(max): 125.0°C | Tj: 111.0°C | 88.8% |
| A205 | CHIP IC | Tj(max): 125.0°C | Tj: 105.7°C | 84.6% |

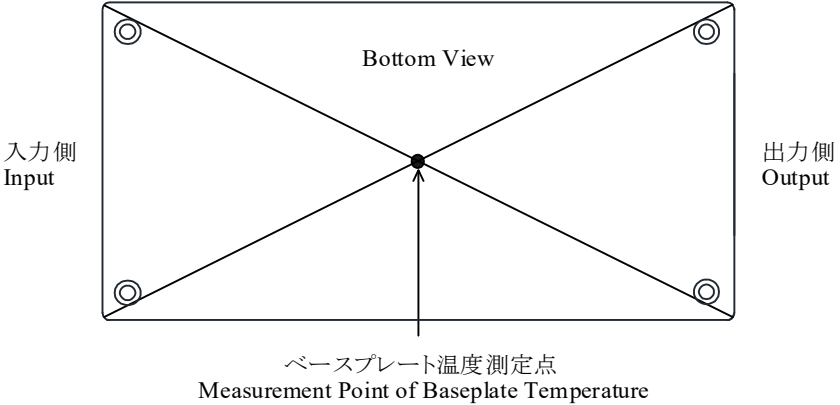
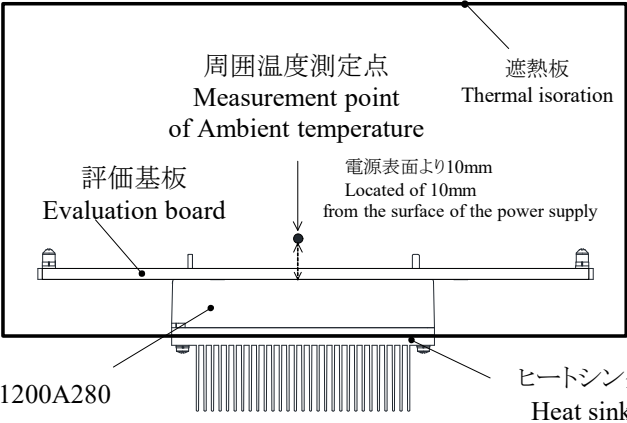
(2)-2 PH1200A280-48

| 部品番号 Location No. | 部品名 Part Name | 最大定格 MAX Rating | 使用状態 Actual Rating | デイレートイング率 Derating Rate |
|----------------------|------------------|--------------------|-----------------------|----------------------------|
| Q301 | CHIP MOS FET | Tch(max): 150.0°C | Tch: 116.6°C | 77.7% |
| Q302 | CHIP MOS FET | Tch(max): 150.0°C | Tch: 114.3°C | 76.2% |
| Q303 | CHIP MOS FET | Tch(max): 150.0°C | Tch: 121.5°C | 81.0% |
| Q304 | CHIP MOS FET | Tch(max): 150.0°C | Tch: 110.2°C | 73.5% |
| D302 | CHIP DIODE | Tj(max): 150.0°C | Tj: 105.3°C | 70.2% |
| Q151 | CHIP MOS FET | Tch(max): 150.0°C | Tch: 113.0°C | 75.3% |
| Q153 | CHIP MOS FET | Tch(max): 150.0°C | Tch: 102.9°C | 68.6% |
| Q156 | CHIP MOS FET | Tch(max): 150.0°C | Tch: 104.1°C | 69.4% |
| Q159 | CHIP MOS FET | Tch(max): 150.0°C | Tch: 104.4°C | 69.6% |
| PC1 | CHIP COUPLER | Tj(max): 125.0°C | Tj: 100.5°C | 80.4% |
| PC2 | CHIP COUPLER | Tj(max): 125.0°C | Tj: 102.6°C | 82.1% |
| A301 | CHIP IC | Tj(max): 150.0°C | Tj: 130.4°C | 86.9% |
| A2 | CHIP IC | Tj(max): 150.0°C | Tj: 120.0°C | 80.0% |
| A5 | CHIP IC | Tj(max): 150.0°C | Tj: 118.5°C | 79.0% |
| A204 | CHIP IC | Tj(max): 125.0°C | Tj: 111.0°C | 88.8% |
| A205 | CHIP IC | Tj(max): 125.0°C | Tj: 105.7°C | 84.6% |

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

MODEL : PH1200A280-12, PH1200A280-48

(1) 測定条件 Measuring Conditions

| | | |
|--|--|-----------------------------------|
| <p>測定方法 Measurement Method</p> | <p>ベースプレート温度測定方法 Baseplate Temperature Measurement Method</p>  <p>周囲温度測定方法 Ambient Temperature Measurement Method</p>  | |
| <p>入力電圧 Input Voltage</p> | <p>280VDC</p> | |
| <p>出力電圧 Output Voltage</p> | <p>12VDC</p> | <p>48VDC</p> |
| <p>出力電流 Output Current</p> | <p>100A (100%)</p> | <p>20A (Derating to 80% load)</p> |
| <p>ベースプレート温度 Baseplate Temperature</p> | <p>100°C</p> | |
| <p>周囲温度 Ambient Temperature</p> | <p>85°C</p> | |

ΔT_{C-P} : 周囲温度85°Cにおいてベースプレート温度が100°Cとなる放熱条件とし、その時のベースプレート温度を基準とした各部品の ΔT (ベースプレートと部品との温度差)を表したものの。Temperature difference between a case of each component and baseplate, fitted power supply with heatsink to be maintained 100°C (baseplate temperature) at 85°C(ambient temperature).

(2) 主要部品温度上昇値 Main Components Temperature Rise ΔT_{C-P} List

(2)-1 PH1200A280-12

| 部品番号 Location No. | 部品名 Part Name | 温度上昇値 ΔT_{C-P} Temperature Rise (°C) |
|----------------------|------------------|---|
| Q301 | CHIP MOS FET | 10.3 |
| Q302 | CHIP MOS FET | 3.3 |
| Q303 | CHIP MOS FET | 9.1 |
| Q304 | CHIP MOS FET | 7.3 |
| D301 | CHIP DIODE | 4.3 |
| D302 | CHIP DIODE | 3.5 |
| Q153 | CHIP MOS FET | 9.3 |
| Q158 | CHIP MOS FET | 7.1 |
| PC2 | CHIP COUPLER | 4.1 |
| A2 | CHIP IC | 6.7 |
| A4 | CHIP IC | 5.4 |
| A201 | CHIP IC | 14.2 |
| A204 | CHIP IC | 4.0 |
| A205 | CHIP IC | 4.4 |
| T302 | TRANS,PULSE | 37.2 |
| T303 | TRANS,PULSE | 4.3 |
| L151 | CHOKE COIL | 6.4 |

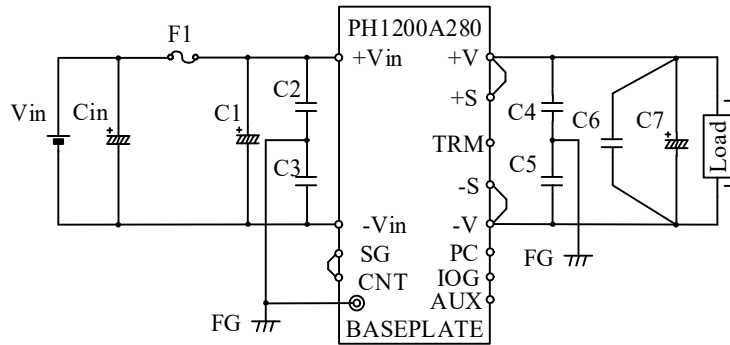
(2)-2 PH1200A280-48

| 部品番号 Location No. | 部品名 Part Name | 温度上昇値 ΔT_{C-P} Temperature Rise (°C) |
|----------------------|------------------|---|
| Q301 | CHIP MOS FET | 10.8 |
| Q302 | CHIP MOS FET | 13.5 |
| Q303 | CHIP MOS FET | 14.5 |
| Q304 | CHIP MOS FET | 5.5 |
| D301 | CHIP DIODE | 3.7 |
| D302 | CHIP DIODE | 2.7 |
| Q152 | CHIP MOS FET | 11.9 |
| Q155 | CHIP MOS FET | 0.2 |
| Q158 | CHIP MOS FET | 2.3 |
| Q161 | CHIP MOS FET | 0.3 |
| PC2 | CHIP COUPLER | 0.5 |
| A2 | CHIP IC | 8.9 |
| A4 | CHIP IC | 9.9 |
| A201 | CHIP IC | 15.1 |
| A204 | CHIP IC | 2.2 |
| A205 | CHIP IC | -0.4 |
| T302 | TRANS,PULSE | 40.5 |
| T303 | TRANS,PULSE | 4.6 |
| L151 | CHOKE COIL | 21.3 |

4. アブノーマル試験 Abnormal Test

MODEL : PH1200A280-48

(1) 試験条件及び回路 Test Condition and Circuit



- 入力電圧 : 425VDC
- ベースプレート温度 : 25°C
- 電解コンデンサ (C1) : 450V 22μF
- フィルムコンデンサ (C4,C5) : 630V 0.022μF
- ヒューズ (F1) : 500VDC, 10A (WN30-10)
- 出力電流 : 25A (100%)
- 電解コンデンサ (Cin) : 450V 10,000μF
- セラミックコンデンサ (C2,C3) : 250VAC 4,700pF
- セラミックコンデンサ (C6) : 100V 2.2μF
- 電解コンデンサ (C7) : 50V 1,500μF×2 Series

(2) 試験結果 (Test Results)

(2)-1 PH1200A280-48

| No. | 試験箇所 Test Point | | 試験 モード Test Mode | | 試験結果 Test Results | | | | | | | | | | | | 備考 Note | | |
|-----|-----------------------|------------------------------|---------------------------|------------------|-------------------|--------------|--------------|--------------|--------------|--------------|-----------------------------|--------------|--------------|-------------------|------------------------|-------------------|------------|-----------------------|---------------|
| | | | | | Fi:Fire | So:Smoke | Bu:Burst | Se:Smell | Re:Red Hot | Da:Damaged | Fu:Fuse Blown | NO:No Output | NC:No Change | Ot:Others | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | | | | | | | |
| | 部品 Location No. | 試験 端子 Test Terminal | S H O R T | O P E N | 発 火 Fi | 発 煙 So | 破 裂 Bu | 異 臭 Se | 発 熱 Re | 破 損 Da | ヒ ュ ー ズ 断 Fu | O V P | O C P | 出 力 断 NO | 変 化 な し NC | そ の 他 Ot | | | |
| 1 | Q301 | D-S | ● | | | | | | | ● | ● | | | ● | | | | Da: Q301,Q302,Q305,Q1 | |
| 2 | | D-G | ● | | | | | | | ● | ● | | | ● | | | | Da: Q302 | |
| 3 | | G-S | ● | | | | | | | | | | | ● | | | | | |
| 4 | | D | | ● | | | | | | | ● | ● | | | ● | | | | Da: Q301,Q302 |
| 5 | | G | | ● | | | | | | | | | | | ● | | | | |
| 6 | | S | | ● | | | | | | | | | | | ● | | | | |
| 7 | Q302 | D-S | ● | | | | | | | ● | ● | | | ● | | | | Da: Q301,Q302,Q306,Q2 | |
| 8 | | D-G | ● | | | | | | | ● | ● | | | ● | | | | Da: Q301 | |
| 9 | | G-S | ● | | | | | | | | | | | ● | | | | | |
| 10 | | D | | ● | | | | | | | ● | ● | | | ● | | | | Da: Q301,Q302 |
| 11 | | G | | ● | | | | | | | | | | | ● | | | | |
| 12 | | S | | ● | | | | | | | | | | | ● | | | | |
| 13 | Q303 | D-S | ● | | | | | | | ● | ● | | | ● | | | | Da: Q303,Q304,Q307,Q3 | |
| 14 | | D-G | ● | | | | | | | ● | ● | | | ● | | | | Da: Q304 | |
| 15 | | G-S | ● | | | | | | | | | | | ● | | | | | |
| 16 | | D | | ● | | | | | | | ● | ● | | | ● | | | | Da: Q303,Q304 |
| 17 | | G | | ● | | | | | | | | | | | ● | | | | |
| 18 | | S | | ● | | | | | | | | | | | ● | | | | |

| No. | 試験箇所 Test Point | | 試験 モード Test Mode | | 試験結果 Test Results | | | | | | | | | | | | 備考 Note |
|-----------------------|------------------------------|-----------------------|---------------------------|--------------|-------------------|--------------|--------------|--------------|--------------|-------------------------|-------------|-------------|-------------------|------------------------|-------------------|----------------------------------|--------------------------|
| | | | | | Fi:Fire | | So:Smoke | | | Bu:Burst | | Se:Smell | | Re:Red Hot | | | |
| | Da:Damaged | | Fu:Fuse Blown | | | NO:No Output | | NC:No Change | | Ot:Others | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | | | | | |
| 部品 Location No. | 試験 端子 Test Terminal | S H O R T | O P E N | 発 火 Fi | 発 煙 So | 破 裂 Bu | 異 臭 Se | 発 熱 Re | 破 損 Da | ヒ ュー ズ 断 Fu | O V P | O C P | 出 力 断 NO | 変 化 な し NC | そ の 他 Ot | | |
| 19 | Q304 | D-S | ● | | | | | | ● | ● | | | | ● | | Da: Q303,Q304,Q308,Q4 | |
| 20 | | D-G | ● | | | | | | ● | ● | | | | ● | | Da: Q303 | |
| 21 | Q304 | G-S | ● | | | | | | | | | | | ● | | | |
| 22 | | D | | ● | | | | | ● | ● | | | | ● | | Da: Q303,Q304 | |
| 23 | | G | | ● | | | | | | | | | | ● | | | |
| 24 | | S | | ● | | | | | | | | | | ● | | | |
| 25 | D301 | A-C | ● | | | | | | ● | ● | | | | ● | | Da: Q301,Q302 | |
| 26 | | A,C | | ● | | | | | | | | | | | ● | Eff. drop, Q151-Q162 over stress | |
| 27 | D302 | A-C | ● | | | | | | ● | ● | | | | ● | | Da: Q301,Q302 | |
| 28 | | A,C | | ● | | | | | | | | | | | ● | Eff. drop, Q151-Q162 over stress | |
| 29 | Q153 (Q154 Q155) | D-S | ● | | | | | | ● | | | | | ● | | Da: Q156,Q153,A201 | |
| 30 | | D-G | ● | | | | | | | | | | | ● | | | |
| 31 | | G-S | ● | | | | | | | | | | | | | ● | Eff. drop |
| 32 | | D | | ● | | | | | | ● | | | | | ● | | Da: Q156,Q153 |
| 33 | | G | | ● | | | | | | | | | | | ● | | |
| 34 | | S | | ● | | | | | | | | | | | ● | | |
| 35 | Q156 (Q157 Q158) | D-S | ● | | | | | | ● | | | | | ● | | Da:Q156,Q153,A201 | |
| 36 | | D-G | ● | | | | | | | | | | | ● | | | |
| 37 | | G-S | ● | | | | | | | | | | | | | ● | Eff. drop |
| 38 | | D | | ● | | | | | | ● | | | | | ● | | Da: Q156,Q153 |
| 39 | | G | | ● | | | | | | | | | | | ● | | |
| 40 | | S | | ● | | | | | | | | | | | ● | | |
| 41 | Q159 (Q160 Q161) | D-S | ● | | | | | | ● | | | | | ● | | Da: Q159,Q162,A202 | |
| 42 | | D-G | ● | | | | | | | | | | | ● | | | |
| 43 | | G-S | ● | | | | | | | | | | | | | ● | Eff. drop |
| 44 | | D | | ● | | | | | | ● | | | | | ● | | Da: Q159,Q162 |
| 45 | | G | | ● | | | | | | | | | | | ● | | |
| 46 | | S | | ● | | | | | | | | | | | ● | | |
| 47 | Q162 (Q151 Q152) | D-S | ● | | | | | | ● | | | | | ● | | Da: Q159,Q162,A202 | |
| 48 | | D-G | ● | | | | | | | | | | | ● | | | |
| 49 | | G-S | ● | | | | | | | | | | | | | ● | Eff. drop |
| 50 | | D | | ● | | | | | | ● | | | | | ● | | Da: Q159,Q162 |
| 51 | | G | | ● | | | | | | | | | | | ● | | |
| 52 | | S | | ● | | | | | | | | | | | ● | | |
| 53 | PC2 | 1 | | ● | | | | | | | | | ● | ● | | | |
| 54 | | 2 | | ● | | | | | | | | | ● | ● | | | |
| 55 | | 3 | | ● | | | | | | | | | ● | ● | | | |
| 56 | | 4 | | ● | | | | | | | | | ● | ● | | | |
| 57 | | 1-2 | ● | | | | | | | | | | ● | ● | | | |
| 58 | | 3-4 | ● | | | | | | | | | | ● | ● | | | |
| 59 | A2 | 1 | | ● | | | | | | | | | ● | ● | | | |
| 60 | | 2 | | ● | | | | | | | | | ● | ● | | | |
| 61 | | 3 | | ● | | | | | | | | | ● | ● | | | |
| 62 | | 4 | | ● | | | | | | | | | ● | ● | | | |
| 63 | | 5 | | ● | | | | | | | | | | | ● | | |
| 64 | | 6 | | ● | | | | | | | | | | ● | | | |
| 65 | | 7 | | ● | | | | | | | | | | ● | | | |
| 66 | | 8 | | ● | | | | | | ● | | | | ● | | | Da: Q156,Q153(Q162,Q159) |
| 67 | | 9 | | ● | | | | | | ● | | | | ● | | | Da: Q301,Q302(Q303,Q304) |

| No. | 試験箇所 Test Point | | 試験モード Test Mode | | 試験結果 Test Results | | | | | | | | | | | | 備考 Note |
|-----|-----------------------|------------------------------|-----------------------|------------------|-------------------|--------------|--------------|--------------|--------------|-------------------------|-------------|-------------|-------------------|------------------------|-------------------|--------------------------|---------------------------------|
| | | | | | Fi:Fire | | So:Smoke | | | Bu:Burst | | Se:Smell | | Re:Red Hot | | | |
| | Da:Damaged | | Fu:Fuse Blown | | | NO:No Output | | NC:No Change | | Ot:Others | | | | | | | |
| | 部品 Location No. | 試験 端子 Test Terminal | S H O R T | O P E N | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | |
| | | | | 発 火 Fi | 発 煙 So | 破 裂 Bu | 異 臭 Se | 発 熱 Re | 破 損 Da | ヒ ュー ズ 断 Fu | O V P | O C P | 出 力 断 NO | 変 化 な し NC | そ の 他 Ot | | |
| 68 | A2 | 10 | ● | | | | | | | | | | | ● | | | |
| 69 | | 11 | ● | | | | | | | | | | | | ● | | |
| 70 | | 12 | ● | | | | | | | | | | | | | ● | Eff. drop |
| 71 | | 13 | ● | | | | | | | | | | | | | ● | Eff. drop |
| 72 | | 14 | ● | | | | | | | | | | | | | ● | Eff. drop |
| 73 | | 15 | ● | | | | | | | | | | | | ● | | |
| 74 | | 16 | ● | | | | | | | | | | | | | ● | |
| 75 | | 17 | ● | | | | | | | ● | | | | | ● | | Da: Q162,Q159,Q153,Q156 |
| 76 | | 18 | ● | | | | | | | ● | | | | | ● | | Da: Q162,Q159,Q153,Q156 |
| 77 | | 19 | ● | | | | | | | ● | ● | | | | ● | | Da: Q303,Q304 |
| 78 | | 20 | ● | | | | | | | ● | ● | | | | ● | | Da: Q303,Q304 |
| 79 | | 21 | ● | | | | | | | ● | ● | | | | ● | | Da: Q303,Q304 |
| 80 | | 22 | ● | | | | | | | ● | ● | | | | ● | | Da: Q303,Q304 |
| 81 | | 23 | ● | | | | | | | | | | | | ● | | |
| 82 | | 24 | ● | | | | | | | | | | | | ● | | |
| 83 | | 1-2 | ● | | | | | | | | | | ● | | | | |
| 84 | | 2-3 | ● | | | | | | | | | | ● | | | | |
| 85 | | 3-4 | ● | | | | | | | | | | ● | | | | |
| 86 | | 4-5 | ● | | | | | | | | | | | | ● | | |
| 87 | | 5-6 | ● | | | | | | | | | | | | ● | | |
| 88 | | 6-7 | ● | | | | | | | | | | | | ● | | No OUTD ,Q301,Q302 gate is low |
| 89 | | 7-8 | ● | | | | | | | | | | | | ● | | No OUTD ,Q301,Q302 gate is low |
| 90 | | 8-9 | ● | | | | | | | | | | | | ● | | No OUTD ,Q301,Q302 gate is low |
| 91 | | 9-10 | ● | | | | | | | | | | | | ● | | |
| 92 | 10-11 | ● | | | | | | | | | | | | ● | | Same as pin9,pin10 short | |
| 93 | 11-12 | ● | | | | | | | | | | | | ● | | Unit enter hiccup state | |
| 94 | 13-14 | ● | | | | | | | | | | | | | ● | Eff. drop | |
| 95 | 14-15 | ● | | | | | | | | | | | | | ● | Eff. drop | |
| 96 | 15-16 | ● | | | | | | | | | | | | | ● | | |
| 97 | 16-17 | ● | | | | | | | ● | | | | | ● | | Da: A2 (VDD short) | |
| 98 | 17-18 | ● | | | | | | | ● | | | | | ● | | Da: Q156,Q153(Q162,Q159) | |
| 99 | 18-19 | ● | | | | | | | ● | ● | | | | ● | | Da: Q301,Q302(Q156,Q153) | |
| 100 | 19-20 | ● | | | | | | | ● | ● | | | | ● | | Da: Q301,Q302 | |
| 101 | 20-21 | ● | | | | | | | ● | ● | | | | ● | | Da: Q301,Q302,Q303,Q304 | |
| 102 | 21-22 | ● | | | | | | | ● | ● | | | | ● | | Da: Q303,Q304 | |
| 103 | 22-23 | ● | | | | | | | ● | ● | | | | ● | | Da: Q303,Q304 | |
| 104 | 23-24 | ● | | | | | | | | | | | | ● | | Vcc of A2 hiccup | |
| 105 | A4(A5) | 1 | ● | | | | | | | | | | | | ● | | |
| 106 | | 2 | ● | | | | | | | ● | ● | | | | ● | | Da: Q301,Q302 |
| 107 | | 3 | ● | | | | | | | | | | | | ● | | |
| 108 | | 4 | ● | | | | | | | ● | ● | | | | ● | | Da: Q303,Q304 |
| 109 | | 5 | ● | | | | | | | | | | | | ● | | |
| 110 | | 6 | ● | | | | | | | | | | | | ● | | |
| 111 | | 7 | ● | | | | | | | | | | | | ● | | |
| 112 | | 8 | ● | | | | | | | | | | | | | ● | |
| 113 | | 1-2 | ● | | | | | | | | | | | | | ● | |
| 114 | | 2-3 | ● | | | | | | | ● | | | | | ● | | Da: A2 |
| 115 | | 3-4 | ● | | | | | | | ● | | | | | ● | | Da: A2 |
| 116 | | 5-6 | ● | | | | | | | ● | ● | | | | ● | | Da: A4(A5),Q303,Q304(Q301,Q302) |

| No. | 試験箇所 Test Point | | 試験 モード Test Mode | | 試験結果 Test Results | | | | | | | | | | | | 備考 Note | |
|-----------------------|------------------------------|-----------------------|---------------------------|--------------|-------------------|--------------|--------------|--------------|--------------|-------------------------|-------------|-------------|-------------------|------------------------|-------------------|--------------------------------------|---------------------------------|--------------------------|
| | | | | | Fi:Fire | | So:Smoke | | | Bu:Burst | | Se:Smell | | Re:Red Hot | | | | |
| | Da:Damaged | | Fu:Fuse Blown | | | NO:No Output | | NC:No Change | | Ot:Others | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | | | | | | |
| 部品 Location No. | 試験 端子 Test Terminal | S H O R T | O P E N | 発 火 Fi | 発 煙 So | 破 裂 Bu | 異 臭 Se | 発 熱 Re | 破 損 Da | ヒ ュー ズ 断 Fu | O V P | O C P | 出 力 断 NO | 変 化 な し NC | そ の 他 Ot | | | |
| 117 | A4(A5) | 6-7 | ● | | | | | | | ● | ● | | | | ● | | Da: A4(A5),Q303,Q304(Q301,Q302) | |
| 118 | | 7-8 | ● | | | | | | | | | | | | ● | | | |
| 119 | A201 (A202) | 1 | | ● | | | | | | | | | | | | ● | Eff. drop | |
| 120 | | 2 | | ● | | | | | | | | | | | | ● | Eff. drop | |
| 121 | | 3 | | ● | | | | | | | | | | | | ● | Eff. drop | |
| 122 | | 4 | | ● | | | | | | | | | | | | ● | Eff. drop | |
| 123 | | 5 | | ● | | | | | | | | | | | | ● | Eff. drop | |
| 124 | | 6 | | ● | | | | | | | | | | | | ● | Eff. drop | |
| 125 | | 7 | | ● | | | | | | | | | | | | ● | Eff. drop | |
| 126 | | 8 | | ● | | | | | | | | | | | | ● | Eff. drop | |
| 127 | | 1-2 | ● | | | | | | | ● | | | | ● | | | Da : Q156(Q162),Q153(Q159) | |
| 128 | | 2-3 | ● | | | | | | | | | | | | | ● | Eff. drop | |
| 129 | | 3-4 | ● | | | | | | | ● | | | | | | ● | Eff. drop, Da: A201(A202) | |
| 130 | | 5-6 | ● | | | | | | | ● | | | | | | ● | Eff. drop, Da: A201(A202) | |
| 131 | 6-7 | ● | | | | | | | | | | | | | ● | Eff. drop, Da: A201(A203) | | |
| 132 | 7-8 | ● | | | | | | | ● | | | | ● | | | Da: A201(A202),Q156(Q162),Q153(Q159) | | |
| 133 | L301 | 1 | | ● | | | | | | | | | ● | | | | | |
| 134 | | 2 | | ● | | | | | | | | | ● | | | | | |
| 135 | | 1-2 | ● | | | | | | | | | | | | ● | | | |
| 136 | L302 | 1 | | ● | | | | | | | | | ● | | | | | |
| 137 | | 2 | | ● | | | | | | | | | ● | | | | | |
| 138 | 1-2 | ● | | | | | | | | | | | | | ● | | Eff. has big drop | |
| 139 | L151 | 1 | | ● | | | | | | | | | ● | | | | | |
| 140 | | 2 | | ● | | | | | | | | | ● | | | | | |
| 141 | 1-2 | ● | | | | | | | | | | | ● | | ● | | | |
| 142 | L152 | 1 | | ● | | | | | | | | ● | ● | | | | | |
| 143 | | 2 | | ● | | | | | | | | ● | ● | | | | | |
| 144 | | 1-2 | ● | | | | | | | | | | | ● | | | | |
| 145 | T301 | pin2 | | ● | | | | | ● | | | | ● | | | | Da: Q301,Q304(Q303,Q302) | |
| 146 | | pin3 | | ● | | | | | ● | | | | ● | | | | Da: Q301,Q304(Q303,Q302) | |
| 147 | | pin7 | | ● | | | | | | | | | ● | | | | | |
| 148 | | pin8 | | ● | | | | | | | | | ● | | | | | |
| 149 | | pin2-pin3 | ● | | | | | | | ● | | | ● | | | | | Da: Q301,Q304(Q303,Q302) |
| 150 | | pin7-pin8 | ● | | | | | | | ● | | | ● | | | | | Da: Q301,Q304(Q303,Q302) |
| 151 | T302 | 1 | | ● | | | | | | | | | ● | | | | | |
| 152 | | 2 | | ● | | | | | | | | | ● | | ● | | Q151-Q162 stress increase | |
| 153 | | 3 | | ● | | | | | | | | | ● | | | | | |
| 154 | | 4 | | ● | | | | | | | | | ● | | | | | |
| 155 | | 5 | | ● | | | | | | | | | ● | | | | | |
| 156 | | 6 | | ● | | | | | | | | | ● | | | | | |
| 157 | | 1-2 | ● | | | | | | | ● | | | ● | | | | | Da: Q156,Q153,Q159,Q162 |
| 158 | | 2-3 | ● | | | | | | | | | | | | | ● | | Eff. drop |
| 159 | | 4-6 | ● | | | | | | | | | | ● | | | | | |
| 160 | | 5-6 | ● | | | | | | | | | | ● | | | | | |
| 161 | T303 | 1 | | ● | | | | | | | | | ● | | | | | |
| 162 | | 2 | | ● | | | | | | | | | ● | | | | | |
| 163 | | 4 | | ● | | | | | | | | | ● | | | | | |
| 164 | | 6 | | ● | | | | | | | | | ● | | | | | |
| 165 | | 8 | | ● | | | | | | | | ● | ● | | | | | |

| No. | 試験箇所 Test Point | | 試験 モード Test Mode | | 試験結果 Test Results | | | | | | | | | | | | 備考 Note | | |
|------------|-----------------------|------------------------------|---------------------------|------------------|-------------------|--------------|--------------|-----------|--------------|--------------|--------------|--------------|--------------|--------------|-----------------------------|-------------|-------------|------------------------|------------------------|
| | | | | | Fi:Fire | | So:Smoke | | | Bu:Burst | | Se:Smell | | Re:Red Hot | | | | | |
| | 部品 Location No. | 試験 端子 Test Terminal | S H O R T | O P E N | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | | | |
| Da:Damaged | | | | | Fu:Fuse Blown | NO:No Output | NC:No Change | Ot:Others | 発 火 Fi | 発 煙 So | 破 裂 Bu | 異 臭 Se | 発 熱 Re | 破 損 Da | ヒ ュ ー ズ 断 Fu | O V P | O C P | 出 力 断 NO | 変 化 な し NC |
| 166 | T303 | 9 | | ● | | | | | | | | ● | | ● | | | | | |
| 167 | | 10 | | ● | | | | | | | | | | | | | ● | Eff. drop | |
| 168 | | 11 | | ● | | | | | | | | | | | | | ● | Eff. drop | |
| 169 | | 1-2 | ● | | | | | | | ● | | | | ● | | | | | Da: A301 |
| 170 | | 2-4 | ● | | | | | | | ● | | | | ● | | | | | Da: A301 |
| 171 | | 4-6 | ● | | | | | | | | | | | ● | | | | | |
| 172 | | 8-9 | ● | | | | | | | | | | | ● | | | | | |
| 173 | | 10-11 | ● | | | | | | | | | | | ● | | | | | |
| 174 | T1 (T2) | 1 | | ● | | | | | | | | | ● | | | | | | |
| 175 | | 2 | | ● | | | | | | | | | ● | | | | | | |
| 176 | | 3 | | ● | | | | | | | | | ● | | | | | | |
| 177 | | 4 | | ● | | | | | | | | | ● | | | | | | |
| 178 | | 5 | | ● | | | | | | | | | ● | | | | | | |
| 179 | | 6 | | ● | | | | | | | | | ● | | | | | | |
| 180 | | 1-2 | ● | | | | | | | ● | | | | ● | | | | | Da: R11,R12 (R21,R22) |
| 181 | | 3-4 | ● | | | | | | | ● | | | | ● | | | | | Da: R11,R12 (R21,R22) |
| 182 | 5-6 | ● | | | | | | | ● | | | | ● | | | | | Da: R11,R12 (R21,R22) | |

5. 振動試験 Vibration Test

MODEL : PH1200A280-12, PH1200A280-28

(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

東菱科技 試験装置 ES-30-370
DONGLING TECH Test Equipment

(3) 供試品台数 The Number of D.U.T. (Device Under Test)

PH1200A280-12 : 3台 (3 units)

PH1200A280-28 : 3台 (3 units)

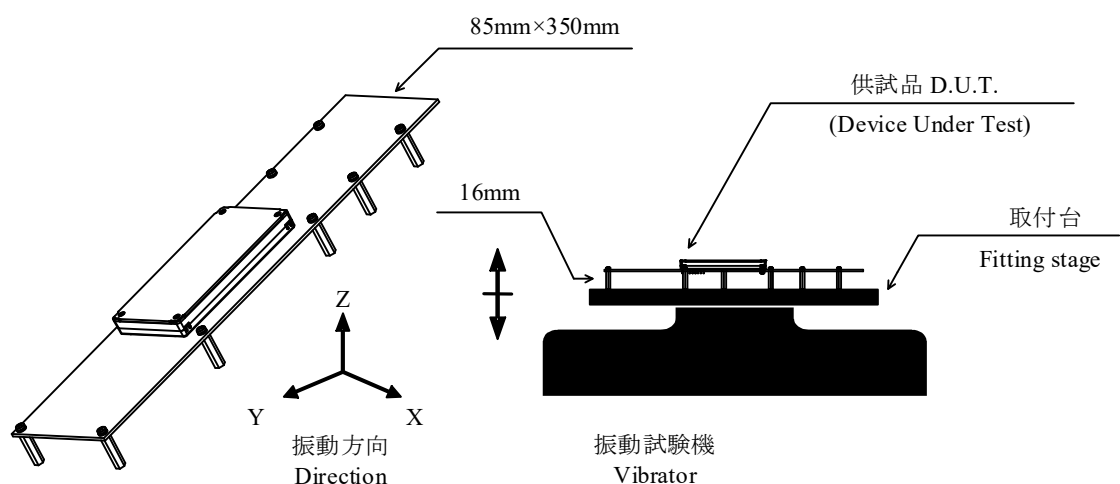
(4) 試験条件 Test Conditions

・周波数範囲 : 10~55Hz
Sweep Frequency
・掃引時間 : 1 分間
Sweep Time 1 min.
・振幅 : 0.825mm (一定)
Amplitude 0.825mm (constant)
・振幅方向 : X, Y, Z
Directions
・試験時間 : 各方向1 時間
Test Time : 1 hour each

(5) 試験方法 Test Method

供試品を基板に取り付け(M3ビスで4箇所固定)、それを取付台に固定する。

Fix the D.U.T. on the circuit board (fitting by four M3-tapped-holes) and fit it on the fitting-stage.



(5) 試験結果 Test Results

合格 OK

・試験条件 Test Conditions

入力電圧:280VDC 出力電流: 100A(12V), 42.9A(28V)

ベースプレート温度:25°C

Input Voltage Output Current

Baseplate Temperature

供試モデル : PH1200A280-12

DUT

| 測定確認項目 Check Item | | No.1 | | No.2 | | No.3 | |
|--------------------------|-------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|
| | | 試験前 Before Test | 試験後 After Test | 試験前 Before Test | 試験後 After Test | 試験前 Before Test | 試験後 After Test |
| 出力電圧 Output Voltage | V | 12.020 | 12.019 | 12.011 | 12.009 | 12.026 | 12.022 |
| リップル電圧 Ripple Voltage | mVp-p | 64 | 52 | 52 | 70 | 52 | 62 |
| 入力変動 Line Regulation | mV | 0.297 | 0.396 | 0.280 | 0.311 | 0.454 | 0.314 |
| 負荷変動 Load Regulation | mV | 0.411 | 0.016 | 0.014 | 0.064 | 0.177 | 0.120 |
| 外観 Appearance | — | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK |

供試モデル : PH1200A280-28

DUT

| 測定確認項目 Check Item | | No.1 | | No.2 | | No.3 | |
|--------------------------|-------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|
| | | 試験前 Before Test | 試験後 After Test | 試験前 Before Test | 試験後 After Test | 試験前 Before Test | 試験後 After Test |
| 出力電圧 Output Voltage | V | 28.112 | 28.106 | 28.047 | 28.048 | 28.059 | 28.052 |
| リップル電圧 Ripple Voltage | mVp-p | 102 | 108 | 99 | 104 | 99 | 106 |
| 入力変動 Line Regulation | mV | 0.657 | 0.918 | 0.272 | 0.493 | 0.060 | 0.163 |
| 負荷変動 Load Regulation | mV | 0.559 | 0.620 | 0.640 | 0.424 | 0.471 | 0.316 |
| 外観 Appearance | — | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK |

6. 衝撃試験 Shock Test

MODEL : PH1200A280-12, PH1200A280-28

(1) 使用衝撃試験装置 Equipment Used

| | | |
|---------------|----------------|-----------|
| 東菱科技 | 試験装置 | ES-30-370 |
| DONGLING TECH | Test Equipment | |

(2) 供試品台数 The Number of D.U.T. (Device Under Test)

| | |
|---------------|-----------------|
| PH1200A280-12 | : 3 台 (3 units) |
| PH1200A280-28 | : 3 台 (3 units) |

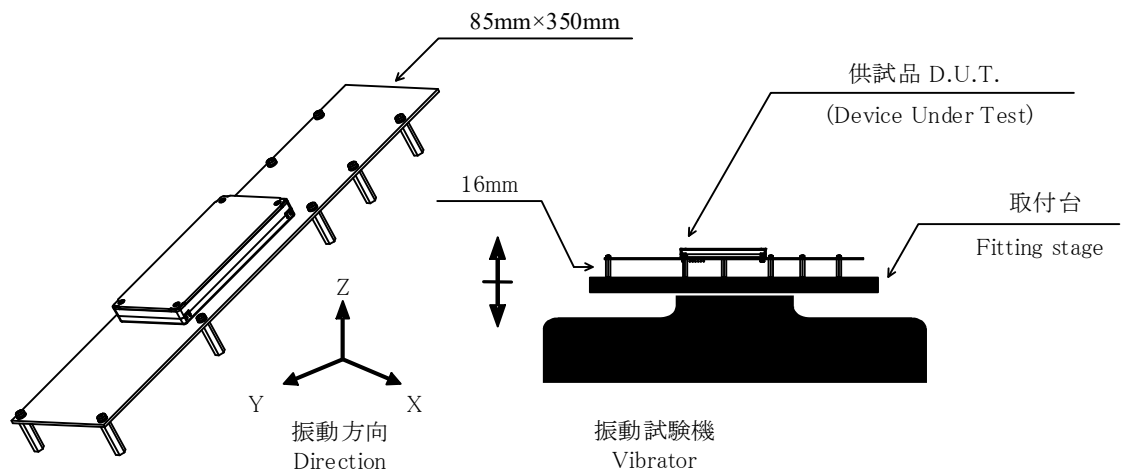
(3) 試験条件 Test Conditions

| | | | |
|-----------------|---------------------------------|--------------|-------------------------------|
| ・パルス波形 | : 正弦半波 | ・加速度 | : 196.1m/s^2 |
| Pulse Waveform | Half Sine Waveform | Acceleration | |
| ・衝撃方向 | : X, Y, Z | ・試験時間 | : $11\text{ms}\pm 5\text{ms}$ |
| Direction | | Test Time | |
| ・衝撃回数 | : +, - 方向に各3回 | | |
| Number of Times | 3 times each for +, - direction | | |

(4) 試験方法 Test Method

供試品を基板に取付け(M3ビスで4箇所固定)、それを取付台に固定する。

Fix the D.U.T. on the circuit board (fitting by four M3-tapped-holes) and fit it on the fitting-stage.



(5) 試験結果 Test Results

合格 OK

・試験条件 Test Conditions

入力電圧:280VDC 出力電流: 100A(12V), 42.9A(28V)

ベースプレート温度:25°C

Input Voltage Output Current

Baseplate Temperature

供試モデル:PH1200A280-12

DUT

| 測定確認項目 Check Item | | No.1 | | No.2 | | No.3 | |
|--------------------------|-------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|
| | | 試験前 Before Test | 試験後 After Test | 試験前 Before Test | 試験後 After Test | 試験前 Before Test | 試験後 After Test |
| 出力電圧 Output Voltage | V | 12.053 | 12.049 | 12.004 | 12.075 | 12.044 | 12.039 |
| リップル電圧 Ripple Voltage | mVp-p | 55 | 58 | 62 | 65 | 59 | 64 |
| 入力変動 Line Regulation | mV | 0.323 | 0.378 | 0.271 | 0.338 | 0.745 | 0.618 |
| 負荷変動 Load Regulation | mV | 0.384 | 0.412 | 0.269 | 0.304 | 0.297 | 0.274 |
| 外観 Appearance | — | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK |

供試モデル:PH1200A280-28

DUT

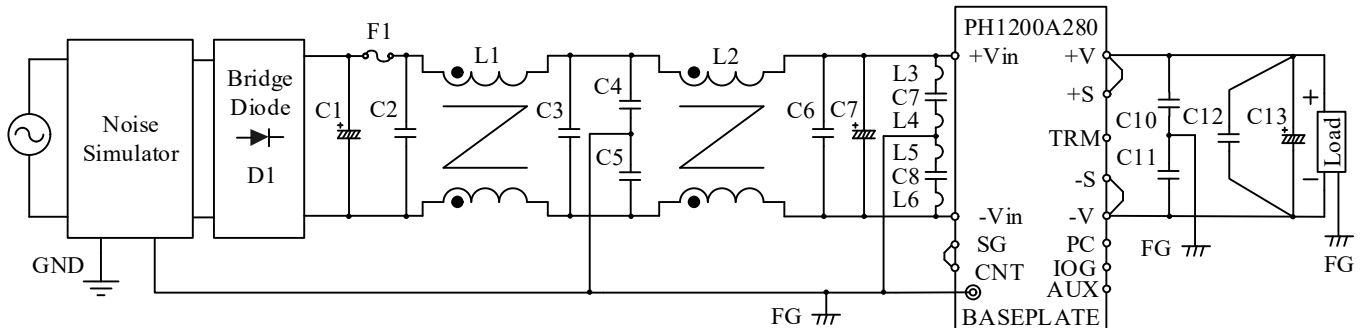
| 測定確認項目 Check Item | | No.1 | | No.2 | | No.3 | |
|--------------------------|-------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|
| | | 試験前 Before Test | 試験後 After Test | 試験前 Before Test | 試験後 After Test | 試験前 Before Test | 試験後 After Test |
| 出力電圧 Output Voltage | V | 28.023 | 28.029 | 28.088 | 28.075 | 28.074 | 28.057 |
| リップル電圧 Ripple Voltage | mVp-p | 115 | 122 | 105 | 102 | 107 | 115 |
| 入力変動 Line Regulation | mV | 0.894 | 0.842 | 0.562 | 0.675 | 0.741 | 0.852 |
| 負荷変動 Load Regulation | mV | 0.641 | 0.695 | 0.589 | 0.476 | 0.525 | 0.691 |
| 外観 Appearance | — | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK |

7. ノイズシミュレート試験 Noise Simulate Test

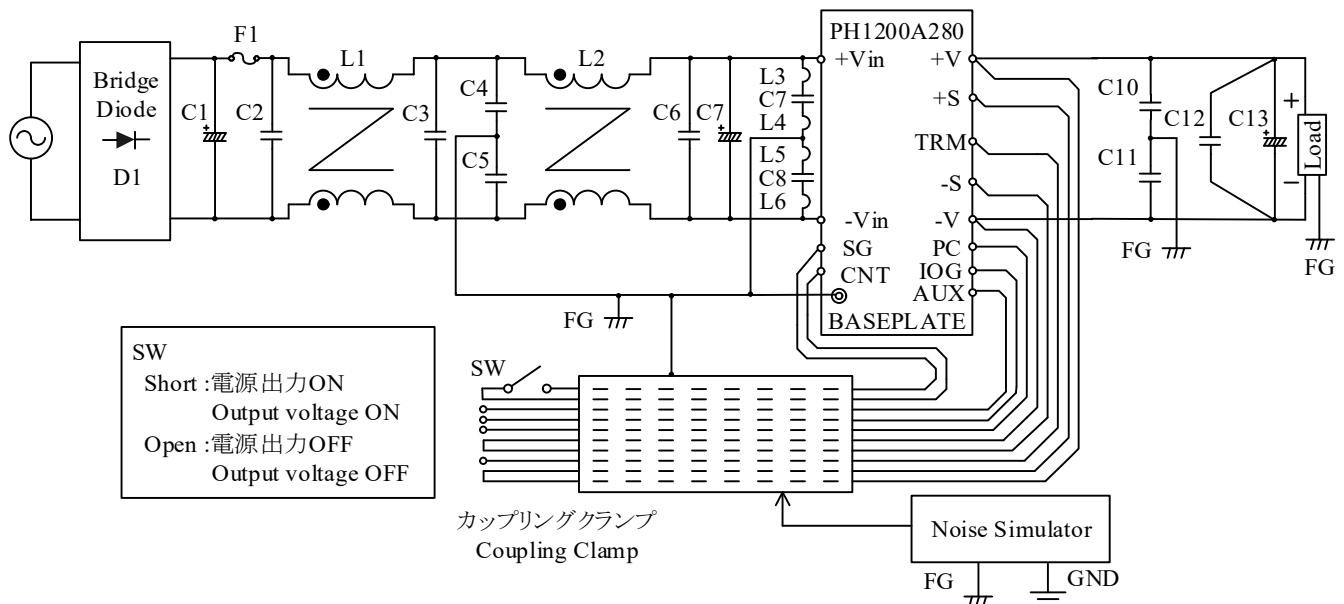
MODEL : PH1200A280 (All output models)

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

- A. 入力ポート : [L, N], [L, FG], [N, FG]に印加
Input port Apply to [L, N], [L, FG] and [N, FG].



- B. 信号ポート : SG, CNT, +S, -S, IOG, PC, TRM, AUXに同時に印加
Signal Port Apply to SG, CNT, +S, -S, IOG, PC, TRM and AUX at the same time.



- ブリッジダイオード (D1) : D25XB60(Shindengen)
Bridge Diode
- ヒューズ (F1) : 500VDC, 10A (WN30-10)
Fuse
- 電解コンデンサ (C1) : 450V 560 μ F \times 6 Parallel
Electrolytic Cap.
- チョークコイル (L1) : 5.0mH
Choke coil
- チョークコイル (L2) : 3.8mH
Choke coil
- フィルムコンデンサ (C2,C3,C6) : 250VAC 0.68 μ F
Film Cap.
- チョークコイル (L3,L4,L5,L6) : 3.3 μ H (HF57BB3.35X2X2)
Bead Core
- セラミックコンデンサ (C4,C5,C8,C9) : 250VAC 2200pF
Ceramic Cap.
- 電解コンデンサ (C7) : 450V 22 μ F
Electrolytic Cap.

| | |
|-------------------------------------|---|
| ・フィルムコンデンサ (C10,C11) Film Cap. | : 630V 0.022 μ F |
| ・セラミックコンデンサ (C12) Ceramic Cap. | : 100V 2.2 μ F |
| ・電解コンデンサ (C13) Electrolytic Cap. | 12V : 25V 1,500 μ F \times 2 Parallel 24V : 50V 1,500 μ F 28V : 50V 1,500 μ F 36V : 63V 560 μ F \times 2 Parallel 48V : 50V 1,500 μ F \times 2 Series |

(2) 供試品台数 The Number of D.U.T. (Device Under Test)

| | |
|---------------|----------------|
| PH1200A280-12 | : 1 台 (1 unit) |
| PH1200A280-24 | : 1 台 (1 unit) |
| PH1200A280-28 | : 1 台 (1 unit) |
| PH1200A280-36 | : 1 台 (1 unit) |
| PH1200A280-48 | : 1 台 (1 unit) |

(3) 試験条件 Test Conditions

| | | | |
|-------------------------------------|--|-----------------------|--|
| ・入力電圧 Input Voltage | : 280VDC | ・ノイズ電圧 Noise Level | : 入力ポート 0 ~ 2kV Input Port |
| ・出力電圧 Output Voltage | : 定格 Rated | | 信号ポート 0 ~ 750V Signal Port |
| ・出力電流 Output Current | 12V : 0A (0%), 100A (100%) 24V : 0A (0%), 50A (100%) 28V : 0A (0%), 42.9A (100%) 36V : 0A (0%), 33.4A (100%) 48V : 0A (0%), 25A (100%) | | |
| ・位相 Phase shift | : 0° ~ 360° | | |
| ・ベースプレート温度 Baseplate Temperature | : 25°C | ・極性 Polarity | : +, - |
| ・パルス幅 Pulse Width | : 50 ~ 1000ns | ・印加モード Mode | : 入力ポート ノーマル、コモン Input Port Normal, Common 信号ポート コモン Signal Port Common |
| ・トリガ選択 Trigger Select | : Line | | |

(4) 判定条件 Acceptable Conditions

- 試験中、5%を超える出力電圧の変動のない事
The regulation of output voltage must not exceed 5% of initial value during test
- 試験後の出力電圧は初期値から変動していない事
The output voltage must be within the regulation of specification after the test.
- 発煙・発火のない事
Smoke and fire are not allowed.

(5) 試験結果 Test Result

| | |
|---------------|-------|
| PH1200A280-12 | 合格 OK |
| PH1200A280-24 | 合格 OK |
| PH1200A280-28 | 合格 OK |
| PH1200A280-36 | 合格 OK |
| PH1200A280-48 | 合格 OK |

8. はんだ耐熱性試験 Resistance to Soldering Heat Test

MODEL : PH1200A280-12

(1) 使用装置 Machine Used

自動はんだ付け装置 : TLC-350XIV (セイテック)
Automatic Dip Soldering Machine (SEITEC)

(2) 供試体台数 The Number of D.U.T. (Device Under Test)

PH1200A280-12 : 1台 (1 unit)

(3) 試験条件 Test Conditions

| | |
|---------------------------|-----------------------------|
| ・溶融はんだ温度 : 260°C | ・予備加熱温度 : 120°C |
| Dip Soldering Temperature | Pre-heating Temperature |
| ・浸漬保持時間 : 12 秒間 | ・予備加熱時間 : 60 秒間 |
| Dip Time 12 seconds | Pre-heating Time 60 seconds |

(4) 試験方法 Test Method

初期測定の後、供試体を基板にのせ、自動はんだ付装置でフラックス浸漬、予備加熱、はんだ付を行う。
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。

Check if there is no abnormal output before test. Then fix the D.U.T. on a circuit board, transfer to flux-dipping, preheat and solder in the automatic dip soldering machine. Leave it for 1 hour at the room temperature, then check if there is no abnormal output.

(5) 試験結果 Test Results

合格 OK

・試験条件 Test Conditions

入力電圧 : 280VDC 出力電流 : 100A(100%)
Input Voltage Output Current

ベースプレート温度 : 25°C
Baseplate Temperature

| 測定確認項目 Check Item | | PH1200A280-12 | |
|------------------------------|-------|--------------------|-------------------|
| | | 試験前 Before Test | 試験後 After Test |
| 出力電圧 Output Voltage | V | 12.036 | 12.034 |
| 効率 Efficiency | % | 93.78 | 93.76 |
| リップル電圧 Ripple Voltage | mVp-p | 51 | 56 |
| 入力変動 Line Regulation | mV | 0.470 | 0.354 |
| 負荷変動 Load Regulation | mV | 0.141 | 0.030 |
| 絶縁抵抗 Isolation Resistance | — | 異常なし OK | 異常なし OK |
| 耐電圧 Withstand Voltage | — | 異常なし OK | 異常なし OK |
| 外観 Appearance | — | 異常なし OK | 異常なし OK |

9. 熱衝撃試験 Thermal Shock Test

MODEL : PH1200A280-12, PH1200A280-48

(1) 使用計測器 Equipment Used

THERMAL SHOCK CHAMBER TSA-101S-W (ESPEC CORP.)

(2) 供試体台数 The Number of D.U.T. (Device Under Test)

PH1200A280-12 : 5 台 (5 units)

PH1200A280-48 : 5 台 (5 units)

(3) 試験条件 Test Conditions

・電源周囲温度 : -55°C ⇔ +100°C

Ambient Temperature

・試験時間 : 30min. ⇔ 30 min.

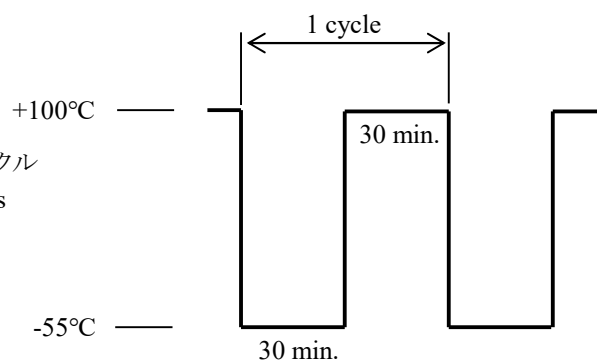
Test Time

・試験サイクル : 125、250、375、450サイクル

Test Cycles 125, 250, 375, 450 cycles

・非動作

Not Operating



(4) 試験方法 Test Method

初期測定の後、供試体を試験槽に入れ、上記サイクルで試験を行う。125、250、375、450 サイクル後に、供試体を常温常湿下に1時間放置し、出力に異常がない事を確認する。

Before the test check if there is no abnormal output and put the D.U.T. in the testing chamber.

Then test it in the above cycles. 125, 250, 375, 450 cycles later, leave it for 1 hour at room temperature and check if there is no abnormal output.

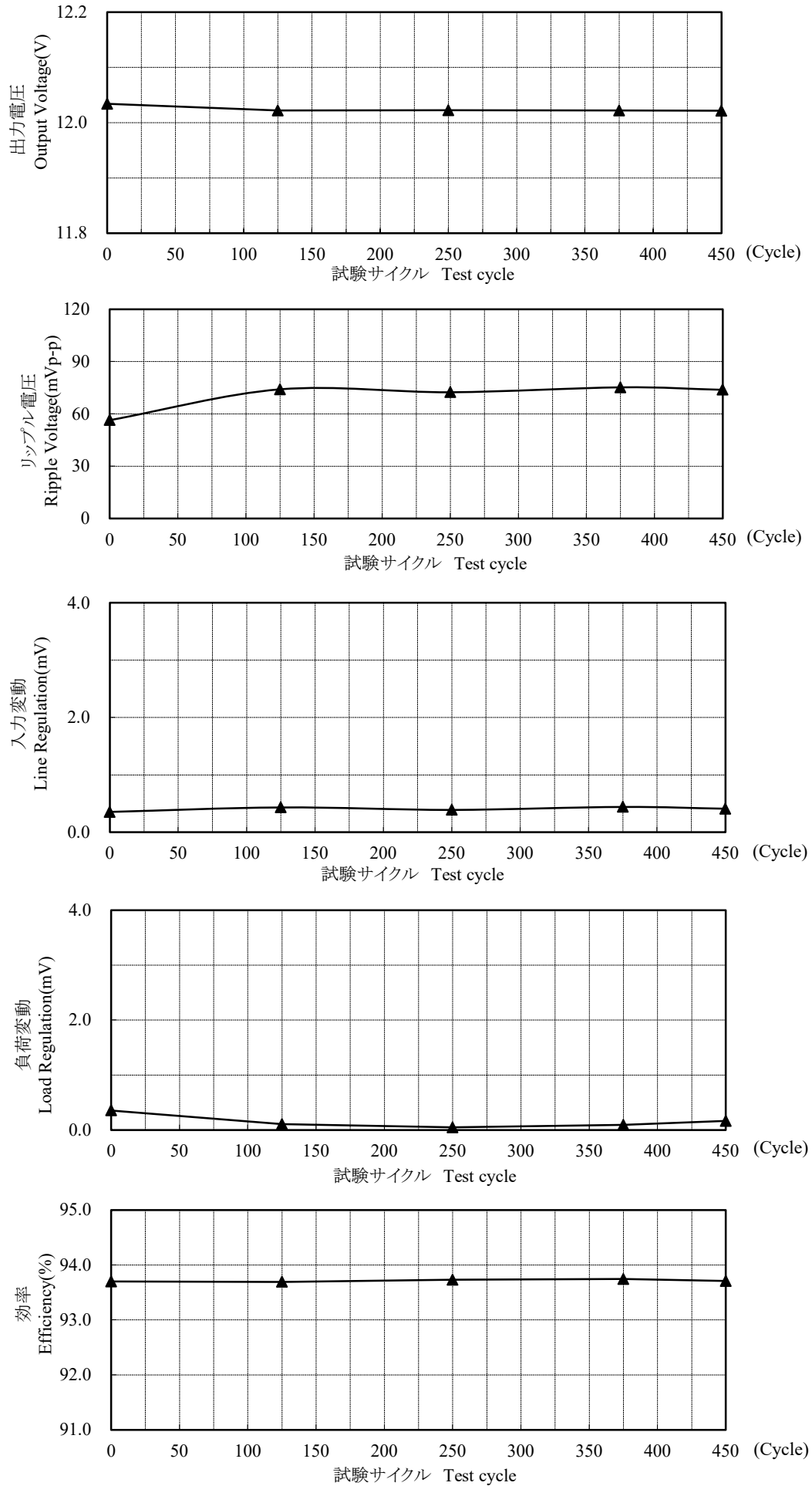
(5) 試験結果 Test Results

合格 OK

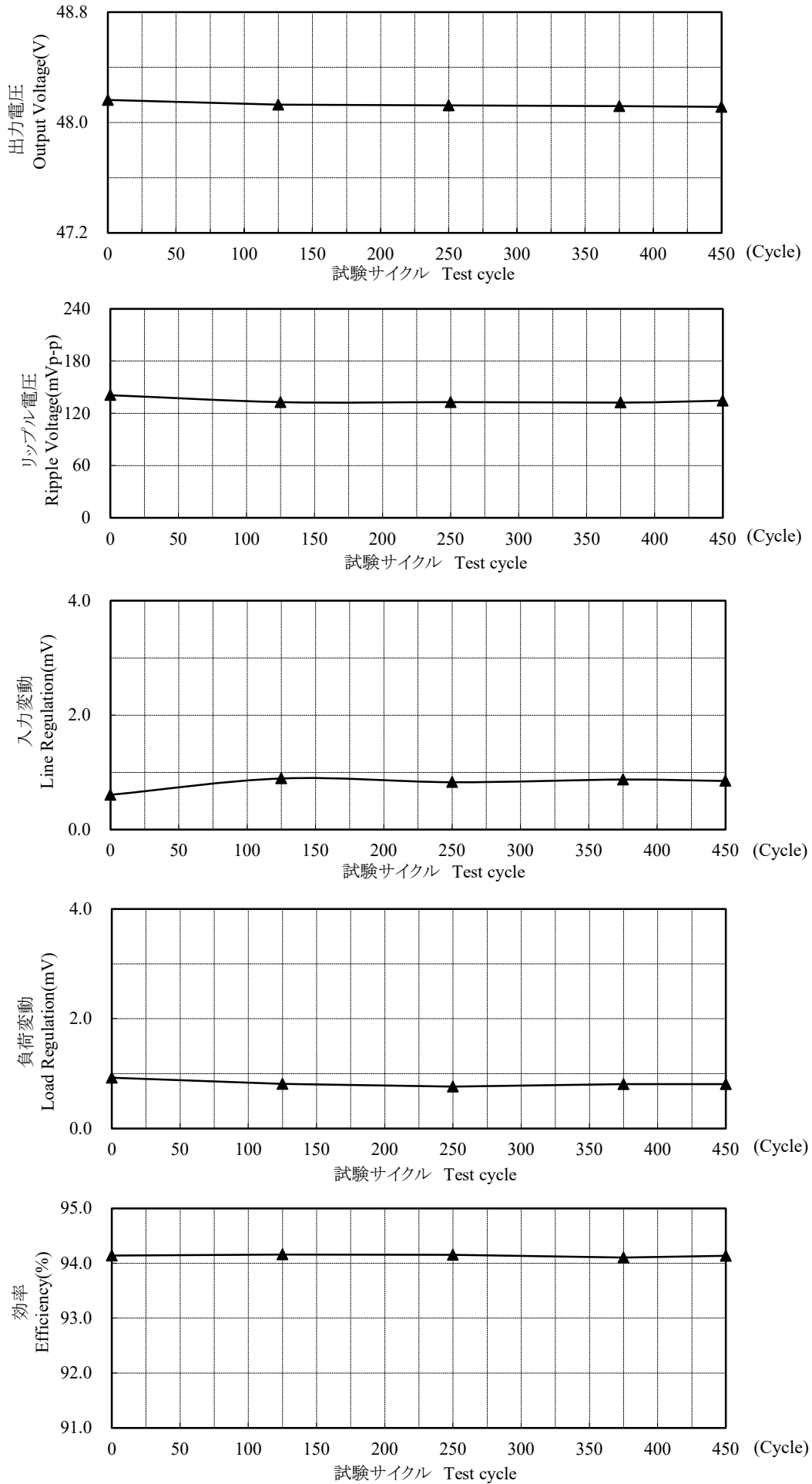
測定データは、次頁に示す。

See next page for measuring data.

(5)-1 PH1200A280-12



(5)-2 PH1200A280-48



10. 高温加湿通電試験 High Temperature and High Humidity Bias Test

MODEL : PH1200A280-12, PH1200A280-48

(1) 使用計測器 Equipment Used

TEMP.& HUMID. CHAMBER PSL-2KPH (ESPEC CORP.)

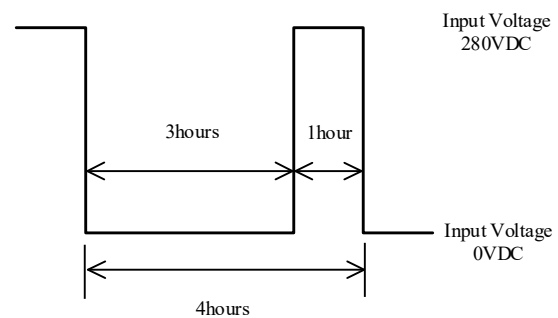
(2) 供試体台数 The Number of D.U.T. (Device Under Test)

PH1200A280-12 : 3台 (3 units)

PH1200A280-48 : 3台 (3 units)

(3) 試験条件 Test Conditions

- ・周囲温度 : 85°C
Ambient Temperature
- ・湿度 : 95%RH
Humidity
- ・試験時間 : 500時間
Test Time 500hours
- ・入力電圧 : 0VDC ⇔ 280VDC
Input Voltage
- ・出力電圧 : 定格
Output Voltage Rated
- ・出力電流 : 0A (0%)
Output Current



(4) 試験方法 Test Method

初期測定の後、供試体を試験槽に入れ、槽の温度を室温(25°C)からベースプレート温度が規定の温度(85°C)になるまで徐々に上げる。供試体を規定の条件にて500時間動作させ、常温常湿下に1時間放置した後、出力に異常がない事を確認する。

Check if there is no abnormal output before test. Then fix the D.U.T. in testing chamber, and the baseplate temperature is gradually increased from 25°C to 85°C. Operate the D.U.T. for 500 hours according to above conditions and leave D.U.T for 1 hour at the room temperature, then check if there is no abnormal output.

(5) 試験結果 Test Results

(5)-1 PH1200A280-12

合格 OK

・試験条件 Test Conditions

入力電圧 : 280VDC

出力電流 : 100A(100%)

ベースプレート温度 : 25°C

Input Voltage

Output Current

Baseplate Temperature

| 測定確認項目 Check Item | | No.1 | | No.2 | | No.3 | |
|------------------------------|-------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|
| | | 試験前 Before Test | 試験後 After Test | 試験前 Before Test | 試験後 After Test | 試験前 Before Test | 試験後 After Test |
| 出力電圧 Output Voltage | V | 12.031 | 12.027 | 12.040 | 12.037 | 12.039 | 12.042 |
| リップル電圧 Ripple Voltage | mVp-p | 55 | 74 | 60 | 78 | 59 | 80 |
| 入力変動 Line Regulation | mV | 0.361 | 0.508 | 0.494 | 0.302 | 0.296 | 0.341 |
| 負荷変動 Load Regulation | mV | 0.192 | 0.102 | 0.133 | 0.127 | 0.131 | 0.166 |
| 絶縁抵抗 Isolation Resistance | — | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK |
| 耐電圧 Withstand Voltage | — | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK |
| 外観 Appearance | — | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK |

(5)-2 PH1200A280-48

合格 OK

・試験条件 Test Conditions

入力電圧 : 280VDC

出力電流 : 25A(100%)

ベースプレート温度 : 25°C

Input Voltage

Output Current

Baseplate Temperature

| 測定確認項目 Check Item | | No.1 | | No.2 | | No.3 | |
|------------------------------|-------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|
| | | 試験前 Before Test | 試験後 After Test | 試験前 Before Test | 試験後 After Test | 試験前 Before Test | 試験後 After Test |
| 出力電圧 Output Voltage | V | 48.154 | 48.178 | 48.173 | 48.132 | 48.164 | 48.151 |
| リップル電圧 Ripple Voltage | mVp-p | 144.000 | 142.000 | 140.000 | 140.000 | 137.000 | 142.000 |
| 入力変動 Line Regulation | mV | 0.769 | 0.807 | 0.650 | 0.520 | 0.630 | 0.664 |
| 負荷変動 Load Regulation | mV | 0.669 | 0.708 | 0.549 | 0.581 | 0.827 | 0.710 |
| 絶縁抵抗 Isolation Resistance | — | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK |
| 耐電圧 Withstand Voltage | — | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK |
| 外観 Appearance | — | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK |

11. 高温連続通電試験 High Temperature Bias Test**MODEL : PH1200A280-12, PH1200A280-48****(1) 使用計測器 Equipment Used**

TEMP. CHAMBER PSL-2KPH (ESPEC CORP.)

(2) 供試体台数 The Number of D.U.T. (Device Under Test)

PH1200A280-12 : 3 台 (3 units)

PH1200A280-48 : 3 台 (3 units)

(3) 試験条件 Test Conditions

| | | | | | |
|-----------------------|----------|---------------------|--------|----------------|-----------|
| ・ベースプレート温度 | : 100°C | ・周囲温度 | : 85°C | ・試験時間 | : 500 時間 |
| Baseplate Temperature | | Ambient Temperature | | Test Time | 500 hours |
| ・入力電圧 | : 280VDC | ・出力電圧 | : 定格 | ・出力電流 | : 100% |
| Input Voltage | | Output Voltage | Rated | Output Current | |

(4) 試験方法 Test Method

初期測定の後、供試体を試験槽に入れ、槽の温度を室温(25°C)からベースプレート温度が規定の温度(100°C)になるまで徐々に上げる。供試体を規定の条件にて500時間動作させ、常温常湿下に1時間放置した後、出力に異常がない事を確認する。

Check if there is no abnormal output before test. Then fix the D.U.T. in testing chamber, and the baseplate temperature is gradually increased from 25°C to 100°C. Operate the D.U.T. for 500 hours according to above conditions and leave D.U.T for 1 hour at the room temperature, then check if there is no abnormal output.

(5) 試験結果 Test Results

(5)-1 PH1200A280-12

合格 OK

・試験条件 Test Conditions

入力電圧 : 280VDC

出力電流 : 100A(100%)

ベースプレート温度 : 25°C

Input Voltage

Output Current

Baseplate Temperature

| 測定確認項目 Check Item | | No.1 | | No.2 | | No.3 | |
|------------------------------|-------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|
| | | 試験前 Before Test | 試験後 After Test | 試験前 Before Test | 試験後 After Test | 試験前 Before Test | 試験後 After Test |
| 出力電圧 Output Voltage | V | 12.018 | 12.015 | 11.998 | 11.995 | 11.993 | 11.996 |
| リップル電圧 Ripple Voltage | mVp-p | 60 | 53 | 36 | 54 | 54 | 53 |
| 入力変動 Line Regulation | mV | 0.609 | 0.325 | 0.400 | 0.269 | 0.029 | 0.289 |
| 負荷変動 Load Regulation | mV | 0.051 | 0.006 | 0.107 | 0.028 | 0.254 | 0.036 |
| 絶縁抵抗 Isolation Resistance | — | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK |
| 耐電圧 Withstand Voltage | — | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK |
| 外観 Appearance | — | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK |

(5)-2 PH1200A280-48

合格 OK

・試験条件 Test Conditions

入力電圧 : 280VDC

出力電流 : 25A(100%)

ベースプレート温度 : 25°C

Input Voltage

Output Current

Baseplate Temperature

| 測定確認項目 Check Item | | No.1 | | No.2 | | No.3 | |
|------------------------------|-------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|
| | | 試験前 Before Test | 試験後 After Test | 試験前 Before Test | 試験後 After Test | 試験前 Before Test | 試験後 After Test |
| 出力電圧 Output Voltage | V | 48.059 | 48.040 | 47.983 | 47.982 | 48.025 | 48.022 |
| リップル電圧 Ripple Voltage | mVp-p | 134 | 135 | 136 | 138 | 140 | 145 |
| 入力変動 Line Regulation | mV | 0.086 | 0.003 | 0.307 | 0.041 | 3.513 | 0.325 |
| 負荷変動 Load Regulation | mV | 0.257 | 0.462 | 1.345 | 0.455 | 2.486 | 0.677 |
| 絶縁抵抗 Isolation Resistance | — | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK |
| 耐電圧 Withstand Voltage | — | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK |
| 外観 Appearance | — | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK | 異常なし OK |