

## UL TEST REPORT AND PROCEDURE

<b>Standard:</b>	UL 60950-1, 2nd Edition, 2014-10-14 (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>	HWS300-acdefg, HWS300P-bcdf, HWS300-24/OR Suffixes: a = 3, 5, 12, 15, 24, or 48 b = 24, 36 or 48 c = "/" or blank d = "PV" or blank e = "RY", "RYLLF" or blank (HWS300-24 only) f = "CO", "CO2", "HD" or blank g = "HU" or blank (HWS300-24 only)
<b>Rating:</b>	Input: AC 100-240 V, 50/60 Hz, 4.1 A (except for HWS300P-24, HWS300P-36 and HWS300P-48) Input: AC 100-240 V, 50/60 Hz, 4.4 A (for HWS300P-24, HWS300P-36 and HWS300P-48)
<b>Applicant Name and Address:</b>	TDK-LAMBDA CORP NAGAOKA TECHNICAL CENTER R&D DIV 2704-1 SETTAYA-MACHI NAGAOKA-SHI NIIGATA 940-1195 JAPAN

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

Reviewed by: Ikuro Kinno

### 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 product covered in this Test Report is building-in type switching power supply with a single output circuit.

This component is a non-temperature dependent per sub-clause 1.4.12.3.

Output:

3.3 Vdc, 60 A (HWS300-3)

5 Vdc, 60 A (HWS300-5)

12 Vdc, 27 A (HWS300-12)

15 Vdc, 22 A (HWS300-15)

24 Vdc, 14 A (HWS300-24)

48 Vdc, 7 A (HWS300-48)

24 Vdc, 12.5 A / Peak Current 21 A (Maximum 504 W for 100-170 Vac input) / Peak Current 42 A (Maximum 1008 W for 170-240 Vac input), maximum 5 seconds, Duty Maximum 35 % (HWS300P-24);

36 Vdc, 8.4 A / Peak Current 14 A (Maximum 504 W for 100-170 Vac input) / Peak Current 28 A (Maximum 1008 W for 170-240 Vac input), maximum 5 seconds, Duty Maximum 35 % (HWS300P-36);

48 Vdc, 6.3 A / Peak Current 10.5 A (Maximum 504 W for 100-170 Vac input) / Peak Current 21 A (Maximum 1008 W for 170-240 Vac input), maximum 5 seconds, Duty Maximum 35 % (HWS300P-48);

Peak Current 16.5A for 200-240 Vac input, maximum 10 seconds, Duty Maximum 35% (HWS300-24/HU)

100% Load at 50°C ambient and 50% Load at 70°C (71°C only for models with suffix "/HD") ambient for Mounting Position A and Mounting Position B.

See Enclosure Id. 7-01 for Output Derating Characteristics (Tma vs Output Load %) and Mounting Condition A and Mounting Condition B details.

See Enclosure Id. 7-05 for Output Derating Characteristics (Tma vs Output Load % and Peak Output Condition) and Mounting Condition A and B details.

### Model Differences

Each model is identical, except for output rating, transformer and some minor secondary components. And HWS300 Series maybe followed by suffix "cdefg" (c = "/" or blank, d = "PV" or blank, e = "RY", "RYLLF" or blank (HWS300-24 only), f = "CO", "CO2", "HD" or blank, g = "HU" or blank (HWS300-24 only))

1. "/PV" - R253 open, R258 jumper in secondary circuit.

2. /RY - Only for HWS300-24: Use relay instead of optocoupler in signal circuit of HWS300.

3. /RYLLF - Only for HWS300-24: Based on /RY except fan. Fan is longer life fan.

4. "/CO" - Coated on PWB soldering surface.

5. "/CO2" -Coated on both of PWB component/soldering surfaces

6. "/HD" - Coated on both of PWB component/soldering surfaces and Tma 71°C at 50% Load.

7. "HU" - Only for HWS300-24: Over Current Protection is Constant current limit and hiccup with automatic recovery. Output is peak output current specification.

"OR" Only for HWS300-24: HWS300-24/OR is identical to HWS300-24/PV with only difference in voltage of control circuit. Changed of output voltage by PV voltage (external voltage). When PV voltage is 0-5 V, output voltage of "PV" is 4.8-28.8 V. "OR" is 9.5-24 V.

Changed of PC voltage (signal output voltage for monitor) by output current. When Load is 100%, PC voltage of "/PV" is -5V. "/OR" is reversed to +5 V.

HWS300-24 may be followed by suffixes e = "/RY" or "/RYLLF" and PWB type name is changed from PDA-036 to SCB363 because of design change.

HWS300P-24 and HWS300P-48 are identical to HWS300-24 and HWS-48 except for over current protection circuit, fan speed control circuit, peak output condition, minor components and major component, which are described in Table 1.5.1.

HWS300P-36 is identical to HWS300P-24 except for output rating, transformer and some minor secondary components.

### Technical Considerations

- 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%, -10%
- Tested for IT power systems : No
- IT testing, phase-phase voltage (V) : N/A
- 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 2000
- Altitude of test laboratory (m) : Approximately 10 to 20
- Mass of equipment (kg) : Approximately 0.98 kg
- The product was submitted and evaluated for use at the maximum ambient temperature (T<sub>ma</sub>) permitted by the manufacturer's specification of: T<sub>ma</sub> differ in accordance with load %. See Enclosure Id. 7-01 for details.
- The product is intended for use on the following power systems: TN
- The following were investigated as part of the protective earthing/bonding: Printed Wiring Board Trace See Enclosure Ids. 5-01, 5-02, 5-03, 5-04, 5-05, 5-06, 5-07, 5-08, and 5-09.

### 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:

- Chassis and Cover have not been evaluated as internal enclosure.
- Y-Capacitors (C3, C4), Primary - Ground Capacitors (C11, C13, C14, C33) may have maximum capacitance 3300 pF or not provided. Therefore, consideration shall be given in conducting Touch Current Test in end product with respect to variation in C3, C4, C11, C13, C14 and C33.
- HWS300-5 was tested with Output Voltage Range of 4.0 - 6.0 Vdc (Maximum 60 A, Maximum 300 W); HWS300-12 was tested with Output Voltage Range of 9.6 - 14.4 Vdc (Maximum 27 A, Maximum 324 W); HWS300-24 was tested with Output Voltage Range of 19.2 - 28.8 Vdc (Maximum 14 A, Maximum 336 W); and HWS300-48 was tested with Output Voltage Range of 38.4 - 52.8 Vdc

(Maximum 7 A, Maximum 336 W). Adjustment was made via Variable Resistor (VR51). Tests were conducted with rated output voltage, ampere load, and VA. Additional testing shall be considered if the end product application is outside this range.

- HWS300-3 was tested with Output Voltage Range of 2.64 - 3.96 Vdc (Maximum 60 A, Maximum 198 W); and HWS300-15 was tested with Output Voltage Range of 12.0 - 18.0 Vdc (Maximum 22 A, Maximum 330 W). Adjustment was made via Variable Resistor (VR51). Tests were conducted with rated output voltage, ampere load, and VA. Additional testing shall be considered if the end product application is outside this range.
- HWS300P-24 was tested with Output Voltage Range of 19.2 - 26.4 Vdc (Maximum 12.5 A, Maximum 300 W) and Output Peak Current 21 A (Maximum 504 W for 100-170 Vac input) / Peak Current 42 A (Maximum 1008 W for 170-240 Vac input), maximum 5 seconds, Duty Maximum 35%; HWS300P-36 was tested with Output Voltage Range of 28.8 - 39.6 Vdc (Maximum 8.4 A, Maximum 302.4 W) and Output Peak Current 14 A (Maximum 504 W for 100-170 V input) / Peak Current 28 A (Maximum 1008 W for 170-240 Vac input), maximum 5 seconds, Duty Maximum 35%; and HWS300P-48 was tested with Output Voltage Range of 38.4 - 52.8 Vdc (Maximum 6.3 A, Maximum 302.4 W) and Output Peak Current 21 A (Maximum 1008 W for 170-240 Vac input), maximum 5 seconds, Duty Maximum 35%. See Enclosure Id. 7-05 for details. Adjustment was made via Variable Resistor (VR51). Tests were conducted with rated output voltage, ampere load, and VA. Additional testing shall be considered if the end product application is outside this range.
- The following Production-Line tests are conducted for this product: Earthing Continuity
- The end-product Electric Strength Test shall take into account the maximum working voltage of: Primary-Secondary: 356 Vrms, 688 Vpk , Primary-Ground: 356 Vrms, 600 Vpk
- The following secondary output circuits are SELV: Output of all models
- The following secondary output circuits are at hazardous energy levels: Output of all models except HWS300-3
- The power supply terminals and/or connectors are: Suitable for factory wiring only
- The maximum investigated branch circuit rating is: 20 A
- The investigated Pollution Degree is: 2
- An investigation of the protective bonding terminals has: Been conducted
- The following magnetic devices (e.g. transformers or inductor) are provided with an OBJY2 insulation system with the indicated rating greater than Class A (105°C): Transformer (T32) (Class 155(F))
- The following end-product enclosures are required: Fire , Electrical
- HWS300-24/HU was tested with Peak Current 16.5A for AC 200-240V input, max. 10sec., Max. duty 35%.
- The following secondary output circuits are ES1: Output of all models
- The following secondary output circuits are at PS3 energy level: Output of all models
- Proper bonding to the end-product main protective earthing termination is: Required (via Cover/Chassis)
- Line to Line Capacitor C1 may have variation in capacitance up to 1.0 uF. Therefore, consideration shall be given in controlling the capacitance value in the end-product application with respect to capacitance discharge issue.
- Humidity conditioning has been conducted by tropical condition.
- Classification of PIS has not been conducted. Therefore, all electrical components and conductors including printed wirings were assumed to be arcing/resistive PIS.

**Additional Information**

N/A

**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.

<b>Markings and instructions</b>	
<b>Clause Title</b>	<b>Marking or Instruction Details</b>
Power rating - Rating	Optional. Ratings (voltage, frequency/dc, current)
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.