Test Report issued under the responsibility of:

TEST REPORT
IEC 62368-1
Audio/video, information and communication technology equipment
Part 1: Safety requirements

Report Number .....:	E220248-A6009-CB-1
Date of issue.....:	2019-10-31
Total number of pages .....:	54
Applicant's name.....:	**TDK-LAMBDA AMERICAS INC**
Address .....:	**SUITE 100** **3320 MATRIX DR** **RICHARDSON TX 75082** **UNITED STATES**
Name of Test Laboratory preparing the Report .....:	UL RTP 12 Laboratory Drive, Research Triangle Park , NC, 27709, USA
Test specification:	
Standard .....:	IEC 62368-1:2014 (Second Edition)
Test procedure .....:	CB Scheme
Non-standard test method.....:	N/A
Test Report Form No.....:	IEC62368_1B
Test Report Form(s) Originator .....:	UL(US)
Master TRF.....:	2014-03

This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

General disclaimer:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing CB Testing Laboratory.
The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.

Test Item description :	DC-To-DC Converters
Trade Mark .....:	TDK, TDK-Lambda
Manufacturer .....:	TDK-LAMBDA AMERICAS INC SUITE 100 3320 MATRIX DR RICHARDSON TX 75082 UNITED STATES
Model/Type reference .....:	i7Czz***A%%%V-xxx-R where zz represents input voltage where it may be 2W (9-36 VDC input), or 4W (9-53 VDC input), 30A max input current. *** represents rated output current between 0.8 A - 30A, where *** may be 1 to 3 digits. %%% represents rated output voltage between 0.8Vdc - 56Vdc, where %%% may be 1 to 3 digits. Note that the third digit is preceded by a decimal point. Example 120 implies 12.0 Volts. xxx indicates a number or alphanumeric character which affects non safety related features. -R is optional and indicates RoHS compliance.
Ratings .....:	Not required. Optional. Input: 9-53Vdc, 30A Max Output: 0.8 VDC to 56VDC; Max 30A, 439 W maximum.

Testing procedure and testing location:			
☒	CB Testing Laboratory:		
Testing location/ address ..... :		UL RTP, 12 Laboratory Drive, Research Triangle Park , NC, 27709, USA	
Tested by (name + signature).....:		Mengis Tesfay / Project Handler	Mengis Tesfay
Approved by (name + signature) .....:		Scott Shepler / Reviewer	Scott Shepler
☐	Testing procedure: CTF Stage 1		
Testing location/ address..... :			
Tested by (name + signature).....:			
Approved by (name + signature) .....:			

☒	Testing procedure: CTF Stage 2		
Testing location/ address..... :		TDK-LAMBDA AMERICAS INC SUITE 100 3320 MATRIX DR RICHARDSON TX 75082 UNITED STATES	
Tested by (name + signature).....:		Steven F. McKitrick / Tester	See original CBTR for signatures
Witnessed by (name + signature).....:		Mengis Tesfay / Project Handler	See original CBTR for signatures
Approved by (name + signature) .....:		Scott Shepler / Reviewer	See original CBTR for signatures
☐	Testing procedure: CTF Stage 3		
☐	Testing procedure: CTF Stage 4		
Testing location/ address..... :			
Tested by (name + signature).....:			
Witnessed by (name + signature).....:			
Approved by (name + signature) .....:			
Supervised by (name + signature) .....:			

List of Attachments (including a total number of pages in each attachment):

National Differences (30 pages)
Enclosures (9 pages)

Summary of testing:

Tests performed (name of test and test clause): None	**Testing Location: None**

Summary of compliance with National Differences:

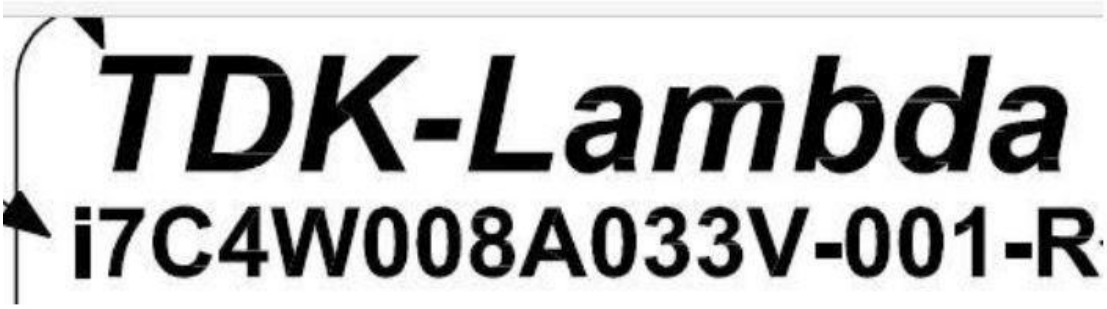
List of countries addressed: Australia / New Zealand, EU Group and National Differences, Japan, USA / Canada

EU Group and National Differences applies to CENELEC member countries: Austria, Belgium, Bulgaria, Belarus, Switzerland, Serbia, Czech Republic, Germany, Denmark, Spain, Finland, France, United Kingdom, Greece, Hungary, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Sweden, Slovenia, Slovakia, Turkey, Ukraine

☒ **The product fulfils the requirements of:** EN 62368-1:2014 + A11:2017

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.



Note: The above markings are the minimum requirements required by the safety lab. For the final production samples, the additional markings which do not give rise to misunderstanding may be added.

TEST ITEM PARTICULARS:	
Classification of use by	Instructed person
Supply Connection	External Circuit - not Mains connected ES1
Supply % Tolerance	None
Supply Connection – Type	No direct connection to Mains. Considered in the end-product
Considered current rating of protective device as part of building or equipment installation	N/A A; N/A
Equipment mobility	for building-in
Over voltage category (OVC)	OVC I
Class of equipment	Not classified
Access location	N/A
Pollution degree (PD)	PD 2
Manufacturer's specified maximum operating ambient (°C)	25
IP protection class	IPX0
Power Systems	N/A
Altitude during operation (m)	2000 m or less
Altitude of test laboratory (m)	2000 m or less
Mass of equipment (kg)	0.08
POSSIBLE TEST CASE VERDICTS:	
- test case does not apply to the test object..... :	N/A
- test object does meet the requirement ..... :	P (Pass)
- test object does not meet the requirement ..... :	F (Fail)
TESTING:	
Date of receipt of test item..... :	2018-11-20, 2019-10-24
Date (s) of performance of tests..... :	2018-11-20, 2019-10-24
GENERAL REMARKS:	
"(See Enclosure #)" refers to additional information appended to the report. **"(See appended table)" refers to a table appended to the report.** **Throughout this report a ☐ comma / ☒ point is used as the decimal separator.**	
Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:	

The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided ..... :	☒ **Yes** ☐ **Not applicable**
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies) ..... :	TDK-LAMBDA AMERICAS INC SUITE 100 3320 MATRIX DR RICHARDSON TX 75082 UNITED STATES TDK-LAMBDA MALAYSIA SDN BHD PLO33 KAWASAN PERINDUSTRIAN SENAI 81400 SENAI JOHOR MALAYSIA

GENERAL PRODUCT INFORMATION:

Report Summary

All applicable tests according to the referenced standard(s) have been carried out.

Product Description

The i7C product family consists of non-isolated DC-DC power modules intended to be used as a component in an end-user's power system. The modules will be offered in multiple input voltage and output voltage ranges. The input ranges from 9 - 53Vdc input at 30 A max. The output voltage will be adjustable between 0.8V to 56V. The rated output power will be 439W or less

Model Differences

All models within the series are similar except for input rating, output rating, and size of inductor.

Additional application considerations – (Considerations used to test a component or sub-assembly) -

This report is based on CB report E220248-A42-CB-1, and CB Test Certificate Ref. US-32823-UL and US-32823-A1-UL, and was previously evaluated to UL/CSA/IEC 60950-1, 2nd edition, + Amendment 1, and Amendment 2. Testing was conducted in accordance with IEC 60950-1:2005 (Second Edition), Am1:2009 + Am2:2013; UL 60950-1, 2nd Edition, 2014- 10-14; and CAN/CSA C22.2 No. 60950-1-07, 2nd Edition, 2014-10, and was deemed equivalent to the test required by IEC62368-1, 2nd Edition, CAN/CSA-C22.2 NO. 62368-1 2nd Ed, Issued December 1, 2014, and UL 62368-1 2nd Ed, Issued December 1, 2014. Testing correlation explanation provided in Enclosure. All required testing took place in original report.

All original sample and test dates are noted in the testing portion of this report. Test date noted 2019-10-24 is for construction review only.

Models i7C4W008A120V-xxx(-R), i7C2W020A120V-xxx(-R) of i7C series were used for test purposes and are considered representative of the entire series. Model i7C4W008A120V-xxx is the highest output voltage and highest power module within the series.

The nameplate included in the report is representative of all models covered under this report.

Technical Considerations

- The product was submitted and evaluated for use at the maximum ambient temperature (Tma) permitted by the manufacturer's specification of : 25°C
- The product is intended for use on the following power systems : No direct connection
- Considered current rating of protective device as part of the building installation (A) : N/A. For building in.
- Mains supply tolerance (%) or absolute mains supply values : No direct connection
- The equipment disconnect device is considered to be : N/A
- The following are available from the Applicant upon request : Installation (Safety) Instructions / Manual
- The product was investigated to the following additional standard : EN 62368-1:2014 + A11:2017, AS/NZS 62368.1:2018

Engineering Conditions of Acceptability

When installed in an end-product, consideration must be given to the following:

- The following output circuits are at ES1 energy levels : All
- The following output circuits are at PS3 energy levels : Output Terminal
- The investigated Pollution Degree is : 2
- An investigation of the protective bonding terminals has : not been conducted
- The following end-product enclosures are required : Electrical, Fire
- The units provide Functional Insulation only between input and output circuits.
- Heating Test shall be evaluated in end product. The following components require special consideration during end-product Thermal (Heating) tests due to the indicated maximum temperature measurements during component-level testing: PWB.
  Rated 130 C.
- This component has been evaluated in 'control of fire spread' method assuming appropriate fire enclosure is provided in end product. Unless the fire enclosure is made of non-combustible or V-0 material, the separation from the PIS shall be considered
- Classification of PIS has not been conducted. Therefore, all electrical components and conductors including printed wirings were assumed to be arcing/resistive PIS.
- Power to the DC-DC Converter is intended to be supplied by isolated secondary circuitry in an end use application.
- All Units were tested with an external 30A fuse during Abnormal Operation and Component Fault testing.
- Output voltage may be adjusted for up the maximum fixed output power (i.e. maximum output current is decreased). When the output voltage is adjusted down, the maximum output current is fixed (i.e. available output power is decreased).

ENERGY SOURCE IDENTIFICATION AND CLASSIFICATION TABLE:	
(Note 1: Identify the following six (6) energy source forms based on the origin of the energy.) (Note 2: The identified classification e.g., ES2, TS1, should be with respect to its ability to cause pain or injury on the body or its ability to ignite a combustible material. Any energy source can be declared Class 3 as a worse case classification e.g. PS3, ES3.	
Electrically-caused injury (Clause 5): (Note: Identify type of source, list sub-assembly or circuit designation and corresponding energy source classification) Example: +5 V dc input ES1	
Source of electrical energy	**Corresponding classification (ES)**
All circuits (Input, Internal Output circuits)	ES1
Electrically-caused fire (Clause 6): (Note: List sub-assembly or circuit designation and corresponding energy source classification) Example: Battery pack (maximum 85 watts): PS2	
Source of power or PIS	**Corresponding classification (PS)**
All circuits (Input, Internal Output circuits)	PS3, Arcing PIS, Resistive PIS
Injury caused by hazardous substances (Clause 7) (Note: Specify hazardous chemicals, whether produces ozone or other chemical construction not addressed as part of the component evaluation.) Example: Liquid in filled component Glycol	
Source of hazardous substances	**Corresponding chemical**
N/A	-
Mechanically-caused injury (Clause 8) (Note: List moving part(s), fan, special installations, etc. & corresponding MS classification based on Table 35.) Example: Wall mount unit MS2	
Source of kinetic/mechanical energy	**Corresponding classification (MS)**
N/A	-
Thermal burn injury (Clause 9) (Note: Identify the surface or support, and corresponding energy source classification based on type of part, location, operating temperature and contact time in Table 38.) Example: Hand-held scanner – thermoplastic enclosure TS1	
Source of thermal energy	**Corresponding classification (TS)**
PWB and Components	TS3 (EUT is for building in. Enclosure to be provided in end product.)
Radiation (Clause 10) (Note: List the types of radiation present in the product and the corresponding energy source classification.) Example: DVD – Class 1 Laser Product RS1	
Type of radiation	**Corresponding classification (RS)**
N/A	-

ENERGY SOURCE DIAGRAM

Indicate which energy sources are included in the energy source diagram. Insert diagram below

☒ **ES** ☒ **PS** ☐ **MS** ☒ **TS** ☐ **RS**