

UL TEST REPORT AND PROCEDURE

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| Standard: | 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) |
| Certification Type: | Component Recognition |
| CCN: | QQGQ2, QQQQ8 (Power Supplies for Information Technology Equipment Including Electrical Business Equipment) |
| Product: | AC-DC Power Supply |
| Model: | ZMS100-X/E/T/J or CUS100MA-X/E/T/J Where: -X = Output Voltage as detailed in the Output Parameters tables below. /E = Curve B radiated for emc /T = Earth fast-on terminal not fitted /J = JST input and/or output connectors fitted Type references may be prefixed by SP and/or NS # followed by / or - (where # may be any number of characters indicating non-safety related model differences) |
| Rating: | Input: 100-240 Vac; 47-63 Hz; 2,2 Amax. Output: Forced air cooling ZMS100-12 12Vac; 8,4A; 100,8W ZMS100-15 15Vac 6,7A; 100,5W ZMS100-24 24Vac; 4,2A; 100,8W ZMS100-28 28Vac; 3,6A; 100,8W ZMS100-36 36Vac; 2,8A; 100,8W ZMS100-48 48Vac; 2,1A; 100,8W Convection cooling ZMS100-12 12Vac; 6,7A; 80,4 W ZMS100-15 15Vac; 5,4A; 81W ZMS100-24 24Vac; 3,4A; 81,6W ZMS100-28 28Vac; 2,9A; 81,2W ZMS100-36 36Vac; 2,25A; 81W ZMS100-48 48Vac; 1,67A; 80,2W |
| Applicant Name and Address: | TDK-LAMBDA UK LTD KINGSLEY AVE ILFRACOMBE EX34 8ES UNITED KINGDOM |

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.

Issue Date: 2014-12-11

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Report Reference #

E135494-A97-UL

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: Dennis Butcher

Reviewed by: Ermanno Rebecchi

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 power supply is an open frame switch mode power supply for building-in.
The power supply can be used as Class I or Class II construction.

Model Differences

All models use different transformer constructions. The secondary output windings have a different number of turns to get different secondary output voltages.

12V and 15V models have an additional secondary winding (W4). This winding is not used for the other models. Winding W4 utilises triple insulated wire, which provides reinforced insulation between the output contacts. Therefore, no short or overload was applied directly on the output contacts.

2 different PCB layouts are used: the 12V & 15V models have the same PCB layout, and the 24V, 28V, 36V and 48V models have the same PCB layouts.

Technical Considerations

- Equipment mobility : for building-in
- Connection to the mains : not directly connected to the mains
- Operating condition : continuous
- Access location : Service access area
- Over voltage category (OVC) : OVC II
- Mains supply tolerance (%) or absolute mains supply values : 85-264 Vac
- Tested for IT power systems : No
- IT testing, phase-phase voltage (V) : N/A
- Class of equipment : Not classified. Complies with either Class I or Class II, depending on installation
- Considered current rating of protective device as part of the building installation (A) : 20A
- Pollution degree (PD) : PD 2
- IP protection class : IP X0
- Altitude of operation (m) : 5000 m
- Altitude of test laboratory (m) : 300 m
- Mass of equipment (kg) : 0.15 kg

- The product was submitted and evaluated for use at the maximum ambient temperature (T_{ma}) permitted by the manufacturer's specification of: 50°C without de-rating of the output., 70°C with the output power de-rated at 2,5% per °C from 50°C to 70°C ambient.
- The means of connection to the mains supply is: To be determined in the end product.
- 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 (refer to Enclosure - Schematics + PWB for layouts)
- The following are available from the Applicant upon request: Installation (Safety) Instructions / Manual

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 following Production-Line tests are conducted for this product: Electric Strength, Earthing Continuity
- The end-product Electric Strength Test is to be based upon a maximum working voltage of: Primary-SELV: 259 Vrms, 568 Vpk
- The following secondary output circuits are SELV: all
- The following secondary output circuits are at non-hazardous energy levels: none
- The power supply terminals and/or connectors are: Not investigated for field wiring
- The maximum investigated branch circuit rating is: 20 A
- The investigated Pollution Degree is: 2
- Proper bonding to the end-product main protective earthing termination is: Required (Class I models only)
- An investigation of the protective bonding terminals has: Been conducted (restricted to the PCB). Further investigation shall be considered in the end product.
- 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): TX1: Class F
- The following end-product enclosures are required: Fire, Electrical
- The following components require special consideration during end-product Thermal (Heating) tests due to the indicated maximum temperature measurements during component-level testing: L1 (155°C), C6, C7, C8 (105°C), C5 (105°C), C1 (100°C), C2, C3, C4, C10, C11 (125°C), TX1 (140°C), XU2, XU4 (100°C), J1 (85°C), J2 (85°C)

Additional Information

The following components are glued to prevent movement:

- For 12V & 15V models: RT1, C5, C11, C7, C8, C9, C12, FE wire on PCB near C8, primary windings of transformer TX1 on PCB
- 24V, 28V, 36V and 48V models: RT1, C5, C6, C7, C8, C11, C2, FE wire on PCB near C2/C11, primary windings of transformer TX1 on PCB

The power supply can be used as Class I or Class II construction.

- For Class I construction, the SMPS must be reliably earthed and professionally installed and fixed with metal screws.
- For Class II construction no earthing connection is required. The SMPS must be fixed so that it is insulated from any unearthed accessible conductive part by at least 1 x MOPP for a working voltage of 240 Vrms (e.g. fixed to metal enclosure by means of plastic spacers and plastic screws).

The power supply provides two supplementary fuses, one in Line and one in Neutral.

The power supply may be either forced air or convection cooled. Due to the fact that air flow for cooling depends on end product use, only convection cooling was considered during temperature measurement.

Therefore, the following temperatures within end equipment use shall not be exceeded:

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| Circuit Ref. | Description | Max. Temperature (°C) |
|----------------------|-------------------------|-----------------------|
| L1 | Common Mode Choke | 155 |
| C6, C7, C8 | Electrolytic Capacitors | 105 |
| C5 | Electrolytic Capacitors | 105 |
| C1 | X Capacitor | 100 |
| C2, C3, C4, C10, C11 | Y Capacitors | 125 |
| TX1 | Transformer Winding | 140 |
| XU2, XU4 | Opto-Coupler | 100 |
| J1 | Input Connector | 85 |
| J2 | Output Connector | 85 |

Additional Standards

The product fulfills the requirements of: CSA C22.2 No. 60950-1-07 + A1:2011 +A2:2014

Markings and instructions

| Clause Title | Marking or Instruction Details |
|---|--|
| Power rating - Ratings | Ratings (voltage, frequency/dc, current) |
| Power rating - Company identification | Listee's or Recognized company's name, Trade Name, Trademark or File Number |
| Power rating - Model | Model Number |
| Fuses - Non-operator access/soldered-in fuses | Unambiguous reference to service documentation for instructions for replacement of fuses replaceable only by service personnel |

Special Instructions to UL Representative

N/A