# HFE1600

## IEC 61000 Test Data

<table>
<thead>
<tr>
<th>APPD</th>
<th>CHK</th>
<th>DWG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dörov P.</td>
<td>Ani P.</td>
<td>Michael C.</td>
</tr>
<tr>
<td>12-May-11</td>
<td>12-May-11</td>
<td>12.05.2011</td>
</tr>
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Test results are typical data. Nevertheless, the following results are considered to be actual capability data because all units have nearly the same characteristics.
1. Electrostatic Discharge Immunity Test (IEC61000-4-2)

(1) Equipment used
NOISEKEN ESS-2000
Discharge resistance: 330 Ohm  Capacity: 150pF

(2) Test conditions
Input voltage: Rated  Output voltage: Rated
Output current: 100%  Polarity: +,–
Number of tests: 10 times  Discharge interval: >1 Second

(3) Test method and Device test point
Contact discharge: FG, Case screw
Air discharge: Input and Output terminal

(4) Acceptable conditions
1. Output voltage regulation not to exceed ±5% of initial (before test) value during test.
2. Output voltage to be within regulation specification after the test.
3. Along with 1 and 2, no discharge of fire or smoke, as well as no output failure.

(5) Test Result

<table>
<thead>
<tr>
<th>Contact Discharge (KV)</th>
<th>HFE1600</th>
<th>Air Discharge (KV)</th>
<th>HFE1600</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>PASS</td>
<td>8</td>
<td>PASS</td>
</tr>
</tbody>
</table>

TDK-Lambda  
R-1
2. Radiated Radio-Frequency Electromagnetic Field Immunity Test (IEC61000-4-3)

(1) Equipment used

Test Laboratory: Hermon Laboratories Ltd.

(2) Test conditions

<table>
<thead>
<tr>
<th>Input voltage:</th>
<th>Rated</th>
<th>Output voltage:</th>
<th>Rated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output current:</td>
<td>100%</td>
<td>Amplitude Modulated:</td>
<td>80%, 1kHz</td>
</tr>
<tr>
<td>Electromagnetic Frequency: 80~1000MHz</td>
<td></td>
<td>Ambient temperature:</td>
<td>25°C</td>
</tr>
<tr>
<td>Distance:</td>
<td>2.4m</td>
<td>Wave Angle: Horizontal and Vertical</td>
<td></td>
</tr>
<tr>
<td>Sweep condition:</td>
<td>1.0% Step Up, 2.0 second Hold</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test Angle:</td>
<td>Top/Botton, Both Sides, Front/Back</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

![Diagram of test setup]

(3) Acceptable conditions

1. Output voltage regulation not to exceed ± 5% of initial (before test) value during test.
2. Output voltage to be within regulation specification after the test.
3. Along with 1 and 2, no discharge of fire or smoke, as well as no output failure.

(4) Test Result

<table>
<thead>
<tr>
<th>Radiated Field Strength (V/m)</th>
<th>HFE1600</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>PASS</td>
</tr>
</tbody>
</table>

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R-2
3. Electrical Fast Transient / Burst Immunity Test (IEC61000-4-4)

(1) Equipment used
EFT/B Generator: SCHAFFNER NSG2025

(2) Test conditions
Input voltage: Rated
Output current: 100%
Output voltage: Rated
Test time: 1 minute
Polarity: -, +
Ambient temperature: 25°C
Number of tests: 3 times

(3) Test method and Device test point: Neutral (N), Line (L), Ground (FG)
Apply pulses from EFT/B Generator to N, L, FG separately, as well as all at the same time.

(4) Acceptable conditions
1. Output voltage regulation not to exceed ±5% of initial (before test) value during test.
2. Output voltage to be within regulation specification after the test.
3. Along with 1 and 2, no discharge of fire or smoke, as well as no output failure.

(5) Test Result

<table>
<thead>
<tr>
<th>Test Voltage (kV)</th>
<th>Repitition Rate (kHz)</th>
<th>HFE1600</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>5</td>
<td>PASS</td>
</tr>
</tbody>
</table>
4. Surge Immunity Test (IEC61000-4-5)

(1) Equipment used
Surge Generator: SCHAFFNER-NSG651
Coupling impedance:
  Common - 12 OHm
  Normal - 2 OHm
Coupling capacitance:
  Common - 9 uF
  Normal - 18 uF
Coupling network: SCHAFFNER-CDN110

(2) Test method and devise test point
Input voltage: Rated
Output current: 100%
Polarity: -,+;
Phase: 0, 90 DEG.

Output voltage: Rated
Number of tests: 5 times
Mode: Common, Normal
Ambient temperature: 25°C

(3) Acceptable conditions
1. Output voltage regulation not to exceed ± 5% of initial (before test) value during test.
2. Output voltage to be within regulation specification after the test.
3. Along with 1 and 2, no discharge of fire or smoke, as well as no output failure.

(4) Test Result

<table>
<thead>
<tr>
<th>Test Voltage (kV)</th>
<th>HFE1600</th>
<th>Test Voltage (kV)</th>
<th>HFE1600</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common</td>
<td></td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td>PASS</td>
<td>2.0</td>
<td>PASS</td>
</tr>
<tr>
<td>4.0</td>
<td>PASS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5. Conducted Disturbances Induced by Radio-Frequency Field Immunity Test (IEC61000-4-6)

(1) Equipment used
RF Signal Generator 10kHz-1050MHz: Fluke, 6061A
RF Amplifier 10kHz-220MHz, 150W: Amplifier Research, 150L
Coupling/Decoupling Network: HL CDN 801-M3

(2) Test Condition:
Input voltage: Rated Output voltage: Rated
Output current: 100% Electromagnetic Frequency: 150kHz~80MHz
Sweep Condition: 1.0% Step Up, 2.0 Seconds Hold
Ambient temperature: 25°C

(3) Test Method:

*Used Analog Voltage Meter

(4) Acceptable conditions
1. Output voltage regulation not to exceed ± 5% of initial (before test) value during test.
2. Output voltage to be within regulation specification after the test.
3. Along with 1 and 2, no discharge of fire or smoke, as well as no output failure.

(5) Test Result

<table>
<thead>
<tr>
<th>Voltage Level (V)</th>
<th>HFE1600</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>PASS</td>
</tr>
</tbody>
</table>
6. Power Frequency Magnetic Field Immunity Test (IEC61000-4-8)

(1) Equipment used
AC High Current Generator for Magnetic Field immunity tests: HL, MFG-130A

(2) Test Condition:
- Input voltage: Rated
- Output current: 100%
- Magnetic Field Strength: 30A/m
- Duration Time: 10min.
- Output voltage: Rated
- Frequency: 50Hz
- Ambient temperature: 25°C

(3) Test Method:

(4) Acceptable conditions
1. Output voltage regulation not to exceed ± 5% of initial (before test) value during test.
2. Output voltage to be within regulation specification after the test.
3. Along with 1 and 2, no discharge of fire or smoke, as well as no output failure.

(5) Test Result

<table>
<thead>
<tr>
<th>EUT positions</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>PASS</td>
</tr>
<tr>
<td>Y</td>
<td>PASS</td>
</tr>
<tr>
<td>Z</td>
<td>PASS</td>
</tr>
</tbody>
</table>
7. Voltage Dips, Short Interruptions Immunity Test (IEC 61000-4-11)

(1) Equipment used
Voltage Dips Generator: CI, 5001ix
Oscilloscope: Yokogawa, DL1740EL

(2) Test Condition:
Input voltage: Rated
Output current: 100%
Repetition: 0.1Hz
Number of pulse: 3
Output voltage: Rated
Frequency: 50Hz
Ambient temperature: 25°C

(3) Test Method:

(4) Acceptable conditions
1. Output voltage regulation not to exceed ± 5% of initial (before test) value during test.
2. Output voltage to be within regulation specification after the test.
3. Along with 1 and 2, no discharge of fire or smoke, as well as no output failure.

(5) Test Result

<table>
<thead>
<tr>
<th>Dip rate</th>
<th>Continue time</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>30% vol.dip</td>
<td>500ms</td>
<td>PASS</td>
</tr>
<tr>
<td>60% vol.dip</td>
<td>200ms</td>
<td>PASS</td>
</tr>
<tr>
<td>&gt;95% vol.dip</td>
<td>20ms; 5,000ms</td>
<td>PASS</td>
</tr>
</tbody>
</table>
8. Input Current Harmonics Test (IEC61000-3-2)

Model:
(1) Equipment used
AC Power Analyzer: PACS-1 (California Instruments)
AC Source: 5001 IX (California Instruments)

(2) Test conditions:
Input voltage: 115VAC; 230VAC
Output current: 100%

(3) Test Method:

![Diagram of test setup]

Vin=115VAC

![Graph showing input current harmonics at 115VAC]

Vin=230VAC

![Graph showing input current harmonics at 230VAC]

<table>
<thead>
<tr>
<th>Vin</th>
<th>HARMONICS 3</th>
<th>HARMONICS 5</th>
<th>HARMONICS 7</th>
<th>HARMONICS 9</th>
<th>HARMONICS 11</th>
<th>HARMONICS 13</th>
<th>HARMONICS 15</th>
<th>HARMONICS 17</th>
<th>HARMONICS 19</th>
</tr>
</thead>
<tbody>
<tr>
<td>115 VAC</td>
<td>4.6</td>
<td>2.28</td>
<td>1.54</td>
<td>0.8</td>
<td>0.66</td>
<td>0.42</td>
<td>0.3</td>
<td>0.264</td>
<td>0.236</td>
</tr>
<tr>
<td>0.3</td>
<td>0.11</td>
<td>0.13</td>
<td>0.13</td>
<td>0.12</td>
<td>0.11</td>
<td>0.10</td>
<td>0.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>230 VAC</td>
<td>2.3</td>
<td>1.14</td>
<td>0.77</td>
<td>0.4</td>
<td>0.33</td>
<td>0.21</td>
<td>0.15</td>
<td>0.132</td>
<td>0.118</td>
</tr>
<tr>
<td>0.54</td>
<td>0.19</td>
<td>0.11</td>
<td>0.08</td>
<td>0.11</td>
<td>0.10</td>
<td>0.10</td>
<td>0.08</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Input Current Harmonics EN61000-3-2 Limit

Input Current Harmonics Measurement

TDK-Lambda R-8