

## UL TEST REPORT AND PROCEDURE

<b>Standard:</b>	UL 60950-1, 2nd Edition, 2019-05-09 (Information Technology Equipment - Safety - Part 1: General Requirements) CAN/CSA C22.2 No. 60950-1-07, 2nd Edition, 2014-10 (Information Technology Equipment - Safety - Part 1: General Requirements)
<b>Certification Type:</b>	Component Recognition
<b>CCN:</b>	QQGQ2, QQGQ8 (Power Supplies for Information Technology Equipment Including Electrical Business Equipment)
<b>Complementary CCN:</b>	QQJQ2, QQJQ8 (Power Supplies for Use in Audio/Video, Information and Communication Technology Equipment)
<b>Product:</b>	Power Supply
<b>Model:</b>	HWS1000-3, HWS1000-5, HWS1000-6, HWS1000-7, HWS1000-12, HWS1000-15, HWS1000-36, HWS1000-48 and HWS1000-60 (maybe followed by suffix "/CO" or "/HD"). HWS1000-24 (maybe followed by suffix "/CO", "/HD", "/RY", "/RYCO", or "/RYHD").
<b>Rating:</b>	Input :100-240VAC, 50/60Hz 9.6A: HWS1000-3  13.5 A: HWS1000-5, HWS1000-6, HWS1000-7, HWS1000-12, HWS1000-15, HWS1000-24, HWS1000-36, HWS1000-48, HWS1000-60  Output: HWS1000-3 :3.3 V, 200 A (maximum 660 W) HWS1000-5 :5 V, 200 A (maximum 1000 W) HWS1000-6 :6 V, 167 A (maximum 1002 W) HWS1000-7 :7.5 V, 134 A (maximum 1005 W) HWS1000-12 :12 V, 88 A (maximum 1056 W) HWS1000-15 :15 V, 70 A (maximum 1050 W) HWS1000-24 :24 V, 46 A (maximum 1104 W) HWS1000-36 :36 V, 30.7 A (maximum 1104 W) HWS1000-48 :48 V, 23 A (maximum 1104 W) HWS1000-60 : 60 V, 18.4 A (maximum 1104 W)
<b>Applicant Name and Address:</b>	TDK-LAMBDA CORP NAGAOKA TECHNICAL CENTER

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This is to certify that representative samples of the products covered by this Test Report have been investigated in accordance with the above referenced Standards. The products have been found to comply with the requirements covering the category and the products are judged to be eligible for Follow-Up Service under the indicated Test Procedure. The manufacturer is authorized to use the UL Mark on such products which comply with this Test Report and any other applicable requirements of UL LLC ('UL') in accordance with the Follow-Up Service Agreement. Only those products which properly bear the UL Mark are considered as being covered by UL's Follow-Up Service under the indicated Test Procedure.

The applicant is authorized to reproduce the referenced Test Report provided it is reproduced in its entirety.

UL authorizes the applicant to reproduce the latest pages of the referenced Test Report consisting of the first page of the Specific Technical Criteria through to the end of the Conditions of Acceptability.

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL.

Prepared By: Tetsuo Iwasaki / Project Handler      Reviewed By: Ikuro Kinno / Reviewer

**Supporting Documentation**

The following documents located at the beginning of this Procedure supplement the requirements of this Test Report:

- A. Authorization - The Authorization page may include additional Factory Identification Code markings.
- B. Generic Inspection Instructions -
  - i. Part AC details important information which may be applicable to products covered by this Procedure. Products described in this Test Report must comply with any applicable items listed unless otherwise stated in the body of this Test Report.
  - ii. Part AE details any requirements which may be applicable to all products covered by this Procedure. Products described in this Test Report must comply with any applicable items listed unless otherwise stated in the body of each Test Report.
  - iii. Part AF details the requirements for the UL Certification Mark which is not controlled by the technical standard used to investigate these products. Products are permitted to bear only the Certification Mark(s) corresponding to the countries for which it is certified, as indicated in each Test Report.

**Product Description**

The units are component type AC/DC Switching Power Supply intended for use in the Information Communication Technology Equipment. These units are not temperature dependent equipment.

**Model Differences**

1. All models are identical, except for Output Rating, Transformer (T201), Inductor (L401), Thermostat (TH201) and some components on secondary circuit.
2. Suffix /CO type: Model with conformal coating on solder side of PWB.
3. Suffix /HD type: Model with conformal coating on solder and component side of PWB.
4. Suffix /RY type (for Model HWS1000-24 only): Model with relay signal outputs (R-NO and R-NC) as Power Fail signal.
5. Suffix /RYCO type (for Model HWS1000-24 only): Suffix /RY type with conformal coating on solder side of PWB.
6. Suffix /RYHD type (for Model HWS1000-24 only): Suffix /RY type with conformal coating on solder and component side of PWB.

**Test Item Particulars**

Mass of equipment (kg)	Approx 3.0
Equipment mobility	for building-in
Connection to the mains	N/A
Operating condition	continuous
Access location	operator accessible
Over voltage category (OVC)	OVC II
Mains supply tolerance (%) or absolute mains supply values	+10%, -15%
Tested for IT power systems	No
IT testing, phase-phase voltage (V)	NA
Class of equipment	Class I (earthed)
Considered current rating of protective device as part of the building installation (A)	20
Pollution degree (PD)	PD 2
IP protection class	IP X0
Altitude of operation (m)	Up to 3000
Altitude of test laboratory (m)	less than 2000 meters

## Technical Considerations

- The product is intended for use on the following power systems : TN
- 1.2 The product was submitted and evaluated for use at the maximum ambient temperature (T<sub>ma</sub>) permitted by the manufacturer's specification of: (At Input Voltage over 90Vac) Models except HWS1000-5: 50°C [for using 100% load of output rating] and 71°C [for using 50% load of output rating], Model HWS1000-5: 40°C [for using 100% load of output rating] and 71°C [for using 50% load of output rating] .(At Input Voltage over 85Vac) Models except HWS1000-5: 50°C [for using 80% load of output rating] and 71°C [for using 40% load of output rating], Model HWS1000-5: 40°C [for using 80% load of output rating] and 71°C [for using 40% load of output rating] .

## Engineering Conditions of Acceptability

For use only in or with complete equipment where the acceptability of the combination is determined by UL LLC. When installed in an end-product, consideration must be given to the following:

- The end-product Electric Strength Test is to be based upon a maximum working voltage of : Primary-SELV: 253 Vrms, 600 Vpk
- The following secondary output circuits are SELV : Output circuit of Models HWS1000-3, HWS1000-5, HWS1000-6, HWS1000-7, HWS1000-12, HWS1000-15, HWS1000-24, HWS1000-36 and HWS1000-48.
- The following secondary output circuits are at hazardous energy levels : Output circuit of All models.
- The power supply terminals and/or connectors are : Suitable for factory wiring only
- Proper bonding to the end-product main protective earthing termination is : Required (via Chassis)
- The following input terminals/connectors must be connected to the end-product supply neutral : The terminal marked "AC (N)" in terminal block (TB1)
- The following magnetic devices (e.g. transformers or inductor) are provided with an OBJ2 insulation system with the indicated rating greater than Class A (105°C) : T201 (Class F), T202 and T203 (Class B), T700 (Class B).
- The following end-product enclosures are required : Fire, Electrical, Mechanical
- Cover and Chassis have not been evaluated as external/ internal enclosure.
- The unit provides with the Variable Resistor (VR900) for output voltage adjustment. See Additional Information.
- The pattern trace connected to "FG" Terminal of Terminal Block (TB1) has not performed Limited Short-Circuit Test in CSA C22.2 No. 04. Also, these "FG" Terminal/ pattern trace were isolated from primary circuit by basic insulation only. The chassis of this component must be properly connected to the Protective Earthing Conductor or Protective Earthing Terminal in the end-product via Protective Bonding Conductor.
- All tests measuring temperatures of components were performed with the unit mounted to horizontal position (Nameplate/Rating Label side up).
- Classification of PIS has not been conducted. Therefore, all electrical components and conductors including printed wirings were assumed to be arcing/resistive PIS.
- Humidity conditioning has been conducted by tropical condition.
- The following output circuits are at ES1 energy levels : Output circuit of Models HWS1000-3, HWS1000-5, HWS1000-6, HWS1000-7, HWS1000-12, HWS1000-15, HWS1000-24, HWS1000-36 and HWS1000-48.
- The following output circuits are at ES2 energy level: Output of Model HWS1000-60
- The following output circuits are at PS3 energy levels : All models' output
- Line to Line Capacitors (C1, C2, C20) may have variations in capacitance up to 1 uF. Therefore, consideration shall be given in controlling the capacitance value in the end-product application with respect to capacitance discharge issue.
- Line to ground Capacitors (C18, C19) may have variation in capacitance up to 4700 pF. Primary to ground Capacitor (C14, C16, C209) may have variation in capacitance up to 2200 pF. Therefore, consideration shall be given in controlling the capacitance value in end product application with respect to touch current issue.

**Additional Information**

Adjustable output range by the Variable Resistor (VR900) and remote sensing are as follow.

- HWS1000-3: 2.64 to 3.96 Vdc, Maximum 200 A, Maximum 660 W.
- HWS1000-5: 4.0 to 6.0 Vdc, Maximum 200 A, Maximum 1000 W.
- HWS1000-6: 4.8 to 7.2 Vdc, Maximum 167 A, Maximum 1002 W.
- HWS1000-7: 6.0 to 9.0 Vdc, Maximum 134A, Maximum 1005 W.
- HWS1000-12: 9.6 to 14.4 Vdc, Maximum 88A, Maximum 1056 W.
- HWS1000-15: 12.0 to 18.0 Vdc, Maximum 70A, Maximum 1050 W.
- HWS1000-24: 19.2 to 28.8 Vdc, Maximum 46A, Maximum 1104 W.
- HWS1000-36: 28.8 to 43.2 Vdc, Maximum 30.7A, Maximum 1104 W.
- HWS1000-48: 39.4 to 52.8 Vdc, Maximum 23 A, Maximum 1104W.
- HWS1000-60: 48 to 66.0 Vdc, Maximum 18. 4A, Maximum 1104W.

Note: Each output wattage can be used when Input voltage is over 90 Vac and Tma is 50°C except Model HWS1000-5 (Tma is 40°C). See CE1.2 in Engineering Consideration, when Tma is exceeding these temperature.

The additional evaluation item according to the standard upgrade was included in the Clause List.

The Clearances and Creepage Distances have additionally been assessed for suitability up to 3000 m elevation.

**Additional Standards**

The product fulfills the requirements of: UL 62368-1, 2nd Edition, 2014-12-01, CAN/CSA C22.2 No. 62368-1-14, 2nd Edition, 2014-12.

**Markings and Instructions**

Clause Title	Marking or Instruction Details
1.7.1 Power rating - Model	Model Number
1.7.1 Power rating - Company identification	Listee's or Recognized company's name, Trade Name, Trademark or File Number
1.7.6 Fuses - Rating	Rated current and voltage and type located on or adjacent to fuse or fuseholder.