



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-A6032-CB-1
Date of issue	2022-02-01
Total number of pages	58
Name of Testing Laboratory preparing the Report	UL RTP 12 Laboratory Drive, Research Triangle Park , NC, 27709, USA
Applicant's name	TDK-LAMBDA AMERICAS INC
Address	3000 TECHNOLOGY DR, SUITE 100 PLANO TX 75074 UNITED STATES

Test specification:	
Standard	IEC 62368-1: 2018
Test procedure	CB Scheme
Non-standard test method	N/A

TRF template used	IECEE OD-2020-F1:2020, Ed.1.3
Test Report Form No	IEC62368_1E
Test Report Form(s) Originator	UL(US)
Master TRF	Dated 2021-02-04

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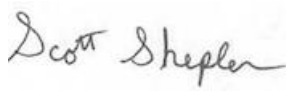
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General disclaimer:

The test results presented in this report relate only to the object tested.
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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(s)	TDK, TDK-Lambda 
Manufacturer	TDK-LAMBDA AMERICAS INC 3000 Technology Dr, Suite 100 Plano TX 75074 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.

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):

<input checked="" type="checkbox"/>	CB Testing Laboratory:	
Testing location/ address	UL RTP, 12 Laboratory Drive, Research Triangle Park , NC, 27709, USA	
Tested by (name, function, signature)..... :	Mengis Tesfay / Project Handler	
Approved by (name, function, signature) .. :	Scott Shepler / Reviewer	
<input type="checkbox"/>	Testing procedure: CTF Stage 1:	
Testing location/ address		
Tested by (name, function, signature)..... :		
Approved by (name, function, signature) .. :		
<input checked="" type="checkbox"/>	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, function, signature)..... :		Steven F. McKitrick / Tester 
Witnessed by (name, function, signature) . :		Mengis Tesfay / Project Handler 
Approved by (name, function, signature) .. :		Scott Shepler / Reviewer 
<input type="checkbox"/>	Testing procedure: CTF Stage 3:	
<input type="checkbox"/>	Testing procedure: CTF Stage 4:	
Testing location/ address :		
Tested by (name, function, signature)..... :		
Witnessed by (name, function, signature) . :		
Approved by (name, function, signature) .. :		
Supervised by (name, function, signature) :		

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

National Differences (29 pages)

Enclosures (9 pages)

Summary of testing:

Tests performed (name of test and test clause):

Testing Location:

**CTF Stage 2: TDK-LAMBDA AMERICAS INC
SUITE 100
3320 MATRIX DR
RICHARDSON TX 75082
UNITED STATES**

B.2.5 – INPUT TEST: SINGLE PHASE

Testing 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. This test was also considered representative to the test required per UL62368-1, 3rd Ed December 13, 2019; CAN/CSA-C22.2 No. 62368-1, 3rd Ed December 13, 2019; and IEC62368-1:2018, 3rd Ed. Test was covered under E220248-A42-CB.

B.1.5, B.2.6, 5.4.1.4, 6.3, 9.3 - NORMAL OPERATING CONDITIONS TEMPERATURE MEASUREMENT

Testing 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. This test was also considered representative to the test required per UL62368-1, 3rd Ed December 13, 2019; CAN/CSA-C22.2 No. 62368-1, 3rd Ed December 13, 2019; and IEC62368-1:2018, 3rd Ed. Test was covered under E220248-A42-CB.

B.3 - SIMULATED ABNORMAL OPERATING CONDITIONS

Testing 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. This test was also considered representative to the test required per UL62368-1, 3rd Ed December 13, 2019; CAN/CSA-C22.2 No. 62368-1, 3rd Ed December 13, 2019; and IEC62368-1:2018, 3rd Ed. Test was covered under E220248-A42-CB.

B.4 - SIMULATED SINGLE FAULT CONDITIONS

Testing 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

ANNEX F.3.10 – TEST FOR THE PERMANENCE OF MARKINGS

December 1, 2014, and UL 62368-1 2nd Ed, Issued December 1, 2014. This test was also considered representative to the test required per UL62368-1, 3rd Ed December 13, 2019; CAN/CSA-C22.2 No. 62368-1, 3rd Ed December 13, 2019; and IEC62368-1:2018, 3rd Ed. Test was covered under E220248-A42-CB.

Testing 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. This test was also considered representative to the test required per UL62368-1, 3rd Ed December 13, 2019; CAN/CSA-C22.2 No. 62368-1, 3rd Ed December 13, 2019; and IEC62368-1:2018, 3rd Ed. Test was covered under E220248-A42-CB.

Summary of compliance with National Differences (List of countries addressed):

EU Group and National Differences, USA / Canada

The product fulfils the requirements of EN IEC 62368-1:2020+A11:2020

Statement concerning the uncertainty of the measurement systems used for the tests

Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:

Procedure number, issue date and title:

Calculations leading to the reported values are on file with the NCB and testing laboratory that conducted the testing.

Statement not required by the standard used for type testing

(Note: When IEC or ISO standard requires a statement concerning the uncertainty of the measurement systems used for tests, this should be reported above. The informative text in parenthesis should be delete in both cases after selecting the applicable option)

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.

The image shows a marking plate design. It features the brand name 'TDK-Lambda' in a large, bold, italicized sans-serif font. Below it, the alphanumeric code 'i7C4W008A033V-001-R' is displayed in a smaller, bold, sans-serif font. To the left of the text, there is a vertical line with a curved arrow pointing upwards and another vertical line with a curved arrow pointing downwards, indicating the placement of the markings on a component.

TDK-Lambda
i7C4W008A033V-001-R

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:	
Product group	built-in component
Classification of use by	Instructed person
Supply Connection	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	N/A A; N/A
Equipment mobility	for building-in
Over voltage category (OVC)	OVC I
Class of equipment	Not Classified
Special installation location	N/A 0
Pollution degree (PD)	PD 2
Manufacturer’s specified Tma (°C)	25
IP protection class	IPX0
Power systems	--
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 <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.	
Manufacturer’s Declaration per sub-clause 4.2.5 of IEC60335-1:	

<p>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</p>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Not applicable
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When differences exist; they shall be identified in the General product information section.

<p>Name and address of factory (ies)</p>	<p>TDK-LAMBDA AMERICAS INC 3000 Technology Dr, Suite 100 Plano TX 75074 UNITED STATES</p> <p>TDK-LAMBDA MALAYSIA SDN BHD PLO33 KAWASAN PERINDUSTRIAN SENAI 81400 SENAI JOHOR MALAYSIA</p>
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General product information and other remarks:

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 Information
 This report is based on CB report references E220248-A6009-CB-1 and CB Test Certificate Ref. US-34699-UL respectively, which was previously evaluated to UL 62368-1, 2nd Edition, 2014-12-01, CSA C22.2 No. 62368-1-14, 2nd Edition, 2014-12, and IEC 62368-1:2014. Testing conducted in accordance with UL 62368-1, 2nd Edition, 2014-12-01, CSA C22.2 No. 62368-1-14, 2nd Edition, 2014-12, and IEC 62368-1:2014, was deemed equivalent to the test required per UL62368-1, 3rd Ed December 13, 2019; CAN/CSA-C22.2 No. 62368-1, 3rd Ed December 13, 2019; and IEC62368-1:2018, 3rd Ed.

The original testing 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, which was conducted under E220248-A42-CB-1 was used for E220248-A6009-CB-1 report. These tests were also considered representative to the test required per UL62368-1, 3rd Ed December 13, 2019; CAN/CSA-C22.2 No. 62368-1, 3rd Ed December 13, 2019; and IEC62368-1:2018, 3rd Ed.

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 (T_{ma}) 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 : 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 IEC 62368-1:2020+A11:2020

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).