



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-A6013-CB-1
Date of issue.....: 2020-02-18
Total number of pages: 65

Applicant's name.....: **TDK-LAMBDA AMERICAS INC**
Address: **SUITE 100**
3320 MATRIX DR
RICHARDSON TX 75082
UNITED STATES

Name of Test Laboratory: UL RTP
preparing the Report: 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

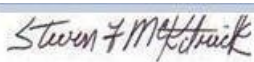
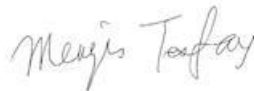
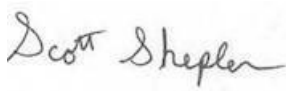
Test Report Form No.....: IEC62368_1B
Test Report Form(s) Originator: UL(US)
Master TRF.....: 2014-03

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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	TDK 
Manufacturer	TDK-LAMBDA AMERICAS INC SUITE 100 3320 MATRIX DR RICHARDSON TX 75082 UNITED STATES
Model/Type reference	iQE24, iQE48 and iQE4W – Series (see enclosure for model matrix) iQE24***A%%V-###-R iQE48***A%%V-###-R iQE4W***A%%V-###-R where *** represents a three digit output current less than or equal to 50A. Values will be expressed in 1A increments. (Note that the first digit is always “0”); where %%% represents a three digit voltage less than or equal to 20V. Values will be expressed in 100mV increments. (Note that the third digit is preceded by a decimal point. Example 120 implies 12.0 Volts.) ###, where it may be 0## or 1## which is a three digit alphanumeric indicating a mechanical or control function modification. The 1 in 1## indicates option for baseplate.
Ratings	Rating iQE24***A%%V-###-R Input: 18 - 36VDC, 15 A OR 19-30 VDC, 15 A Output - 20 VDC Max, 35 A Max, 120 W iQE48***A%%V-###-R Input: 36 - 75VDC, 10 A OR 42-60VDC, 10 A Output - 20 VDC Max, 50 A Max, 204 W iQE4W***A%%V-###-R Input: 18 - 75VDC, 15 A Output - 20 VDC Max, 35 A Max, 132 W where *** represents a three digit current less than or equal to 50A. Values will be expressed in 1A increments.(Note that the first digit is always “0”); where %%% represents a three digit voltage less than or equal to 20V. Values will be expressed in 100mV increments. (Note that the third digit is preceded by a decimal point. Example 120 implies 12.0 Volts.)

	<p>###, where it may be 0## or 1## which is a three digit alphanumeric indicating a mechanical or control function modification. The 1 in 1## indicates option for baseplate.</p> <p>(see enclosure for model matrix details)</p>	
Testing procedure and testing location:		
<input type="checkbox"/>	CB Testing Laboratory:	
Testing location/ address		
Tested by (name + signature).....:		
Approved by (name + signature)		
<input type="checkbox"/>	Testing procedure: CTF Stage 1	
Testing location/ address..... :		
Tested by (name + signature).....:		
Approved by (name + 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 + signature).....:		Steve McKitrick / Tester 
Witnessed by (name + signature).....:		Mengis Tesfay / Project Handler 
Approved by (name + 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 + signature).....:		
Witnessed by (name + signature).....:		
Approved by (name + signature)		

Supervised by (name + signature)

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

National Differences (30 pages)

Enclosures (26 pages)

Summary of testing:

Tests performed (name of test and test clause):

DETERMINATION OF WORKING VOLTAGE (5.4.1.8)

ELECTRIC STRENGTH TEST (5.4.9)

INPUT TEST: SINGLE PHASE (B.2.5)

NORMAL OPERATING CONDITIONS TEMPERATURE MEASUREMENT (B.2.6)

Testing Location:

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

Testing conducted under IEC 60950-1:2005 (Second Edition); Am1:2009 + Am2:2013 evaluation was considered equivalent. Test was covered under on VDE CB report reference 2520400-3336-0015/128803, Amendment 1, Report reference 2520400-3336-0015/162617 and Amendment 2215288-Ci3-2 with its respective CB Test Certificate Ref. DE1-42642, DE1-42642/A1 and DE1-42642/A2 respectively which were previously evaluated to UL/CSA/IEC 60950-1, 2nd edition, + Amendment 1 & 2 by VDE Testing and Certification Institute.

Testing conducted under IEC 60950-1:2005 (Second Edition); Am1:2009 + Am2:2013 evaluation was considered equivalent. Test was covered under on VDE CB report reference 2520400-3336-0015/128803, Amendment 1, Report reference 2520400-3336-0015/162617 and Amendment 2215288-Ci3-2 with its respective CB Test Certificate Ref. DE1-42642, DE1-42642/A1 and DE1-42642/A2 respectively which were previously evaluated to UL/CSA/IEC 60950-1, 2nd edition, + Amendment 1 & 2 by VDE Testing and Certification Institute. Test was also repeated per UL/CSA/IEC 62368-1 under this investigation.

Testing conducted under IEC 60950-1:2005 (Second Edition); Am1:2009 + Am2:2013 evaluation was considered equivalent. Test was covered under on VDE CB report reference 2520400-3336-0015/128803, Amendment 1, Report reference 2520400-3336-0015/162617 and Amendment 2215288-Ci3-2 with its respective CB Test Certificate Ref. DE1-42642, DE1-42642/A1 and DE1-42642/A2 respectively which were previously evaluated to UL/CSA/IEC 60950-1, 2nd edition, + Amendment 1 & 2 by VDE Testing and Certification Institute.

Testing conducted under IEC 60950-1:2005 (Second Edition); Am1:2009 + Am2:2013 evaluation was considered equivalent. Test was covered under on VDE CB report reference 2520400-3336-0015/128803, Amendment 1, Report reference 2520400-3336-0015/162617 and Amendment 2215288-Ci3-2 with its respective CB Test Certificate Ref. DE1-42642, DE1-42642/A1 and DE1-42642/A2 respectively which were

SIMULATED ABNORMAL OPERATING
CONDITIONS (B.3)

previously evaluated to UL/CSA/IEC 60950-1, 2nd edition, + Amendment 1 & 2 by VDE Testing and Certification Institute.

Testing conducted under IEC 60950-1:2005 (Second Edition); Am1:2009 + Am2:2013 evaluation was considered equivalent. Test was covered under on VDE CB report reference 2520400-3336-0015/128803, Amendment 1, Report reference 2520400-3336-0015/162617 and Amendment 2215288-Ci3-2 with its respective CB Test Certificate Ref. DE1-42642, DE1-42642/A1 and DE1-42642/A2 respectively which were previously evaluated to UL/CSA/IEC 60950-1, 2nd edition, + Amendment 1 & 2 by VDE Testing and Certification Institute.

SIMULATED SINGLE FAULT CONDITIONS (B.4)

Testing conducted under IEC 60950-1:2005 (Second Edition); Am1:2009 + Am2:2013 evaluation was considered equivalent. Test was covered under on VDE CB report reference 2520400-3336-0015/128803, Amendment 1, Report reference 2520400-3336-0015/162617 and Amendment 2215288-Ci3-2 with its respective CB Test Certificate Ref. DE1-42642, DE1-42642/A1 and DE1-42642/A2 respectively which were previously evaluated to UL/CSA/IEC 60950-1, 2nd edition, + Amendment 1 & 2 by VDE Testing and Certification Institute.

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 , Bulgaria, Belgium, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Lithuania, Latvia, Luxembourg, Malta, the Netherlands, Republic of North Macedonia, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Serbia, Sweden, Switzerland, Turkey and the United Kingdom

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 ES2 (iQE48 and iQE4W Series); ES1 (iQE24 Series)
Supply % Tolerance	None
Supply Connection – Type	Not connected to Mains. For building in
Considered current rating of protective device as part of building or equipment installation	N/A (For building in) A; equipment
Equipment mobility	for building-in
Over voltage category (OVC)	other: Not directly connected to Mains
Class of equipment	Not classified
Access location	N/A
Pollution degree (PD)	PD 2
Manufacturer’s specified maximum operating ambient (°C)	25°C
IP protection class	IPX0
Power Systems	N/A
Altitude during operation (m)	2000 m or less
Altitude of test laboratory (m)	app 180 m m
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..... :	2010-01-13, 2015-07-24, 2020-01-30
Date (s) of performance of tests..... :	2010-01-13 to 2010-01-18, 2015-11-23, 2020-01-30
GENERAL REMARKS:	
<p>"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report.</p> <p>Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.</p>	
Manufacturer’s Declaration per sub-clause 4.2.5 of IEC60068-2-1:	

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 :	<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.

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
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GENERAL PRODUCT INFORMATION:

Report Summary

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

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 iQE Series, including iQE24, iQE48, and iQE are similar in construction and employ identical mechanical configuration, using the same PWB, same transformer core set, and inductor core set, except for rating.

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

This report is based on VDE CB report reference 2520400-3336-0015/128803, Amendment 1, Report reference 2520400-3336-0015/162617 and Amendment 2215288-Ci3-2 with its respective CB Test Certificate Ref. DE1-42642, DE1-42642/A1 and DE1-42642/A2 respectively which was previously evaluated to UL/CSA/IEC 60950-1, 2nd edition, + Amendment 1 & 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.

Additionally, limited testing was deemed necessary for this investigation to IEC 62368-1. The following tests were performed under this investigation:

ELECTRIC STRENGTH TEST (5.4.9)

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) : For building in. 20 A fuse to be provided in an end product.
- 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. 20 A external fuse is to be provided in the end product.
- The investigated Pollution Degree is : 2
- The following end-product enclosures are required : Electrical, Fire
- 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.

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)
Input (iQE24 Series)	ES1
Internal (iQE24 Series)	ES1
Output (iQE24 Series)	ES1
Input (iQE48 and iQE4W Series)	ES2
Internal (iQE48 and iQE4W Series)	ES2
Output (iQE48 and iQE4W Series)	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)
Input (All Models)	PS3 (declared)
Output (All Models)	PS3
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 (All Models)	TS3 (for building in, to be addressed in the end product)

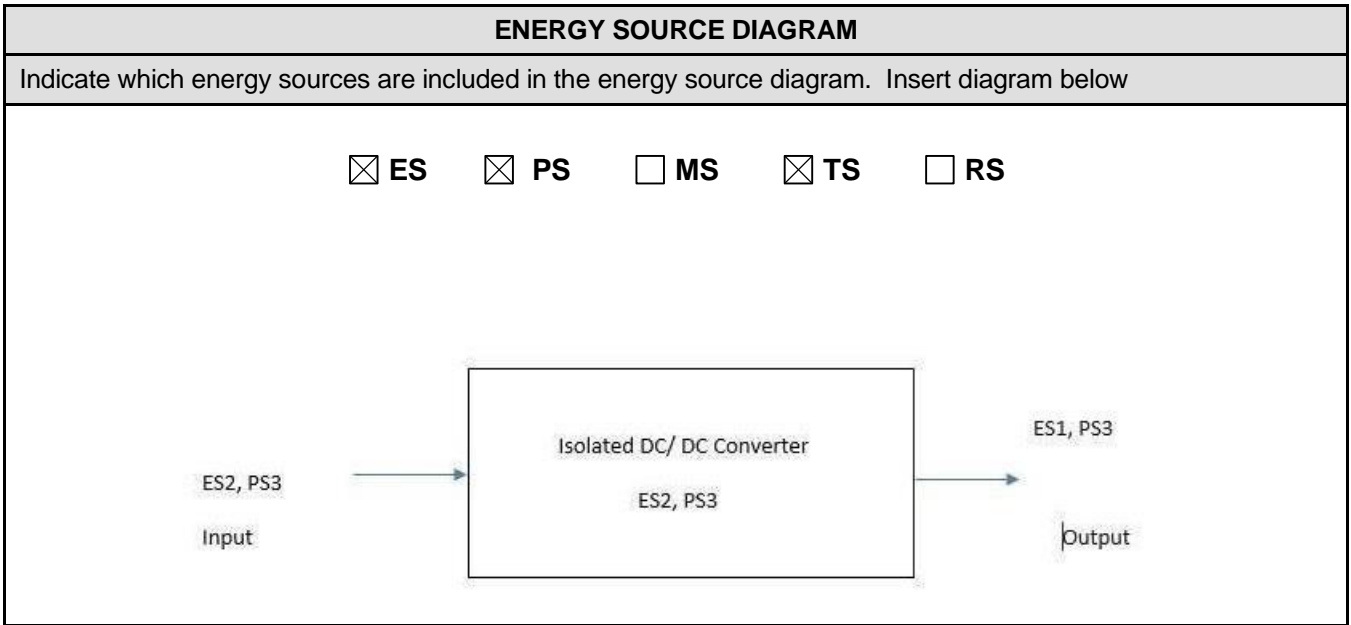
ENERGY SOURCE IDENTIFICATION AND CLASSIFICATION TABLE:**Radiation (Clause 10)**

(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	--



OVERVIEW OF EMPLOYED SAFEGUARDS				
Clause	Possible Hazard			
5.1	Electrically-caused injury			
Body Part (e.g. Ordinary)	Energy Source (ES3: Primary Filter circuit)	Safeguards		
		Basic	Supplementary	Reinforced (Enclosure)
Instructed Person (Model iQE24)	ES1: Input	Instructed Person	--	For building in
Instructed Person (Model iQE24)	ES1: Internal	Instructed Person	--	For building in
Instructed Person (Model iQE24)	ES1: Output	Instructed Person	--	For building in
Instructed Person (iQE48 and iQE4W Series)	ES2: Input	Instructed Person	--	For building in. Enclosure to be provided in an end product.
Instructed Person (iQE48 and iQE4W Series)	ES2: Internal	Instructed Person	--	For building in. Enclosure to be provided in an end product.
Instructed Person (iQE48 and iQE4W Series)	ES1: Output	Instructed Person	--	For building in. Enclosure to be provided in an end product.
6.1	Electrically-caused fire			
Material part (e.g. mouse enclosure)	Energy Source (PS2: 100 Watt circuit)	Safeguards		
		Basic	Supplementary	Reinforced
Input All Models	PS3	Do not ignite	PWB: Rated V1	For building in. Enclosure to be provided in an end product.
Outputs All Models	PS3	Do not ignite	PWB: Rated V1	For building in. Enclosure to be provided in an end product.

7.1	Injury caused by hazardous substances			
Body Part (e.g., skilled)	Energy Source (hazardous material)	Safeguards		
		Basic	Supplementary	Reinforced
N/A	--	--	--	--
8.1	Mechanically-caused injury			
Body Part (e.g. Ordinary)	Energy Source (MS3:High Pressure Lamp)	Safeguards		
		Basic	Supplementary	Reinforced (Enclosure)
N/A	--	--	--	--
9.1	Thermal Burn			
Body Part (e.g., Ordinary)	Energy Source (TS2)	Safeguards		
		Basic	Supplementary	Reinforced
PWB and Components	TS3	--	--	EUT is for building in. Enclosure to be provided in end product.
10.1	Radiation			
Body Part (e.g., Ordinary)	Energy Source (Output from audio port)	Safeguards		
		Basic	Supplementary	Reinforced
N/A	--	--	--	--
Supplementary Information:				
(1) See attached energy source diagram for additional details.				
(2) "N" – Normal Condition; "A" – Abnormal Condition; "S" Single Fault				