

## 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>Product:</b>	DC-DC Converter
<b>Model:</b>	EZA2500-32048
<b>Rating:</b>	HVDC INPUT: DC300-380V, 8.5A OUTPUT: DC320V, 7.8A LVDC INPUT: DC36-60V, 56.0A OUTPUT: DC48V, 52.0A
<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.

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**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 unit is component type DC-DC Converter for use in dedicated system. (Building-in)  
The unit and dedicated system is intended to be located between Grid side (nominal 320 Vdc) and Battery side (nominal 48 Vdc)  
This DC-DC Converter provides dual directions converter function which from/to high voltage to/from low voltage.

**Model Differences**

N/A

**Technical Considerations**

- Equipment mobility : for building-in
- Connection to the mains : not directly connected to the mains
- Operating condition : continuous
- Access location : N/A
- Over voltage category (OVC) : OVC II
- Mains supply tolerance (%) or absolute mains supply values : No direct connection
- Tested for IT power systems : N/A
- 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 m
- Altitude of test laboratory (m) : Approximately 10 to 20 m
- Mass of equipment (kg) : Approximately 8 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: 40°C
- The following were investigated as part of the protective earthing/bonding: Protective bonding terminal on TB1
- LEDs provided in the product are considered low power devices: Yes

**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/ Earthed Dead Metal: 476 Vrms, 744 Vpk
- The following secondary output circuits are SELV: I/F circuit
- The following secondary output circuits are at non-hazardous energy levels: I/F circuit
- The following secondary output circuits are supplied by a Limited Power Source: I/F circuits - CN383, CN384 (RS485), CN382 (CN).
- The following output terminals were referenced to earth during performance testing: -V and -V at LVDC and HVDC.
- The power supply terminals and/or connectors are: Suitable for factory wiring only
- The maximum investigated branch circuit rating is: 20 A for upstream of HVDC.
- The investigated Pollution Degree is: 2
- Proper bonding to the end-product main protective earthing termination is: Required
- 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): T1: 155°C (RTI of EIM), T101 (Class B)
- The following end-product enclosures are required: Fire, Electrical
- Front side has been subjected to Impact test and 250N Steady Force test.
- External circuit connected to LVDC side (Battery side) is considered SELV.
- External circuit connected to HVDC side (Grid side) is considered DC hazardous voltage circuit which is rectified AC Mains circuit. (Primary circuit)
- Output circuit voltage at LVDC (TB201) is evaluated to Secondary Hazardous Voltage isolated from primary circuit by reinforced insulation.
- Primary to ground and secondary capacitors (C10, C11, C12, C16, C17, C51, C52) may have the capacitance variation. Therefore, consideration shall be given in conducting Touch current test in end product application with respect to the variation in those capacitors.

#### **Additional Information**

Output voltage at both LVDC and HVDC are adjustable during installation. (See below, and Derating curve in Enclosure - Miscellaneous: 7-01.

LVDC output: 36-60 Vdc.

HVDC output: 300 - 380 Vdc.

The following Operating Mode and conditions were used during the tests, and were considered representative.

Operating Mode No.1 (Charging Operation) - Input; HVDC 300 Vdc, Output; LVDC 48 Vdc, 52.0A.

Operating Mode No.2 (Charging Operation) - Input; HVDC 380 Vdc, Output; LVDC 60 Vdc, 41.6A.

Operating Mode No.3 (Discharging Operation) - Input; LVDC 48.45 Vdc, Output; HVDC 300 Vdc, 8.3A.

Operating Mode No.4 (Discharging Operation) - Input; LVDC 60 Vdc, Output; HVDC 380 Vdc, 6.57A.

Insulation class (EIS) was not applied to main transformer T1 as compliance criteria because isolation between primary and secondary is done by simple construction.

Critical components which have been evaluated and certified to former revision of standard IEC60950-1 were reviewed and found to comply with IEC 60950-1:2005 (Second Edition); Am1:2009 + Am2:2013.

#### **Additional Standards**

The product fulfills the requirements of: EN 60950-1:2006 + A1:2010 + A11:2009 + A12:2011 + A2:2013

### Markings and instructions

Clause Title	Marking or Instruction Details
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

Inspect the transformers listed in "Production-Line Testing Requirements" per AA1.1 - C.  
When the tests were conducted at other location, inspect test record and specification sheet provided by component's manufacturer.

Verify that the specification sheet indicates 100% routine test specified in "Production-Line Testing Requirements" have been conducted at the component's manufacturer.