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-A6008-CB-1
Date of issue.....:	2019-11-01 ; Correction 1 : 2019-11-06
Total number of pages .....:	11
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

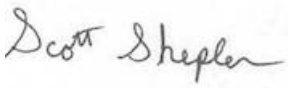
This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

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
Manufacturer .....:	TDK-LAMBDA AMERICAS INC SUITE 100 3320 MATRIX DR RICHARDSON TX 75082 UNITED STATES
Model/Type reference .....:	HQA Series - HQA24***W%%%V-xxx(-S)(-?) where 24 represents nominal input voltage, with a 18-40Vdc input *** represents rated power in Watts, with max power of 120. (000 to 120 to represent from 0 to 120 watts) %%% represents rated output voltage, 48Vdc, (000 to 480 to represent from 0 to 48 VDC) and xxx indicates a number or alphanumeric character which affects non safety related features Optional-S indicating standard, or -M indicating enhanced, with optional -? (indicating Non safety related option) following the previous option HQA2W***W%%%V-xxx(-S)(-?) where 2W represents nominal input voltage, with a 10-40Vdc input, with a Max Input Current of 16A *** represents rated power in Watts, with max power, of 120. (000 to 120 to represent from 0 to 120 watts) %%% represents rated output voltage between,3.3Vdc - 28Vdc, (033 to 280 to represent from 3.3 to 28 VDC) with Max Output Power of 120W and xxx indicates a number or alphanumeric character which affects non safety related features Optional-S indicating standard, or -M indicating enhanced, with optional -? (indicating Non safety related option) following the previous option
Ratings .....:	Optional Rated Input: 9 - 40 VDC, 16 A Max Rated Output: 48 VDC Max, 35 A Max, 120 W Max.

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	
Approved by (name + signature) .....:	Scott Shepler / Reviewer	
☐ 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).....:	See previously issued VDE CBTR for names, functions, and signatures / --	See previously issued VDE CBTR for names, functions, and signatures
Witnessed by (name + signature).....:	See previously issued VDE CBTR for names, functions, and signatures / --	See previously issued VDE CBTR for names, functions, and signatures
Approved by (name + signature) .....:	See previously issued VDE CBTR for names, functions, and signatures / --	See previously issued VDE CBTR for names, functions, and 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 (0 pages)
Enclosures (0 pages)

Summary of testing:

Tests performed (name of test and test clause):	**Testing Location:** **CBTL: UL RTP, 12 Laboratory Drive, Research Triangle Park , NC, 27709, USA**
DETERMINATION OF WORKING VOLTAGE (5.4.1.8)	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. Testing correlation explanation provided in Enclosure.
TESTS FOR SEMICONDUCTOR COMPONENTS AND CEMENTED JOINTS (5.4.7, 5.4.1.5.3)	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. Testing correlation explanation provided in Enclosure.
ELECTRIC STRENGTH TEST (5.4.9)	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. Testing correlation explanation provided in Enclosure. Only electric strength test was repeated per 62368-1.
INPUT TEST: SINGLE PHASE (B.2.5)	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. Testing correlation explanation provided in Enclosure.
NORMAL OPERATING CONDITIONS TEMPERATURE MEASUREMENT (B.2.6)	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. Testing correlation explanation provided in Enclosure.
SIMULATED ABNORMAL OPERATING CONDITIONS (B.3)	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. Testing correlation explanation provided in Enclosure.
SIMULATED SINGLE FAULT CONDITIONS (B.4)	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. Testing correlation explanation provided in Enclosure.
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**
ELECTRIC STRENGTH TEST (5.4.9)	Test conducted under CTF-2

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 current rating of protective device as part of building or equipment installation	N/A, No direct connection to Mains 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)	0.10
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..... :	2015-07-01, 2019-10-25
Date (s) of performance of tests..... :	2015-07-01 to 2015-07-31, 2019-10-25
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

The original report was modified on 2019-11-06 to include the following changes/additions:
This Report was deemed a Correction, due to:
-Added missing list of tests due to omission on previous report.

All original sample and test dates are noted in the testing portion of this report.

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

Product Description

The product is a component type DC to DC power module with a planar power transformer. The converter is provided with input terminal pins for factory installation onto a printed wiring board with a connection to a dc source of supply and output terminal pins. These models have been evaluated as having Basic insulation from input to output. The product employs a multilayer PWB planar transformer.

Model Differences

All models within the HQA Series employ identical mechanical configuration, using the same PWB, same transformer winding turns ratio and same transformer core set. The house-keeping transformers used for the bias supply, current sensing, and gate drive purposes are also the same for all models within the series.

HQA24***A%%%V-xxx(-S)(-?)

where 24 represents nominal input voltage, with a 18-40Vdc input, *** represents rated output current between 0A - 2.5A, %%% represents rated output voltage ,48Vdc, with Max Output Power of 120W and xxx indicates a number or alphanumeric character which affects non safety related features. Optional-S indicating standard, or -M indicating enhanced, with optional -? (indicating Non safety related option) following the previous option HQA Series Example model number tested: HQA24120W480V-xxx.

HQA2W***A%%%V-xxx(-S)(-?)

where 2W represents nominal input voltage, with a 10-40Vdc input, with a Max Input Current of 16A, *** represents rated output current between 2.5A - 35A, %%% represents rated output voltage between,3.3Vdc - 28Vdc, with Max Output Power of 120W. and xxx indicates a number or alphanumeric character which affects non safety related features, Optional-S indicating standard or -M indicating enhanced, with optional -? (indicating

Non safety related option) following the previous option, HQA Series model numbers tested: HQA2W120W280V-xxx.

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

This Report was deemed a Correction, due to:

-Added missing list of tests due to omission on previous report.

This report is based on VDE CB report 215009-CI3-1, and its amendment 228400-CI3-1 and CB Test Certificate Ref. CB: DE1-55984 and DE1-55984/A1 respectively which was previously evaluated to UL/CSA/IEC 60950-1, 2nd edition, + Amendment 1, and Amendment 2.

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. Testing correlation explanation provided in Enclosure. All original sample and test dates are noted in the testing portion of this report. Only Electric Strength test (5.4.9) was repeated to 62368-1.

All original sample and test dates are noted in the testing portion of this report.

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

Engineering Conditions of Acceptability

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

- The following product-line tests are conducted for this product : Electric Strength
- The following output circuits are at ES1 energy levels : All
- The following output circuits are at PS3 energy levels : Output Terminal
- The maximum investigated branch circuit rating is : EUT is for building in. 30 A fuse was used during test.
- The investigated Pollution Degree is : 2
- The following end-product enclosures are required : Electrical, Fire
- The output circuit is considered PS3 (Hazardous voltage Secondary, hazardous energy level). There are no user accessible areas in the equipment.
- Heating Test shall be evaluated in end product.

- 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.
- Unit intended for building-in and supplied power from secondary circuit which is isolated from primary circuit by double or reinforced insulation.