

G+GENESYS™ 7.5kW

RELIABILITY DATA

| DWG: IA922-79-01 | | |
|----------------------------|----------------------------|--------------------------|
| APPD | CHK | DWG |
| Yaniv Nisinman 03/03/22 | Barak Marmor 22/02/2022 | Amichai Wald 06/01/22 |

TDK-LAMBDA

| INDEX | PAGE |
|------------------------------------|---------|
| 1.MTBF; Calculated Value of MTBF | R-1 |
| 2.Components Derating | R-2~9 |
| 3.Main Components Temperature Rise | R-10~15 |
| 4.Elec. Capacitors Computed Life | R-16 |
| 5.Abnormal Test | R-17~23 |
| 6.Vibration Test | R-24 |

The above data is typical value. As all units have nearly the same characteristics, the data to be considered as ability value.

M.T.B.F.

Calculation based on parts stress reliability projection of Telcordia (Bellcore)
 "Reliability Prediction Procedure for Electronic Equipment" Document number TR-322, Issue5)
 Individual failure λ_{SSi} is calculated from electrical stress and temperature rise of each device.

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

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

- λ_{equip} : Total Equipment failure rate (FITs = Failures in 10^9 hours)
- λ_{Gi} : Generic failure rate for the i th device
- π_{Qi} : Quality factor for the i th device
- π_{Si} : Stress factor for the i th device
- π_{Ti} : Temperature factor for the i th device
- m : Number of different device types
- N_i : Quantity of i th device type
- π_E : Equipment environmental factor

Conditions:

Vin=200VAC

Vo=600V

Io=12.5A

Ta=25°C

Environmental Factor: Gf - Ground, Fixed, Uncontrolled

M.T.B.F. = 367163 (HOURS)

2.COMPONENT DERATING

G+7.5KW SERIES

Calculation method

(1) Conditions

| | |
|----------------------|--------------------------|
| Input: | Nominal |
| Output: | Vout - 100%, Iout - 100% |
| Ambient temperature: | 50°C |
| Mounting Method: | Standard Mounting |

(2) Semiconductors

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

(3) IC, Resistors, Capacitors, etc.

Ambient temperature, operating conditions and power dissipation are within derating criteria.

(4) Calculation method of thermal impedance:

$$\Theta_{j-a} = \frac{Tj(\max) - Ta}{Pc(\max)} \quad \Theta_{j-c} = \frac{Tj(\max) - Tc}{Pc(\max)} \quad \Theta_{j-l} = \frac{Tj(\max) - Tl}{Pc(\max)}$$

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

Ta: Ambient Temperature at Start Point of Derating; 25°C in General

Pc (max): Maximum Power Dissipation

Tj (max): Maximum Junction temperature

Θ_{j-c} : Thermal Impedance between Junction and Case

Θ_{j-a} : Thermal Impedance between Junction and Air

Θ_{j-l} : Thermal Impedance between Junction and Lead

Vin = 170Vac Load = 100% Ta=50°C **INPUT 3-PHASE 208V**

| | | | |
|----------------------------------------|-----------------------------------------------------------|----------------------------------------------------|------------------------------------------------|
| D1 STBR6012W ST | Tjmax= 175 °C Pd = 12.5 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.45 °C/W DTc = 44.9 °C Tj = 100.5 °C | Pmax = --- W Tc = 94.9 °C D.F. = 57.4 % |
| D2 STBR6012W ST | Tjmax= 175 °C Pd = 12.5 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.45 °C/W DTc = 47.3 °C Tj = 102.9 °C | Pmax = --- W Tc = 97.3 °C D.F. = 58.8 % |
| D3 STBR6012W ST | Tjmax= 175 °C Pd = 12.5 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.45 °C/W DTc = 44.9 °C Tj = 100.5 °C | Pmax = --- W Tc = 94.9 °C D.F. = 57.4 % |
| D4 STBR6012W ST | Tjmax= 175 °C Pd = 12.5 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.45 °C/W DTc = 47.6 °C Tj = 103.2 °C | Pmax = --- W Tc = 97.6 °C D.F. = 59.0 % |
| D5 STBR6012W ST | Tjmax= 175 °C Pd = 12.5 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.45 °C/W DTc = 44.6 °C Tj = 100.3 °C | Pmax = --- W Tc = 94.6 °C D.F. = 57.3 % |
| D6 STBR6012W ST | Tjmax= 175 °C Pd = 12.5 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.45 °C/W DTc = 40.2 °C Tj = 95.8 °C | Pmax = --- W Tc = 90.2 °C D.F. = 54.8 % |
| A1 TL432AQDBZR Texas Instruments | Tjmax= 150 °C Pd = --- W Tj = Tc + (q j-c x Pd) => | qj-c = --- °C/W DTc = 30.0 °C Tj = 80.0 °C | Pmax = --- W Tc = 80.0 °C D.F. = 53.3 % |
| A2 TL432AQDBZR Texas Instruments | Tjmax= 150 °C Pd = --- W Tj = Tc + (q j-c x Pd) => | qj-c = --- °C/W DTc = 30.0 °C Tj = 80.0 °C | Pmax = --- W Tc = 80.0 °C D.F. = 53.3 % |
| L1 IA938-35-01 TDK | Tjmax= 155 °C Pd = --- W Tj = Tc + (q j-c x Pd) => | qj-c = --- °C/W DTc = 54.1 °C Tj = 104.1 °C | Pmax = --- W Tc = 104.1 °C D.F. = 67.2 % |
| L2 IA938-35-01 TDK | Tjmax= 155 °C Pd = --- W Tj = Tc + (q j-c x Pd) => | qj-c = --- °C/W DTc = 45.7 °C Tj = 95.7 °C | Pmax = --- W Tc = 95.7 °C D.F. = 61.7 % |

Vin = 342Vac Load = 100% Ta=50°C **INPUT 3-PHASE 480V**

| | | | |
|----------------------------------------|----------------------------------------------------------|---------------------------------------------------|------------------------------------------------|
| L1 IA765-35-03 TDK | Tjmax= 155 °C Pd = --- W Tj = Tc + (q j-c x Pd) => | qj-c = --- °C/W DTc = 55.9 °C Tj = 105.9 °C | Pmax = --- W Tc = 105.9 °C D.F. = 68.3 % |
| A1 TL432AQDBZR Texas Instruments | Tjmax= 150 °C Pd = --- W Tj = Tc + (q j-c x Pd) => | qj-c = --- °C/W DTc = 22.0 °C Tj = 72.0 °C | Pmax = --- W Tc = 72.0 °C D.F. = 48.0 % |
| A2 TL432AQDBZR Texas Instruments | Tjmax= 150 °C Pd = --- W Tj = Tc + (q j-c x Pd) => | qj-c = --- °C/W DTc = 22.0 °C Tj = 72.0 °C | Pmax = --- W Tc = 72.0 °C D.F. = 48.0 % |

Vin = 170Vac Load = 100% Ta=50°C **BIAS 208**

| | | | |
|--------------------------------|-----------------------------------------------------------|----------------------------------------------------|-----------------------------------------------|
| A3 MIP2E2DMUL MATSUSHITA | Tjmax= 150 °C Pd = 1.23 W Tj = Tc + (q j-c x Pd) => | qj-c = 10.0 °C/W DTc = 40.0 °C Tj = 102.3 °C | Pmax = --- W Tc = 90.0 °C D.F. = 68.2 % |
| A4 MIP2E5DMY PANASONIC | Tjmax= 150 °C Pd = 0.99 W Tj = Tc + (q j-c x Pd) => | qj-c = 3.0 °C/W DTc = 26.0 °C Tj = 79.0 °C | Pmax = --- W Tc = 76.0 °C D.F. = 52.6 % |
| A5 MIP2E4DMY PANASONIC | Tjmax= 150 °C Pd = 0.71 W Tj = Tc + (q j-c x Pd) => | qj-c = 3.0 °C/W DTc = 24.0 °C Tj = 76.1 °C | Pmax = --- W Tc = 74.0 °C D.F. = 50.8 % |

 Vin = 342Vac Load = 100% Ta=50°C **BIAS 480**

| | | | |
|-------------------------------|-----------------------------------------------------------|---------------------------------------------------|-----------------------------------------------|
| D9 STBR6012W ST | Tjmax= 175 °C Pd = 8.51 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.5 °C/W DTc = 24.0 °C Tj = 78.3 °C | Pmax = --- W Tc = 74.0 °C D.F. = 44.7 % |
| D32 STBR6012W ST | Tjmax= 175 °C Pd = 8.51 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.5 °C/W DTc = 24.0 °C Tj = 78.3 °C | Pmax = --- W Tc = 74.0 °C D.F. = 44.7 % |
| D33 STBR6012W ST | Tjmax= 175 °C Pd = 8.51 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.5 °C/W DTc = 24.0 °C Tj = 78.3 °C | Pmax = --- W Tc = 74.0 °C D.F. = 44.7 % |
| D34 STBR6012W ST | Tjmax= 175 °C Pd = 8.51 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.5 °C/W DTc = 24.0 °C Tj = 78.3 °C | Pmax = --- W Tc = 74.0 °C D.F. = 44.7 % |
| D35 STBR6012W ST | Tjmax= 175 °C Pd = 8.51 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.5 °C/W DTc = 24.0 °C Tj = 78.3 °C | Pmax = --- W Tc = 74.0 °C D.F. = 44.7 % |
| D36 STBR6012W ST | Tjmax= 175 °C Pd = 8.51 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.5 °C/W DTc = 24.0 °C Tj = 78.3 °C | Pmax = --- W Tc = 74.0 °C D.F. = 44.7 % |
| A2 MIP2E4DMY PANASONIC | Tjmax= 150 °C Pd = 0.72 W Tj = Tc + (q j-c x Pd) => | qj-c = 3.0 °C/W DTc = 15.0 °C Tj = 67.2 °C | Pmax = --- W Tc = 65.0 °C D.F. = 44.8 % |
| A3 MIP2E4DMY PANASONIC | Tjmax= 150 °C Pd = 0.87 W Tj = Tc + (q j-c x Pd) => | qj-c = 3.0 °C/W DTc = 30.0 °C Tj = 82.6 °C | Pmax = --- W Tc = 80.0 °C D.F. = 55.1 % |
| A5 MIP2E2DMUL PANASONIC | Tjmax= 150 °C Pd = 0.87 W Tj = Tc + (q j-c x Pd) => | qj-c = 10.0 °C/W DTc = 28.7 °C Tj = 87.4 °C | Pmax = --- W Tc = 78.7 °C D.F. = 58.3 % |

Vin = 170Vac Load = 100% Ta=50°C **PFC 208**

| | | | |
|--------------------------------------|-----------------------------------------------------------|---------------------------------------------------|-------------------------------------------------|
| Q3 IPW60R037P7 INFINEON | Tjmax= 150 °C Pd = 10.8 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.5 °C/W DTc = 47.2 °C Tj = 102.5 °C | Pmax = 255.0 W Tc = 97.2 °C D.F. = 68.3 % |
| Q4 IPW60R037P7 INFINEON | Tjmax= 150 °C Pd = 10.8 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.5 °C/W DTc = 46.5 °C Tj = 101.8 °C | Pmax = 255.0 W Tc = 96.5 °C D.F. = 67.8 % |
| Q7 IPW60R037P7 INFINEON | Tjmax= 150 °C Pd = 10.8 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.5 °C/W DTc = 47.2 °C Tj = 102.5 °C | Pmax = 255.0 W Tc = 97.2 °C D.F. = 68.3 % |
| Q8 IPW60R037P7 INFINEON | Tjmax= 150 °C Pd = 10.8 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.5 °C/W DTc = 44.7 °C Tj = 100.0 °C | Pmax = 255.0 W Tc = 94.7 °C D.F. = 66.6 % |
| D2 IDH10G65C6XKSA1 INFINEON | Tjmax= 175 °C Pd = 7.3 W Tj = Tc + (q j-c x Pd) => | qj-c = 1.3 °C/W DTc = 33.4 °C Tj = 92.8 °C | Pmax = 72.0 W Tc = 83.4 °C D.F. = 53.1 % |
| D3 IDH10G65C6XKSA1 INFINEON | Tjmax= 175 °C Pd = 7.3 W Tj = Tc + (q j-c x Pd) => | qj-c = 1.3 °C/W DTc = 24.8 °C Tj = 84.2 °C | Pmax = 72.0 W Tc = 74.8 °C D.F. = 48.1 % |
| D5 IDH10G65C6XKSA1 INFINEON | Tjmax= 175 °C Pd = 7.3 W Tj = Tc + (q j-c x Pd) => | qj-c = 1.3 °C/W DTc = 24.5 °C Tj = 83.9 °C | Pmax = 72.0 W Tc = 74.5 °C D.F. = 48.0 % |
| D6 IDH10G65C6XK+B65SA INFINEON | Tjmax= 175 °C Pd = 7.3 W Tj = Tc + (q j-c x Pd) => | qj-c = 1.3 °C/W DTc = 28.6 °C Tj = 88.1 °C | Pmax = 72.0 W Tc = 78.6 °C D.F. = 50.3 % |

 Vin = 342Vac Load = 100% Ta=50°C **PFC 480**

| | | | |
|---------------------------|-----------------------------------------------------------|---------------------------------------------------|--------------------------------------------------|
| Q8 SCT2160KEC ROHM | Tjmax= 175 °C Pd = 12.7 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.7 °C/W DTc = 55.7 °C Tj = 114.6 °C | Pmax = 165.0 W Tc = 105.7 °C D.F. = 65.5 % |
| Q9 SCT2160KEC ROHM | Tjmax= 175 °C Pd = 12.7 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.7 °C/W DTc = 41.2 °C Tj = 100.1 °C | Pmax = 165.0 W Tc = 91.2 °C D.F. = 57.2 % |
| Q10 SCT2160KEC ROHM | Tjmax= 175 °C Pd = 12.7 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.7 °C/W DTc = 59.6 °C Tj = 118.5 °C | Pmax = 165.0 W Tc = 109.6 °C D.F. = 67.7 % |
| Q11 SCT2160KEC ROHM | Tjmax= 175 °C Pd = 12.7 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.7 °C/W DTc = 55.2 °C Tj = 114.1 °C | Pmax = 165.0 W Tc = 105.2 °C D.F. = 65.2 % |
| D5 SCS205KGC ROHM | Tjmax= 175 °C Pd = 1.32 W Tj = Tc + (q j-c x Pd) => | qj-c = 1.5 °C/W DTc = 13.4 °C Tj = 65.4 °C | Pmax = 88.0 W Tc = 63.4 °C D.F. = 37.4 % |
| D6 SCS205KGC ROHM | Tjmax= 175 °C Pd = 1.32 W Tj = Tc + (q j-c x Pd) => | qj-c = 1.5 °C/W DTc = 10.5 °C Tj = 62.5 °C | Pmax = 88.0 W Tc = 60.5 °C D.F. = 35.7 % |
| D7 SCS205KGC ROHM | Tjmax= 175 °C Pd = 1.32 W Tj = Tc + (q j-c x Pd) => | qj-c = 1.5 °C/W DTc = 14.5 °C Tj = 66.5 °C | Pmax = 88.0 W Tc = 64.5 °C D.F. = 38.0 % |
| D8 SCS205KGC ROHM | Tjmax= 175 °C Pd = 1.32 W Tj = Tc + (q j-c x Pd) => | qj-c = 1.5 °C/W DTc = 14.4 °C Tj = 66.4 °C | Pmax = 88.0 W Tc = 64.4 °C D.F. = 37.9 % |

Vin = 170Vac

Load = 100%

Ta=50°C

DC/DC 20V

| | | | |
|----------------------------------------|-----------------------------------------------------------|---------------------------------------------------|-------------------------------------------------|
| Q1 FMW30N60S1HF Fuji | Tjmax= 150 °C Pd = 6.2 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.57 °C/W DTc = 27.2 °C Tj = 80.8 °C | Pmax = 220.0 W Tc = 77.2 °C D.F. = 53.8 % |
| Q2 FMW30N60S1HF Fuji | Tjmax= 150 °C Pd = 6.26 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.57 °C/W DTc = 25.1 °C Tj = 78.6 °C | Pmax = 220.0 W Tc = 75.1 °C D.F. = 52.4 % |
| Q33 FMW30N60S1HF Fuji | Tjmax= 150 °C Pd = 6.03 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.57 °C/W DTc = 26.2 °C Tj = 79.7 °C | Pmax = 220.0 W Tc = 76.2 °C D.F. = 53.1 % |
| Q5 TK62N60W5,S1VF TOSHIBA | Tjmax= 150 °C Pd = 4.75 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.31 °C/W DTc = 21.5 °C Tj = 73.0 °C | Pmax = 130.0 W Tc = 71.5 °C D.F. = 48.7 % |
| Q6 TK62N60W5,S1VF TOSHIBA | Tjmax= 150 °C Pd = 4.48 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.31 °C/W DTc = 25.7 °C Tj = 77.1 °C | Pmax = 130.0 W Tc = 75.7 °C D.F. = 51.4 % |
| Q9 TK62N60W5,S1VF TOSHIBA | Tjmax= 150 °C Pd = 4.99 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.31 °C/W DTc = 22.7 °C Tj = 74.3 °C | Pmax = 130.0 W Tc = 72.7 °C D.F. = 49.5 % |
| Q10 TK62N60W5,S1VF TOSHIBA | Tjmax= 150 °C Pd = 4.59 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.31 °C/W DTc = 25.3 °C Tj = 76.7 °C | Pmax = 130.0 W Tc = 75.3 °C D.F. = 51.1 % |
| Q17,Q19,Q21 IPP023N10N5 INFINEON | Tjmax= 175 °C Pd = 2.48 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.4 °C/W DTc = 38.8 °C Tj = 89.8 °C | Pmax = 375.0 W Tc = 88.8 °C D.F. = 51.3 % |
| Q23-Q27 IPP023N10N5 INFINEON | Tjmax= 175 °C Pd = 2.48 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.4 °C/W DTc = 39.4 °C Tj = 90.4 °C | Pmax = 375.0 W Tc = 89.4 °C D.F. = 51.6 % |
| D4 IDH10G65C6 INFINEON | Tjmax= 175 °C Pd = 8.3 W Tj = Tc + (q j-c x Pd) => | qj-c = 1.3 °C/W DTc = 26.7 °C Tj = 87.5 °C | Pmax = 72.0 W Tc = 76.7 °C D.F. = 50.0 % |

Vin = 170Vac Load = 100% Ta=50°C **DC/DC 150V**

| | | | |
|----------------------------------|-----------------------------------------------------------|---------------------------------------------------|-------------------------------------------------|
| Q1 FMW30N60S1HF Fuji | Tjmax= 150 °C Pd = 6.33 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.57 °C/W DTc = 21.0 °C Tj = 74.6 °C | Pmax = 220.0 W Tc = 71.0 °C D.F. = 49.7 % |
| Q2 FMW30N60S1HF Fuji | Tjmax= 150 °C Pd = 5.61 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.57 °C/W DTc = 25.9 °C Tj = 79.1 °C | Pmax = 220.0 W Tc = 75.9 °C D.F. = 52.7 % |
| Q17 FMW30N60S1HF Fuji | Tjmax= 150 °C Pd = 5.94 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.57 °C/W DTc = 25.1 °C Tj = 78.5 °C | Pmax = 220.0 W Tc = 75.1 °C D.F. = 52.3 % |
| Q5 TK62N60W5,S1VF TOSHIBA | Tjmax= 150 °C Pd = 4.55 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.31 °C/W DTc = 22.4 °C Tj = 73.8 °C | Pmax = 130.0 W Tc = 72.4 °C D.F. = 49.2 % |
| Q6 TK62N60W5,S1VF TOSHIBA | Tjmax= 150 °C Pd = 4.72 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.31 °C/W DTc = 26.4 °C Tj = 77.9 °C | Pmax = 130.0 W Tc = 76.4 °C D.F. = 51.9 % |
| Q9 TK62N60W5,S1VF TOSHIBA | Tjmax= 150 °C Pd = 4.38 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.31 °C/W DTc = 19.1 °C Tj = 70.5 °C | Pmax = 130.0 W Tc = 69.1 °C D.F. = 47.0 % |
| Q10 TK62N60W5,S1VF TOSHIBA | Tjmax= 150 °C Pd = 4.66 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.31 °C/W DTc = 19.1 °C Tj = 70.6 °C | Pmax = 130.0 W Tc = 69.1 °C D.F. = 47.0 % |
| D30~D33 STTH50W03CW ST | Tjmax= 175 °C Pd = 8.33 W Tj = Tc + (q j-c x Pd) => | qj-c = 1.0 °C/W DTc = 46.0 °C Tj = 104.3 °C | Pmax = --- W Tc = 96.0 °C D.F. = 59.6 % |
| D4 IDH10G65C6 INFINEON | Tjmax= 175 °C Pd = 8.96 W Tj = Tc + (q j-c x Pd) => | qj-c = 1.3 °C/W DTc = 27.2 °C Tj = 88.8 °C | Pmax = 72.0 W Tc = 77.2 °C D.F. = 50.8 % |

Vin = 170Vac

Load = 100%

Ta=50°C

DC/DC 500V (For 1500-5 P.S)

| | | | |
|----------------------------------------------------|-----------------------------------------------------------|---------------------------------------------------|-------------------------------------------------|
| Q1 FMW30N60S1HF Fuji | Tjmax= 150 °C Pd = 5.82 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.57 °C/W DTc = 21.0 °C Tj = 74.3 °C | Pmax = 220.0 W Tc = 71.0 °C D.F. = 49.5 % |
| Q2 FMW30N60S1HF Fuji | Tjmax= 150 °C Pd = 4.59 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.57 °C/W DTc = 25.5 °C Tj = 78.1 °C | Pmax = 220.0 W Tc = 75.5 °C D.F. = 52.1 % |
| Q5 TK62N60W5,S1VF TOSHIBA | Tjmax= 150 °C Pd = 4.03 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.31 °C/W DTc = 30.9 °C Tj = 82.2 °C | Pmax = 130.0 W Tc = 80.9 °C D.F. = 54.8 % |
| Q6 TK62N60W5,S1VF TOSHIBA | Tjmax= 150 °C Pd = 4.14 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.31 °C/W DTc = 33.1 °C Tj = 84.4 °C | Pmax = 130.0 W Tc = 83.1 °C D.F. = 56.3 % |
| Q9 TK62N60W5,S1VF TOSHIBA | Tjmax= 150 °C Pd = 3.99 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.31 °C/W DTc = 19.1 °C Tj = 70.3 °C | Pmax = 130.0 W Tc = 69.1 °C D.F. = 46.9 % |
| Q10 TK62N60W5,S1VF TOSHIBA | Tjmax= 150 °C Pd = 3.72 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.31 °C/W DTc = 19.1 °C Tj = 70.3 °C | Pmax = 130.0 W Tc = 69.1 °C D.F. = 46.8 % |
| D30, D32, D34, D37 IDH05G120C5XKSA1 INFINEON | Tjmax= 175 °C Pd = 4.5 W Tj = Tc + (q j-c x Pd) => | qj-c = 1.1 °C/W DTc = 36.6 °C Tj = 91.4 °C | Pmax = 109.0 W Tc = 86.6 °C D.F. = 52.2 % |
| D4 IDH10G65C6 INFINEON | Tjmax= 175 °C Pd = 2.2 W Tj = Tc + (q j-c x Pd) => | qj-c = 2.1 °C/W DTc = 27.3 °C Tj = 81.9 °C | Pmax = 72.0 W Tc = 77.3 °C D.F. = 46.8 % |

Vin = 170Vac

Load = 100%

Ta=50°C

DC/DC 600V


| | | | |
|------------------------------------|-----------------------------------------------------------|---------------------------------------------------|-------------------------------------------------|
| Q1 FMW30N60S1HF Fuji | Tjmax= 150 °C Pd = 5.82 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.57 °C/W DTc = 21.0 °C Tj = 74.3 °C | Pmax = 220.0 W Tc = 71.0 °C D.F. = 49.5 % |
| Q2 FMW30N60S1HF Fuji | Tjmax= 150 °C Pd = 4.59 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.57 °C/W DTc = 25.5 °C Tj = 78.1 °C | Pmax = 220.0 W Tc = 75.5 °C D.F. = 52.1 % |
| Q17 FMW30N60S1HF Fuji | Tjmax= 150 °C Pd = 5.82 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.57 °C/W DTc = 27.7 °C Tj = 81.0 °C | Pmax = 220.0 W Tc = 77.7 °C D.F. = 54.0 % |
| Q5 TK62N60W5,S1VF TOSHIBA | Tjmax= 150 °C Pd = 4.03 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.31 °C/W DTc = 30.9 °C Tj = 82.2 °C | Pmax = 130.0 W Tc = 80.9 °C D.F. = 54.8 % |
| Q6 TK62N60W5,S1VF TOSHIBA | Tjmax= 150 °C Pd = 4.14 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.31 °C/W DTc = 33.1 °C Tj = 84.4 °C | Pmax = 130.0 W Tc = 83.1 °C D.F. = 56.3 % |
| Q9 TK62N60W5,S1VF TOSHIBA | Tjmax= 150 °C Pd = 3.99 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.31 °C/W DTc = 19.1 °C Tj = 70.3 °C | Pmax = 130.0 W Tc = 69.1 °C D.F. = 46.9 % |
| Q10 TK62N60W5,S1VF TOSHIBA | Tjmax= 150 °C Pd = 3.72 W Tj = Tc + (q j-c x Pd) => | qj-c = 0.31 °C/W DTc = 19.1 °C Tj = 70.3 °C | Pmax = 130.0 W Tc = 69.1 °C D.F. = 46.8 % |
| D29~D36 IDH02G120C5 INFINEON | Tjmax= 175 °C Pd = 3.54 W Tj = Tc + (q j-c x Pd) => | qj-c = 1.5 °C/W DTc = 36.6 °C Tj = 92.1 °C | Pmax = --- W Tc = 86.6 °C D.F. = 52.6 % |
| D3 IDH10G65C6 INFINEON | Tjmax= 175 °C Pd = 2.2 W Tj = Tc + (q j-c x Pd) => | qj-c = 1.3 °C/W DTc = 27.3 °C Tj = 80.2 °C | Pmax = 72.0 W Tc = 77.3 °C D.F. = 45.8 % |

3.Main Components Temperature Rise

G20-375 3Φ208

| Location No. | | Parts Name | ΔT Temperature Rise (°C) |
|---------------|---------|-------------|--------------------------|
| | | | Standard Mounting |
| DCDC | C5 | E-Cap | 32.05 |
| | D4 | Diode | 26.67 |
| | L1 core | Choke | 54.43 |
| | L1 in | Choke | 47.00 |
| | L2 | Choke | 36.76 |
| | L3 core | Choke | 34.65 |
| | Q1 | Mosfet | 27.23 |
| | Q23 | Mosfet | 39.39 |
| | Q32 | Mosfet | 31.00 |
| | Q6 | Mosfet | 27.49 |
| | R90 | Shunt | 52.94 |
| | T2 | Transformer | 24.56 |
| | T3 core | Transformer | 33.91 |
| | T3 in | Transformer | 62.78 |
| PFC208 | C21 | E-Cap | 9.86 |
| | D2 | Diode | 37.31 |
| | L1 core | Choke | 7.88 |
| | L1 in | Choke | 50.73 |
| | Q3 | Mosfet | 55.61 |
| | T1 | Transformer | 27.81 |
| | T2 | Transformer | 26.39 |
| OUTPUT FILTER | C3 | E-Cap | 38.97 |
| | C8 | E-Cap | 39.22 |
| | L1 core | Choke | 34.84 |
| INPUT208 | D4 | Diode | 47.62 |
| | L1 | Choke | 73.03 |
| | L2 | Choke | 59.71 |
| | L3 | Choke | 46.98 |
| BIAS208 | A5 | Top-Switch | 30.18 |
| | C10 | E-Cap | 20.34 |
| | C31 | E-Cap | 20.43 |
| | C33 | E-Cap | 13.69 |
| | C35 | E-Cap | 10.48 |
| | T2 | Transformer | 43.04 |
| | T3 | Transformer | 46.14 |

Conditions:


| | |
|-------------------|--------------------------------------------------------------------------------------|
| Standard Mounting |  |
| Ta | 50°C |
| Input Voltage | 170~265V |
| Output Voltage | 20V |
| Output Current | 375A |

3.Main Components Temperature Rise

G20-375 3Φ480

| Location No. | | Parts Name | ΔT Temperature Rise (°C) |
|---------------|-------------|-------------|--------------------------|
| | | | Standard Mounting |
| DCDC | C5 | E-Cap | 31.20 |
| | C12 | E-Cap | 13.10 |
| | D4 | Diode | 24.48 |
| | L1 core | Choke | 48.32 |
| | L1 in | Choke | 42.32 |
| | L2 | Choke | 30.78 |
| | L3 core | Choke | 28.77 |
| | Q1 | Mosfet | 25.42 |
| | Q23 | Mosfet | 38.74 |
| | Q32 | Mosfet | 26.98 |
| | Q6 | Mosfet | 21.69 |
| | R90 | Shunt | 53.76 |
| | T1 | Transformer | 15.56 |
| | T2 | Transformer | 21.94 |
| | T3 core | Transformer | 27.43 |
| T3 in | Transformer | 58.23 | |
| PFC480 | C21 | E-Cap | 8.52 |
| | D7 | Diode | 15.91 |
| | L1 core | Choke | 7.30 |
| | L1 in | Choke | 44.50 |
| | Q10 | Mosfet | 60.70 |
| OUTPUT FILTER | C3 | E-Cap | 38.97 |
| | C8 | E-Cap | 39.22 |
| | L1 core | Choke | 34.84 |
| INPUT480 | L1 | Choke | 74.58 |
| BIAS 480 | A5 | Top-Switch | 33.02 |
| | C10 | E-Cap | 21.52 |
| | C18 | E-Cap | 21.52 |
| | C21 | E-Cap | 19.92 |
| | C5 | E-Cap | 24.49 |
| | L1 | Choke | 37.59 |
| | L2 | Choke | 73.22 |
| | L3 | Choke | 14.83 |
| | T1 | Transformer | 45.31 |
| | T2 | Transformer | 10.52 |
| T3 | Transformer | 41.88 | |

Conditions:


| | |
|-------------------|--------------------------------------------------------------------------------------|
| Standard Mounting |  |
| Ta | 50°C |
| Input Voltage | 342~520V |
| Output Voltage | 20V |
| Output Current | 375A |

3.Main Components Temperature Rise

G150-50 3Φ208

| Location No. | | Parts Name | ΔT Temperature Rise (°C) |
|---------------|-------------|-------------|--------------------------|
| | | | Standard Mounting |
| DC-DC | C5 | E-Cap | 27.46 |
| | C57 | E-Cap | 20.14 |
| | D4 | Diode | 27.20 |
| | D33 | Diode | 45.95 |
| | L1 core | Choke | 46.68 |
| | L1 in | Choke | 45.26 |
| | L2 | Choke | 36.68 |
| | L3 | Choke | 60.31 |
| | Q16 | Mosfet | 25.34 |
| | Q2 | Mosfet | 25.86 |
| | Q6 | Mosfet | 26.67 |
| | R96 | Shunt | 40.65 |
| | T1 | Transformer | 18.17 |
| | T2 | Transformer | 20.63 |
| | T3 core | Transformer | 33.44 |
| T3 in | Transformer | 60.48 | |
| OUTPUT FILTER | C15 | E-Cap | 33.34 |
| | C4 | E-Cap | 33.91 |
| | L1 core | Choke | 30.36 |

Conditions:


| | |
|-------------------|--------------------------------------------------------------------------------------|
| Standard Mounting |  |
| Ta | 50°C |
| Input Voltage | 170~265V |
| Output Voltage | 150V |
| Output Current | 50A |

3.Main Components Temperature Rise

G600-12.5 3Φ208

| Location No. | | Parts Name | ΔT Temperature Rise (°C) |
|---------------|-------------|-------------|--------------------------|
| | | | Standard Mounting |
| DC-DC | C13 | E-Cap | 27.98 |
| | C8 | E-Cap | 29.15 |
| | D3 | Diode | 27.35 |
| | D36 | Diode | 36.65 |
| | L1 core | Choke | 59.95 |
| | L1 in | Choke | 52.48 |
| | L2 | Choke | 28.91 |
| | L3 | Choke | 70.71 |
| | Q16 | Mosfet | 29.45 |
| | Q17 | Mosfet | 27.66 |
| | Q6 | Mosfet | 33.12 |
| | R99 | Shunt | 31.28 |
| | T1 | Transformer | 22.69 |
| | T2 | Transformer | 23.10 |
| T3 | Transformer | 66.12 | |
| PFC208 | C21 | E-Cap | 9.96 |
| | D2 | Diode | 32.11 |
| | L1 core | Choke | 8.74 |
| | L1 in | Choke | 50.08 |
| | Q3 | Mosfet | 50.81 |
| | T1 | Transformer | 25.28 |
| | T2 | Transformer | 23.48 |
| OUTPUT FILTER | C67 | E-Cap | 28.52 |
| | C7 | E-Cap | 27.78 |
| | L1 core | Choke | 27.85 |
| INPUT208 | D2 | Diode | 47.21 |
| | L1 | Choke | 67.33 |
| | L2 | Choke | 56.83 |
| | L3 | Choke | 44.10 |
| BIAS208 | A5 | Top-Switch | 25.31 |
| | C10 | E-Cap | 18.51 |
| | C31 | E-Cap | 18.57 |
| | C33 | E-Cap | 13.93 |
| | C35 | E-Cap | 10.49 |
| | T2 | Transformer | 42.14 |
| | T3 | Transformer | 37.72 |

Conditions:


| | |
|-------------------|--------------------------------------------------------------------------------------|
| Standard Mounting |  |
| Ta | 50°C |
| Input Voltage | 170V~265V |
| Output Voltage | 600V |
| Output Current | 12.5A |

3.Main Components Temperature Rise

G600-12.5 3Φ480

| Location No. | | Parts Name | ΔT Temperature Rise (°C) |
|---------------|-------------|-------------|--------------------------|
| | | | Standard Mounting |
| DC-DC | C13 | E-Cap | 24.10 |
| | C8 | E-Cap | 24.65 |
| | D3 | Diode | 25.70 |
| | D36 | Diode | 33.30 |
| | L1 core | Choke | 51.04 |
| | L1 in | Choke | 45.09 |
| | L2 | Choke | 26.67 |
| | L3 | Choke | 68.34 |
| | Q16 | Mosfet | 25.67 |
| | Q17 | Mosfet | 25.64 |
| | Q6 | Mosfet | 26.25 |
| | R99 | Shunt | 29.07 |
| | T1 | Transformer | 19.08 |
| | T2 | Transformer | 21.02 |
| T3 | Transformer | 63.72 | |
| PFC480 | C21 | E-Cap | 8.07 |
| | D5 | Diode | 14.66 |
| | L1 core | Choke | 5.69 |
| | L1 in | Choke | 42.60 |
| | Q10 | Mosfet | 54.07 |
| OUTPUT FILTER | C67 | E-Cap | 27.18 |
| | C7 | E-Cap | 26.49 |
| | L1 core | Choke | 26.98 |
| INPUT480 | L1 | Choke | 74.82 |
| BIAS 480 | A5 | Top-Switch | 31.55 |
| | C10 | E-Cap | 19.97 |
| | C18 | E-Cap | 20.27 |
| | C21 | E-Cap | 19.68 |
| | C5 | E-Cap | 24.45 |
| | L1 | Choke | 41.09 |
| | L2 | Choke | 48.62 |
| | L3 | Choke | 17.34 |
| | T1 | Transformer | 41.02 |
| | T2 | Transformer | 9.24 |
| T3 | Transformer | 42.68 | |

Conditions:


| | |
|-------------------|--------------------------------------------------------------------------------------|
| Standard Mounting |  |
| Ta | 50°C |
| Input Voltage | 342~520V |
| Output Voltage | 600V |
| Output Current | 12.5A |

3.Main Components Temperature Rise

G1500-5 3Φ208

| Location No. | | Parts Name | ΔT Temperature Rise (°C) |
|---------------|-------------|-------------|--------------------------|
| | | | Standard Mounting |
| DC-DC | C13 | E-Cap | 25.65 |
| | C5 | E-Cap | 26.80 |
| | D32 | Diode | 34.83 |
| | D4 | Diode | 21.63 |
| | L1 core | Choke | 40.29 |
| | L1 in | Choke | 35.51 |
| | L2 | Choke | 35.65 |
| | L3 | Choke | 59.44 |
| | Q10 | Mosfet | 24.38 |
| | Q16 | Mosfet | 27.00 |
| | Q2 | Mosfet | 27.28 |
| | T1 | Transformer | 20.53 |
| | T2 | Transformer | 16.85 |
| | T3 core | Transformer | 39.86 |
| T3 in | Transformer | 61.77 | |
| OUTPUT FILTER | L1 Core | Choke | 24.08 |
| | R14 | Shunt | 30.27 |

Conditions:

| | |
|-------------------|--------------------------------------------------------------------------------------|
| Standard Mounting |  |
| Ta | 50°C |
| Input Voltage | 170V~265V |
| Output Voltage | 1500V |
| Output Current | 5A |

4.ELECTROLYTIC CAPACITORS LIFE TIME ESTIMATION


| MODEL | COMPUTED LIFE (year) at Tambient | | |
|-------------|----------------------------------|------|------|
| | 30°C | 40°C | 50°C |
| G20V-375A | 12.4 | 6.2 | 3.1 |
| G150V-50A | 15.0 | 7.6 | 3.8 |
| G600V-12.5A | 15.0 | 7.6 | 3.8 |
| G1500V-5A | 15.0 | 7.6 | 3.8 |

FORMULA: $L = L_o \times 2^{\frac{105-T_c}{10}}$ (years)

L: Elec.capacitor computed life (24 hours per day,365 days operation)

L_o: Guarantee life for Elec.capacitor

T_c: Case temperature of Elec.capacitor

| | |
|-------------------|--------------------------------------------------------------------------------------|
| Standard Mounting |  |
| Input Voltage | Nom. |
| Output Voltage | 100% |
| Output Current | 100% |

5. ABNORMAL TEST

BIAS 3P208

Condition: Ta:25°C Input:230VAC Vout:100% Iout:100%

| No. | Test Position | | Failure Mode | | Study result (prediction of the phenomena) | | | | | | | | | | | | | | Note | | | |
|-----|---------------|------------|--------------|------|--------------------------------------------|--------------|-------|-------|-------|---------|---------|-----------|-----|------|-----|---------|-----------|-----------|------|--------------------------------|--------|---------------------------------|
| | Location No. | Test Point | Short | Open | Fire | Slight Smoke | Smoke | Burst | Smell | Red Hot | Damaged | Fuse Open | PVO | PCCO | PTO | AC FAIL | No Output | No Change | | PS functional after AC recycle | Others | |
| 1 | A3 | 1-2 | ● | | | | | | | | | | | | | | | | | | | Display stopped working |
| 2 | | 1 | ● | ● | | | | | | | | | | | | | | | | ● | ● | Display stopped working |
| 3 | | 2-3 | ● | | | | | | | | | | | | | | | | | | | R34 |
| 4 | | 2 | ● | ● | | | | | | | | | | | | | | | | ● | ● | Display stopped working |
| 5 | | 3-1 | ● | ● | | | | | | | ● | | | | | | | | | | | R34, ZD3, A3, SelvBias |
| 6 | | 3 | ● | ● | | | | | | | | | | | | | | | | ● | ● | Display stopped working |
| 7 | A4 | 1-2 | ● | ● | | | | | | | | | | | | | ● | | | | | Output Hicc-Up, OTP after 3 min |
| 8 | | 1 | ● | ● | | | | | | | | | | | | | ● | | | | | Output Hicc-Up, OTP after 3 min |
| 9 | | 2-3 | ● | ● | | | | | | | ● | | | | | | ● | | | | | R60, Q11 |
| 10 | | 2 | ● | ● | | | | | | | | | | | | | ● | | | | | Output Hicc-Up, OTP after 3 min |
| 11 | | 3-1 | ● | ● | | | | | | | ● | | | | | | ● | | | | | R60, ZD4, Q11, Q14, Q15, Q16 |
| 12 | | 3 | ● | ● | | | | | | | | | | | | | ● | | | | | Output Hicc-Up, OTP after 3 min |
| 13 | A5 | 1-2 | ● | ● | | | | | | | | | | | | | | | | | | Internal Error |
| 14 | | 1 | ● | ● | | | | | | | | | | | | | | | | | | Internal Error |
| 15 | | 2-3 | ● | ● | | | | | | ● | ● | | | | | | | | | | | Internal Error |
| 16 | | 2 | ● | ● | | | | | | | | | | | | | | | | | | Internal Error |
| 17 | | 3-1 | ● | ● | | | | | | ● | ● | | | | | | | | | | | Internal Error |
| 18 | | 3 | ● | ● | | | | | | | | | | | | | | | | | | Internal Error |
| 19 | C10, C18 | | ● | ● | | | | | | | | | | | | | | | | | | Internal Error |
| 20 | | | ● | ● | | | | | | | | | | | | | | | | | | |
| 21 | C31, C32 | | ● | ● | | | | | | | | | | | | | ● | | | | | |
| 22 | | | ● | ● | | | | | | | | | | | | | | | | | | |
| 23 | C35, C37 | | ● | ● | | | | | | | | | | | | | | | | | | |
| 24 | | | ● | ● | | | | | | | | | | | | | | | | | | |
| 25 | D3, D5, D6 | A-C | ● | ● | | | | | | | | | | | | | | | | | | |
| 26 | | A | ● | ● | | | | | | | | | | | | | | | | | | |
| 27 | D11, D23, D24 | A-C | ● | ● | | | | | | | ● | | | | | | ● | | | | | C31, C32 |
| 28 | | A | ● | ● | | | | | | | | | | | | | | | | | | |
| 29 | D19, D20 | A-C | ● | ● | | | | | | | | | | | | | | | | | | |
| 30 | | A | ● | ● | | | | | | | | | | | | | | | | | | |
| 31 | Q16 | B-E | ● | ● | | | | | | | | | | | | | | | | | | Hicc-Up, OTP after 3 min |
| 32 | | B | ● | ● | | | | | | | | | | | | | | | | | | Hicc-Up, OTP after 3 min |
| 33 | | C-E | ● | ● | | | | | | | | | | | | | | | | | | VFAN=6V |
| 34 | | E | ● | ● | | | | | | | | | | | | | | | | | | Hicc-Up, OTP after 3 min |
| 35 | | C-B | ● | ● | | | | | | | | | | | | | | | | | | VFAN=6.5V |
| 36 | | C | ● | ● | | | | | | | | | | | | | | | | | | Hicc-Up, OTP after 3 min |

5. ABNORMAL TEST

PFC 3P208

Condition: Ta:25°C Input:230VAC Vout:100% Iout:100%

| No. | Test Position | | Failure Mode | | Study result (prediction of the phenomena) | | | | | | | | | | | | | | Note | | | | | | | | |
|-----|----------------|------------|--------------|------|--------------------------------------------|--------------|-------|-------|-------|---------|---------|-----------|---|---|---|---|---|---|------|---|---|---|---------|-----------|-----------|--------------------------------|--------------------------------------------|
| | Location No. | Test Point | Short | Open | Fire | Slight Smoke | Smoke | Burst | Smell | Red Hot | Damaged | Fuse Open | P | O | V | P | C | O | | P | - | O | AC FAIL | No Output | No Change | PS functional after AC recycle | Others |
| 1 | C21, C24 | | • | • | | | | | | | • | • | | | | | | | | | | | • | • | | | D1, Input3P208 - F1, F3, DC/DC 20V- F1,Q11 |
| 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | Display shows: V - 0 and I - 0 |
| 3 | D2, D3, D5, D6 | A-C | • | • | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | | A | • | • | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | L1, L2 | | • | • | | | | | | | • | • | | | | | | | | | | | • | • | | | Q3, Q4, R10, R14, ZD1: Input - F1, F3 |
| 6 | | | • | • | | | | | | | • | • | | | | | | | | | | | • | • | | | Q7, Q8, R24, R28, ZD2: Input - F1, F3 |
| 7 | Q3, Q4, Q7, Q8 | G-S | • | • | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | | G | • | • | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | | D-S | • | • | | | | | | | • | • | | | | | | | | | | | • | • | | | |
| 10 | | S | • | • | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | | D-G | • | • | | | | | | | • | • | | | | | | | | | | | • | • | | | |
| 12 | | D | • | • | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Q9, Q10, Q11 | G-S | • | • | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | | G | • | • | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | | D-S | • | • | | | | | | | | | | | | | | | | | | | | | | | |
| 16 | | S | • | • | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | | D-G | • | • | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | | D | • | • | | | | | | | | | | | | | | | | | | | | | | | |

5. ABNORMAL TEST

BIAS 3P480

Condition: Ta:25°C Input:480VAC Vout:100% Iout:100%

| No. | Test Position | | Failure Mode | | Study result (prediction of the phenomena) | | | | | | | | | | | | | | Note | | | |
|-----|-------------------------------|------------|--------------|------|--------------------------------------------|--------------|-------|-------|-------|---------|---------|-----------|-----|-----|-----|-----|---------|-----------|------|------------------------------------------|--------|--------------------------------------------------|
| | Location No. | Test Point | Short | Open | Fire | Slight Smoke | Smoke | Burst | Smell | Red Hot | Damaged | Fuse Open | P O | P C | P O | P O | AC FAIL | No Output | | No Change PS functional after AC recycle | Others | |
| 1 | A2 | 1-2 | • | | | | | | | | | | | | | | | | | | | FAN's stopped working, OTP after 3 min |
| 2 | based on GEN+ 5 abnormal test | 1 | | • | | | | | | | | | | | | | | | | | | FAN's stopped working, OTP after 3 min |
| 3 | | 2-3 | • | | | | | | | | | | | | | | | | | | | R118, Q5 |
| 4 | | 2 | | • | | | | | | | | | | | | | | | | | | FAN's stopped working, OTP after 3 min |
| 5 | | 2-3 | • | | | | | | | | | | | | | | | | | | | R118,Q5,Q22,Q20,Q19 |
| 6 | | 3 | | • | | | | | | | | | | | | | | | | | | FAN's stopped working, OTP after 3 min |
| 7 | A3 | 1-2 | • | | | | | | | | | | | | | | | | | | | Internal Error |
| 8 | based on GEN+ 5 abnormal test | 1 | | • | | | | | | | | | | | | | | | | | | Internal Error |
| 9 | | 2-3 | • | | | | | | | | • | • | | | | | | | | | | F1, F3, R74, Q5 |
| 10 | | 2 | | • | | | | | | | | | | | | | | | | | | Internal Error |
| 11 | | 3-1 | • | | | | | | | | • | • | | | | | | | | | | F1, F3, R74, Q5 |
| 12 | | 3 | | • | | | | | | | | | | | | | | | | | | Internal Error |
| 13 | A5 | 1-2 | • | | | | | | | | | | | | | | | | | | | Display stopped working |
| 14 | based on GEN+ 5 abnormal test | 1 | | • | | | | | | | | | | | | | | | | | | Display stopped working |
| 15 | | 2-3 | • | | | | | | | | • | • | | | | | | | | | | Display stopped working |
| 16 | | 2 | | • | | | | | | | | | | | | | | | | | | Display stopped working |
| 17 | | 3-1 | • | | | | | | | | • | • | | | | | | | | | | Display stopped working |
| 18 | | 3 | | • | | | | | | | | | | | | | | | | | | Display stopped working |
| 19 | C3, C9, C10 | | • | | | | | | | | | | | | | | | | | | | Internal Error |
| 20 | | | | • | | | | | | | | | | | | | | | | | | based on GEN+ 5 abnormal test |
| 21 | C24 | | • | | | | | | | | | | | | | | | | | | | display stopped working |
| 22 | | | | • | | | | | | | | | | | | | | | | | | based on GEN+ 5 abnormal test |
| 23 | D9, D32-D36 | A-C | • | | | | | | | | • | | | | | | | | | | | F1, F2, F3 |
| 24 | | A | | • | | | | | | | | | | | | | | | | | | Output - unstable, based on GEN+ 5 abnormal test |
| 25 | D15, D16 | A-C | • | | | | | | | | | | | | | | | | | | | Internal Error |
| 26 | | A | | • | | | | | | | | | | | | | | | | | | based on GEN+ 5 abnormal test |
| 27 | D26-D28 | A-C | • | | | | | | | | | | | | | | | | | | | Display stopped working |
| 28 | | A | | • | | | | | | | | | | | | | | | | | | based on GEN+ 5 abnormal test |
| 29 | D30,D31,D37 | A-C | • | | | | | | | | | | | | | | | | | | | FAN's stopped working, OTP after 3 min |
| 30 | | A | | • | | | | | | | | | | | | | | | | | | based on GEN+ 5 abnormal test |
| 31 | Q21 | G-S | • | | | | | | | | | | | | | | | | | | | |
| 32 | | G | | • | | | | | | | | | | | | | | | | | | |
| 33 | | D-S | • | | | | | | | | • | | | | | | | | | | | F1, F2 |
| 34 | | S | | • | | | | | | | | | | | | | | | | | | |
| 35 | | D-G | • | | | | | | | | • | • | | | | | | | | | | F1, F2, Q3 |
| 36 | | D | | • | | | | | | | | | | | | | | | | | | based on GEN+5 abnormal test |

5. ABNORMAL TEST

PFC 3P480

Condition: Ta:25°C Input:480VAC Vout:100% Iout:100%

| No. | Test Position | | Failure Mode | | Study result (prediction of the phenomena) | | | | | | | | | | | | | | Note | |
|-----|----------------|------------|--------------|------|--------------------------------------------|--------------|-------|-------|-------|---------|---------|-----------|-----|-----|-----|---------|-----------|----------------------------|------|-------------------------------------------|
| | Location No. | Test Point | Short | Open | Fire | Slight Smoke | Smoke | Burst | Smell | Red Hot | Damaged | Fuse Open | P O | P C | P O | AC FAIL | No Output | No Change after AC recycle | | Others |
| 1 | C4, C5, C6, C8 | | • | | | | | | | | | | | | | | | • | | Based on gen+5 abnormal test |
| 2 | | | | • | | | | | | | | | | | | | | • | | Internal Error |
| 3 | C2, C7, C9 | | • | | | | | | | | | | | | | | | • | | Based on gen+5 abnormal test |
| 4 | | | | • | | | | | | | | | | | | | | • | | Based on gen+5 abnormal test |
| 5 | C21, C24 | | • | | | | | | | | • | • | | | | • | | • | | DC/DC 20V- F1, Q11 |
| 6 | | | | • | | | | | | | | | | | | | | • | | |
| 7 | D5-D8 | A-C | • | | | | | | | | | | | | | | | • | • | Display shows: V - 0 and I - 0 |
| 8 | | A | • | | | | | | | | | | | | | | | • | | Based on gen+5 abnormal test |
| 9 | L1 | A-B | • | | | | | | | | • | • | | | | | | • | | Q10, Input480 - F1, F3 |
| 10 | | A | • | | | | | | | | | | | | | | | • | • | Q9, Q11 - temp enlarge from 60°C to 117°C |
| 11 | | 1-2 | • | | | | | | • | | • | • | | | | | | • | | L1/1-2, Input480 - F1, F2, F3 |
| 12 | | 1 | • | | | | | | | | | | | | | | | • | | Based on gen+5 abnormal test |
| 13 | Q10, Q11 | G-S | • | | | | | | | | | | | | | | | • | • | Q8, Q10 - temp enlarge from 60°C to 117°C |
| 14 | | G | • | | | | | | | | • | • | | | | | | • | | Q11; Input480 - F1, F2, F3 |
| 15 | | D-S | • | | | | | | | | • | • | | | | | | • | | Input480 - F1, F2, F3 |
| 16 | | S | • | | | | | | | | • | • | | | | | | • | | Q9; Input480 - F1, F2 |
| 17 | | D-G | • | | | | | | | | • | • | | | | | | • | | Q11; Input480 - F1, F2, F3 |
| 18 | | D | • | | | | | | | | • | • | | | | | | • | | Q9; Input480 - F1, F3 |

5. ABNORMAL TEST

DCDC 20V

Condition: Ta:25°C Input:230VAC Vout:100% Iout:100%

| No. | Test Position | | Study result (prediction of the phenomena) | | | | | | | | | | | | | | Note | | | | | | | | | | | | | | |
|-----|----------------|------------|--------------------------------------------|-------|------|------|--------------|-------|-------|-------|---------|---------|-----------|---|---|---|------|---|---|---|---|---|---|---------|-----------|-----------|--------------------------------|--------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| | Location No. | Test Point | Failure Mode | Short | Open | Fire | Slight Smoke | Smoke | Burst | Smell | Red Hot | Damaged | Fuse Open | P | O | V | | P | C | O | P | - | O | AC FAIL | No Output | No Change | PS functional after AC recycle | Others | | | |
| 1 | C4, C5, C7, C8 | | | • | | | | | | | | | | | | | | | | | | | | | | | | | Q5, Q6, Q1, R5, R137, TS1, A1, A7, A9, A10, A11, D5(input), D3(input), F2, F3, ZD3(PFC) | | |
| 2 | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | C12, C13, C58 | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | fuse open and in bias 208 bypass diode will be damaged | | |
| 5 | L3 | | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | | | | | • | | | | | | | | | | | | | | | | | | | | | | | | Vo go down to 26V; Mode CV change to CC | | |
| 7 | Q1 | G-S | | • | | | | | | | | | | | | | | | | | | | | | | | | | Q2 temp enlarge from 50°C to 58°C | | |
| 8 | | G | | • | | | | | | | | | | | | | | | | | | | | | | | | | A10 Damaged | | |
| 9 | | D-S | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | | S | | • | | | | | | | | | | | | | | | | | | | | | | | | | | Q2 temp enlarge from 51°C to 56°C | |
| 11 | | D-G | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | | D | | • | | | | | | | | | | | | | | | | | | | | | | | | | | Q2 temp enlarge from 48°C to 53°C | |
| 13 | Q5 | G-S | | • | | | | | | | | | | | | | | | | | | | | | | | | | Vo go down, Mode CV change to CC | | |
| 14 | | G | | • | | | | | | | | | | | | | | | | | | | | | | | | | | Q5, Q6, Q1, R5, R137, TS1, A1, A7, A9, A10, A11, D5(input), D3(input), F2, F3, ZD3(PFC) | |
| 15 | | D-S | | • | | | | | | | | | | | | | | | | | | | | | | | | | | Q5, Q6, Q1, R5, R137, TS1, A1, A7, A9, A10, A11, D5(input), D3(input), F2, F3, ZD3(PFC) | |
| 16 | | S | | • | | | | | | | | | | | | | | | | | | | | | | | | | | D5, D6, R23, R24, R28, R30, Q3, Q5, Q6, D4 | |
| 17 | | D-G | | • | | | | | | | | | | | | | | | | | | | | | | | | | | Q5, Q6, Q1, R5, R137, TS1, A1, A7, A9, A10, A11, D5(input), D3(input), F2, F3, ZD3(PFC) | |
| 18 | | D | | • | | | | | | | | | | | | | | | | | | | | | | | | | | Vo go down ; Mode CV change to CC | |
| 19 | Q23 | G-S | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | | G | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21 | | D-S | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | Q5, Q6, Q1, R5, R137, TS1, A1, A7, A9, A10, A11, D5(input), D3(input), F2, F3, ZD3(PFC) |
| 22 | | S | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 23 | | D-G | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | Q5, Q6, Q1, R5, R137, TS1, A1, A7, A9, A10, A11, D5(input), D3(input), F2, F3, ZD3(PFC) |
| 24 | | D | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25 | T3 | A-B | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | Q5, Q6, Q1, R5, R137, TS1, A1, A7, A9, A10, A11, D5(input), D3(input), F2, F3, ZD3(PFC) |
| 26 | | 1 | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | Vo go down; Mode CV change to CC |
| 27 | | A-C | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | Q5, Q6, Q1, R5, R137, TS1, A1, A7, A9, A10, A11, D5(input), D3(input), F2, F3, ZD3(PFC) |
| 28 | | A | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | Vo go down; Mode CV change to CC |
| 29 | | B-C | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | Q5, Q6, Q1, R5, R137, TS1, A1, A7, A9, A10, A11, D5(input), D3(input), F2, F3, ZD3(PFC) |
| 30 | | B | | • | | | | | | | | | | | | | | | | | | | | | | | | | | | Vo go down; Mode CV change to CC |

5. ABNORMAL TEST

DCDC 500V

Condition: Ta:25°C Input:480VAC Vout:100% Iout:100%

| No. | Test Position | | Failure Mode | | Study result (prediction of the phenomena) | | | | | | | | | | | | | Note | | | | | | | |
|-----|---------------|------------|--------------|------|--------------------------------------------|--------------|-------|-------|-------|---------|---------|-----------|---|---|---|---|---|------|---|---------|-----------|-----------|--------------------------------|--------|------------------------------------------------------------------------------------------------------------------|
| | Location No. | Test Point | Short | Open | Fire | Slight Smoke | Smoke | Burst | Smell | Red Hot | Damaged | Fuse Open | P | O | P | O | P | | O | AC FAIL | No Output | No Change | PS functional after AC recycle | Others | |
| 1 | C4,C5,C7,C8 | | • | | | | | | | | | | | | | | | | | | | | | | |
| 2 | | | | • | | | | | | | | | | | | | | | | | | | | | |
| 3 | C12, C13, C54 | | • | | | | | | | | | | | | | | | | | | | | | | |
| 4 | | | | • | | | | | | | | | | | | | | | | | | | | | |
| 5 | D32 | A-C | • | | | | | | | | | | | | | | | | | | | • | • | | D34, R78-85, D17 Vo go downto 1474V , Mode CV change to CC |
| 6 | | A | | • | | | | | | | | | | | | | | | | | | | | | R78-85, D17 Vo go downto 1440V , Mode CV change to CC |
| 7 | L3 | 9-10 | • | | | | | | | | | | | | | | | | | | | • | • | | |
| 8 | | 9 | | • | | | | | | | | | | | | | | | | | | • | • | | |
| 9 | Q1 | G-S | • | | | | | | | | | | | | | | | | | | | | | | Q2 temp rise from 52°C to 80.4°C |
| 10 | | G | | • | | | | | | | | | | | | | | | | | | | | | |
| 11 | | D-S | • | | | | | | | | | | | | | | | | | | | | | | Q6 temp rise from 55°C to 60°C, Q2 temp descends from 52°C to 33°C, Vo does not descend below 581V |
| 12 | | S | | • | | | | | | | | | | | | | | | | | | | | | Q2, A11 |
| 13 | | D-G | • | | | | | | | | | | | | | | | | | | | | | | Q6 temp rise from 55°C to 60°C, Q2 temp descends from 52°C to 33°C, Vo does not descend below 581V |
| 14 | | D | | • | | | | | | | | | | | | | | | | | | | | | Q2 temp rise from 53.5°C to 77.3°C |
| 15 | Q5 | G-S | • | | | | | | | | | | | | | | | | | | | | | | Vo go down, Mode CV change to CC |
| 16 | | G | | • | | | | | | | | | | | | | | | | | | | | | ZD1, R2, D1, R5, D4, D52, Q6, Q5, Q9, Q10, R1, (DCDCslave) A1, (input) F1, F3, (PFC) Q8-11, (PFCCNTmod) A2 |
| 17 | | D-S | • | | | | | | | | | | | | | | | | | | | | | | ZD1, R2, D1, R5, D4, D52, Q6, Q5, Q9, Q10, R1, (DCDCslave) A1, (input) F1, F3, (PFC) Q8-11, (PFCCNTmod) A2 |
| 18 | | S | | • | | | | | | | | | | | | | | | | | | | | | ZD1, R2, D1, R5, D4, D52, Q6, Q5, Q9, Q10, R1, (DCDCslave) A1, (input) F1, F3, (PFC) Q8-11, (PFCCNTmod) A2 |
| 19 | | D-G | • | | | | | | | | | | | | | | | | | | | | | | ZD1, R2, D1, R5, D4, D52, Q6, Q5, Q9, Q10, R1, (DCDCslave) A1, (input) F1, F3, (PFC) Q8-11, (PFCCNTmod) A2 |
| 20 | | D | | • | | | | | | | | | | | | | | | | | | | | | ZD1, R2, D1, R5, D4, D52, Q6, Q5, Q9, Q10, R1, (DCDCslave) A1, (input) F1, F3, (PFC) Q8-11, (PFCCNTmod) A2 |
| 21 | T3 | 1 | | • | | | | | | | | | | | | | | | | | | | | | Vo go downto 840V , Mode CV change to CC |
| 22 | | 2 | | • | | | | | | | | | | | | | | | | | | | | | Vo go downto 840V , Mode CV change to CC |
| 23 | | 2-3 | • | | | | | | | | | | | | | | | | | | | | | | ZD1, R2, D1, R5, D4, D52, Q6, Q5, Q9, Q10, R1, (DCDCslave) A1, (input) F1, F3, (PFC) Q8-11, (PFCCNTmod) A2 |
| 24 | | A-C | • | | | | | | | | | | | | | | | | | | | | | | D4, Q1, Q2, TS1, Q5, Q6, Q9, Q10, R6 |
| 25 | | A | | • | | | | | | | | | | | | | | | | | | | | | Vo go downto 840V , Mode CV change to CC |
| 26 | | C | | • | | | | | | | | | | | | | | | | | | | | | Vo go downto 840V , Mode CV change to CC |

5. ABNORMAL TEST

DCDC 600V

Condition: Ta:25°C Input:230VAC Vout:100% Iout:100%

| No. | Test Position | | Study result (prediction of the phenomena) | | | | | | | | | | | | | | | Note | | | | |
|-----|-----------------|------------|--------------------------------------------|-------|------|------|--------------|-------|-------|-------|---------|---------|-----------|-----|-----|-----|-----|------|---------|-----------|------------------------------------------|---------------------------------------------------------------------------|
| | Location No. | Test Point | Failure Mode | Short | Open | Fire | Slight Smoke | Smoke | Burst | Smell | Red Hot | Damaged | Fuse Open | P-O | V-O | P-O | P-O | | AC FAIL | No Output | No Change PS functional after AC recycle | Others |
| 1 | C4,C5,C7,C8 | | | • | | | | | | | | | | | | | | | • | | | |
| 2 | | | | | • | | | | | | | | | | | | | | | • | | |
| 3 | C12, C13, C56 | | | • | | | | | | | | • | • | | | | | | | • | | |
| 4 | | | | | • | | | | | | | | | | | | | | | • | | |
| 5 | D21-D28 | A-C | | • | | | | | | | | | | | | | | | | • | | |
| 6 | | A | | | • | | | | | | | | | | | | | | | • | | |
| 7 | D29-D36 | A-C | | • | | | | | | • | | • | • | | | | | | | • | | |
| 8 | | A | | | • | | | | | • | | • | • | | | | | | | • | | |
| 9 | Q1, Q2, Q17 | G-S | | • | | | | | | | | | | | | | | | | • | • | Q2, Q17 temp enlarge from 57°C to 76°C, @25C |
| 10 | | G | | | • | | | | | | | | | • | | | | | | • | • | |
| 11 | | D-S | | | • | | | | | | | | | • | | | | | | • | • | |
| 12 | | S | | | • | | | | | | | | | | | | | | | • | • | Q2, Q17 temp enlarge from 57°C to 76°C, @25C |
| 13 | | D-G | | | • | | | | | | | | | • | | | | | | • | • | |
| 14 | | D | | | • | | | | | | | | | | | | | | | • | • | Q2, Q17 temp enlarge from 57°C to 76°C, @25C |
| 15 | Q5, Q6, Q9, Q10 | G-S | | • | | | | | | | | | | | | | | | | • | • | Vo descends, PS in CC mode |
| 16 | | G | | | • | | | | | • | | • | • | | | | | | | | • | Q5,Q6,Q1,R5,R137,TS1,A1,A7,A9,A10,A11,D5(i nput),D3(input),F2,F3,ZD3(PFC) |
| 17 | | D-S | | • | | | | | | • | | • | • | | | | | | | • | • | Q5,Q6,Q1,R5,R137,TS1,A1,A7,A9,A10,A11,D5(i nput),D3(input),F2,F3,ZD3(PFC) |
| 18 | | S | | | • | | | | | • | | • | • | | | | | | | • | • | D5, D6, R23, R24, R28, R30, Q3, Q5, Q6, D4 |
| 19 | | D-G | | | • | | | | | • | | • | • | | | | | | | • | • | Q5,Q6,Q1,R5,R137,TS1,A1,A7,A9,A10,A11,D5(i nput),D3(input),F2,F3,ZD3(PFC) |
| 20 | | D | | | • | | | | | | | | | | | | | | | • | • | Vo descends, PS in CC mode |
| 21 | T3 | 1-2 | | • | | | | | | • | | • | • | | | | | | | • | • | |
| 22 | | 1 | | | • | | | | | | | | | | | | | | | | • | |
| 23 | | 3 | | | • | | | | | | | | | | | | | | | | • | |
| 24 | | A-C | | • | | | | | | | | | | | | | | | | | • | |
| 25 | | A | | | • | | | | | | | | | | | | | | | | • | |
| 26 | | B-C | | • | | | | | | | | | | | | | | | | | • | |
| 27 | | B | | | • | | | | | | | | | | | | | | | | • | |
| 28 | | C | | | • | | | | | | | | | | | | | | | | • | |

6.VIBRATION TEST

MODEL: G600-12.5 3P480

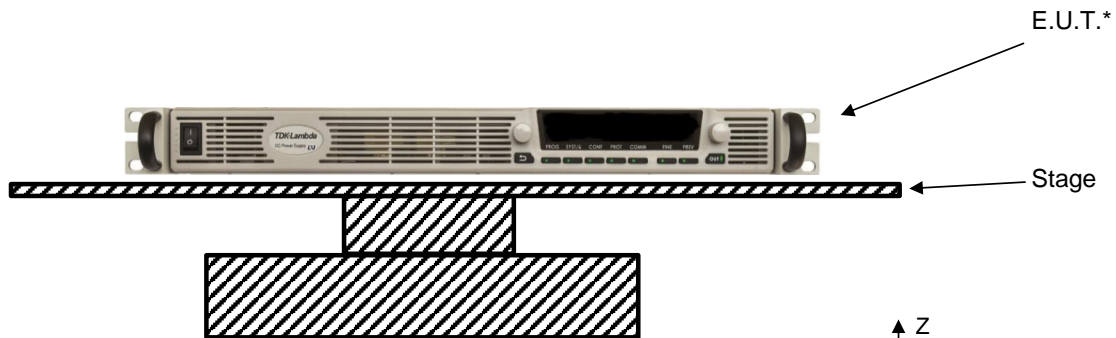
(1) Vibration test class

Frequency variable endurance test

(2) Equipment used

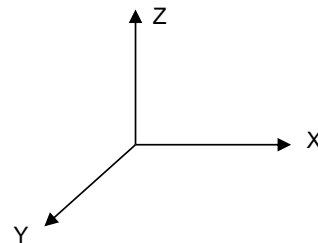
| Name | Manufaturer | Model |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------|
| Vibration Test System (Amplifier #SP6893-011/1, Remote Control Panel #SP9663-008/1, Vibrator #SP6893-005/1, Slip Table, Driver Bar, Pump, Fan, Head Expander) | Ling Dynamic Systems | V875 |
| Precision Barometer, 870 - 1050 hPa | LUFFT Mess- und Regeltechnik GmbH | DKD-K-26701 |
| Temp. & Humidity Meter, (-50 ~+70) deg, (20 - 99)% RH | Mad Electronics | HTC-1 |
| APEX SL VIBRATION CONTROLLER | Unholtz-Dickie | APEX SL |
| Isotron Accelerometer 100.2 mVlg | Dytran Instruments Inc. | 3256A2 |
| Altitude Test Chamber, Alt.:100.0 feet, 75~177) deg. C, Hum.: (20 to 95)% | Thermotron | FA-46_CHM-5-5 |

(3) Testing method



Test condition:

Random frequency 10Hz~500Hz
 Acceleration X: 0.24
 Y: 0.89
 Z: 1.25
 Direction X,Y,Z
 Test time 1H.each



*E.U.T. is fixed to vibrator surface by mounting straps

(4)Test Result



NG

Vin=400Vac; Iout=12.5A

| Check item | Vout [V] | Ripple [mVp-p] | E.U.T.state |
|---------------------|----------|----------------|-------------|
| Directions \Initial | 600.076 | 9.57 | O.K. |
| X | 600.076 | 9.57 | O.K. |
| Y | 600.076 | 9.57 | O.K. |
| Z | 600.076 | 9.57 | O.K. |