UL TEST REPORT AND PROCEDURE

Standard:	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)
Certification Type:	Component Recognition
CCN:	QQGQ2, QQGQ8 (Power Supplies for Information Technology Equipment Including Electrical Business Equipment)
Complementary CCN:	QQJQ2, QQJQ8 (Power Supplies for Use in Audio/Video, Information and Communication Technology Equipment)
Product:	DC-DC Converter
Model:	EZA2500-32048ab, EZA2500-32048 HBDab (a is "CO", "FC" or blank, b is "N" or blank) EZA2500W-32048c (c is "NC", "MP", "PE" or blank)
Rating:	EZA2500-32048 HVDC INPUT: DC300-380V, 8.5A OUTPUT: DC320V, 7.8A LVDC INPUT: DC36-60V, 56.0A OUTPUT: DC48V, 52.0A EZA2500W-32048 HVDC INPUT: DC260-400V, 8.5A OUTPUT: DC320V, 7.8A LVDC INPUT: DC36-65V, 56.0A OUTPUT: DC48V, 52.0A Refer to Product Description for detail.
Applicant Name and Address:	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.

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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 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 as explained below.

<EZA2500-32048>
Charging Operation: Conversion from HVDC side (Input: 300-380 VDC) to LVDC side (Output: 48 VDC).
Discharing Operation: Conversion from LVDC side (Input: 36-60 VDC) to HVDC side (Output: 320 VDC).

<EZA2500W-32048>
Charging Operation: Conversion from HVDC side (Input: 260-400 VDC) to LVDC side (Output: 48 VDC).
Discharing Operation: Conversion from LVDC side (Input: 36-65 VDC) to HVDC side (Output: 320 VDC).

Model Differences

EZA2500-32048ab (a is "CO", "FC" or blank, b is "N" or blank)
CO: Model with thin coating on both component and solder side of PWB
FC: Model with thin coating on both component and solder side of PWB and Splash Proof Fan
N: Model without brackets
Thin coating is not for reduce required spacing.

EZA2500W-32048c (c is "NC", "MP", "PE" or blank)
NC: Model without thin coating on PWB.
MP: MPPT function provided. (not safety relevant)
PE: Sub power supply circuit of LVDC side not provided.
Thin coating is not for reduce required spacing.

Model EZA2500W-32048 is identical to model EZA2500-32048 except below.
- Rated voltage range.
- Thin coating provided.
- Cooling Fan.
- Main Transformer (T1).
- Part No. of EMSIF Board.
- Air deflector employed.

Model EZA2500-32048 HBDab is equivalent to Model EZA2500-32048ab except for model designation.

Technical Considerations

- Equipment mobility : for building-in, rack-mounting

- 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 class not specified
- Altitude of operation (m) : Up to 3000 m
- Altitude of test laboratory (m) : less than 2000 meters
- Mass of equipment (kg) : Approximately 8 kg
- The product was submitted and evaluated for use at the maximum ambient temperature (Tma) permitted by the manufacturer's specification of: 50°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
- External circuit connected to HVDC side is considered DC circuit which is rectified AC Mains circuit.

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 [For models EZA2500-32048] and 507 Vrms, 818 Vpk [For models EZA2500W-32048]
- 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 130(B))
- The following end-product enclosures are required: Fire, Electrical, Mechanical
- Front panel has been evaluated as assuming to be an external of end product.
- External circuit connected to LVDC side (Battery side) is considered SELV.

- Output circuit voltage at LVDC (TB201) is isolated from HVDC by reinforced insulation (T1).
- 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.
- External circuit connected to LVDC side is considered ES1.
- 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

Output voltage at both LVDC and HVDC are adjustable during installation. (See below, and Derating curve in Enclosure - Miscellaneous: 7-01 and 7-04.)
EZA2500-32048
LVDC output: 36 - 60 VDC
HVDC output: 300 - 380 VDC

EZA2500W-32048
LVDC output: 36 - 65 VDC
HVDC output: 260 - 400 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.2-B (Charging Operation) - Input; HVDC 400 VDC, Output; LVDC 65 VDC, 38.4A.
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.
Operating Mode No.4-A (Discharging Operation) - Input; HVDC 65 VDC, Output; LVDC 400 VDC, 6.24A.

Unless otherwise noted, tests were performed on model EZA2500-32048 and model EZA2500W-32048.

Insulation class of the main transformer T1 was determined upon EIM class of major insulating material (HVDC side windings) and evaluation of EIS was not required due to simple construction of the insulation between HVDC and LVDC.

Backfeed protection is to be considered in end product

The Clearances and Creepage Distances have additionally been assessed for suitability up to 3000 m elevation.
Backfeed protection is to be considered in end product.

Additional Standards

The product fulfills the requirements of: 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
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