



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: E135494-A6006-CB-1
Date of issue.....: 2020-01-10
Total number of pages: 178

Applicant's name.....: **TDK-LAMBDA UK LTD**
Address: **KINGSLEY AVE**
ILFRACOMBE
EX34 8ES UNITED KINGDOM
UNITED KINGDOM

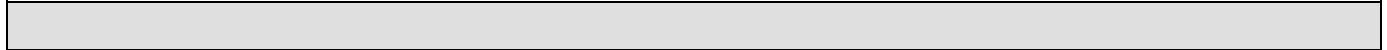
Name of Test Laboratory: UL International Polska Sp. z o.o.
preparing the Report: Aleja Krakowska 81, 05-090 Sekocin Nowy, Poland

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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Test Item description	:	AC-DC Power Supply
Trade Mark	:	TDK LAMBDA TDK-Lambda
Manufacturer	:	TDK-LAMBDA UK LTD KINGSLEY AVE ILFRACOMBE EX34 8ES UNITED KINGDOM
Model/Type reference	:	Vega 450, Vega 650, Vega 900, Vega Lite 550 and Vega Lite 750 models (see enclosure MISC-Model Differences, 7-03, for details of models and nomenclature)
Ratings	:	Vega 450 and Vega Lite 550. PSUs with cooling option F and without xEW and xFW options: Input voltage: 94.5-240 V ac nom., (abs. 85-264 V ac), 47-63 Hz, 8.5 A rms max. All other PSUs: Input voltage: 100-240 V ac nom., (abs. 90-264 V ac), 47-63 Hz, 8.5 A rms max. Vega 650, Vega Lite 750 and Vega 900. PSUs with cooling option F and without xEW and xFW options: Input voltage: 94.5-240 V ac nom., (abs. 85-264 V ac), 47-63 Hz, 12 A rms max. All other PSUs: Input voltage: 100-240 V ac nom., (abs. 90-264 V ac), 47-63 Hz, 11 A rms max. Input voltage for Vega 650 may also be rated 133-318V dc nom., (abs. 120-350V dc), 10A max., for models described within Products covered, custom models. (See enclosure MISC-Model Differences, 7-03, for details of ratings)
Testing procedure and testing location:		
<input type="checkbox"/>	CB Testing Laboratory:	
Testing location/ address :		
Tested by (name + signature).....:		
Approved by (name + signature)		
Testing procedure: CTF Stage 1		
Testing location/ address..... :		

Tested by (name + signature).....:			
Approved by (name + signature)			
<input type="checkbox"/>	Testing procedure: CTF Stage 2		
Testing location/ address.....:			
Tested by (name + signature).....:			
Witnessed by (name + signature).....:			
Approved by (name + signature)			
<input checked="" type="checkbox"/>	Testing procedure: CTF Stage 3		
<input type="checkbox"/>	Testing procedure: CTF Stage 4		
Testing location/ address.....:		TDK-LAMBDA UK LTD KINGSLEY AVE ILFRACOMBE EX34 8ES UNITED KINGDOM	
Tested by (name + signature).....:		Steve Hirstwood / Tester	
Witnessed by (name + signature).....:		Piotr A. Bizunowicz / Handler	
Approved by (name + signature)		Tracy Burgess / Authorized Signatory	
Supervised by (name + signature)		Piotr A. Bizunowicz / Handler	

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

National Differences (25 pages)

Enclosures (219 pages)

Summary of testing:

Tests performed (name of test and test clause):

STEADY FORCE TEST, 250 N (4.4.4.2, ANNEX T.5)
 STEADY FORCE TEST, 30 N (4.4.4.2, ANNEX T.3)
 IMPACT TEST (4.4.4.4, ANNEX T.6)
 CLASSIFICATION OF ELECTRICAL ENERGY SOURCES (5.2, 5.7)
 DETERMINATION OF WORKING VOLTAGE (5.4.1.8)
 BALL PRESSURE TEST (5.4.1.10.3)
 SEPARABLE THIN SHEET MATERIAL (5.4.4.6.2)
 ELECTRIC STRENGTH TEST (5.4.9)
 SAFEGUARDS AGAINST CAPACITOR DISCHARGE AFTER DISCONNECTION OF A CONNECTOR (5.5.2.2)
 PROSPECTIVE TOUCH VOLTAGE AND TOUCH CURRENT MEASUREMENT (5.7)
 INPUT TEST: SINGLE PHASE (B.2.5)
 NORMAL OPERATING CONDITIONS TEMPERATURE MEASUREMENT (B.2.6)
 SIMULATED ABNORMAL OPERATING CONDITIONS (B.3)
 SIMULATED SINGLE FAULT CONDITIONS (B.4)
 TRANSFORMER OVERLOAD (ANNEX G.5.3.3)
 LIMITED SHORT CIRCUIT TEST (ANNEX R.1, 5.6.4.1, 5.6.4.4, 5.6.5.1)
 STEADY FORCE TEST, 10 N (ANNEX T.2, 5.4.2.6, 5.4.3.2, G.15.3.6)

Testing Location:

**CTF Stage 3: TDK-LAMBDA UK LTD
 KINGSLEY AVE
 ILFRACOMBE
 EX34 8ES UNITED KINGDOM**

Refer to enclosure 7-05

Summary of compliance with National Differences:**List of countries addressed:** Australia / New Zealand, EU Group and National Differences, 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 - Refer to Enclosure titled Marking Plate for copy.

TEST ITEM PARTICULARS:	
Classification of use by	Skilled person
Supply Connection	AC Mains DC Mains
Supply % Tolerance	+10%/-10%
Supply Connection – Type	To be determined in End Use Application
Considered current rating of protective device as part of building or equipment installation	20 A; building;
Equipment mobility	for building-in
Over voltage category (OVC)	OVC II
Class of equipment	Class I
Access location	To be determined in End Use Application
Pollution degree (PD)	PD 2
Manufacturer’s specified maximum operating ambient (°C)	50 (See also enc.7-04 for derating information)
IP protection class	IPX0
Power Systems	TN TT dc mains
Altitude during operation (m)	5000m excluding IEC60320 inlet and/or cooling option D or E (Papst fan 622HH) which have rating of 3000 m
Altitude of test laboratory (m)	2000 m or less
Mass of equipment (kg)	2.7
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..... :	2018-10-04 to 2019-09-02
Date (s) of performance of tests..... :	2018-10-04 to 2019-08-30
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 IEC60068-2-11:	

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 UK LTD KINGSLEY AVE ILFRACOMBE EX34 8ES UNITED KINGDOM PANYU TRIO MICROTRONICS CO LTD SHIJI INDUSTRIAL ESTATE DONGYONG NANSHA GUANGZHOU GUANGDONG 511453 CHINA
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GENERAL PRODUCT INFORMATION:

Report Summary

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

Product Description

Product Description –
 Vega 450, Vega 650, Vega 900, Vega Lite 550 and Vega Lite 750 are switch mode power supply units for building into host equipment. There are essentially 2 converters (450 and 650) and all units use the same modules. The Vega 450 and 550 use the 450 converter whilst the Vega 650, 750 and 900 use the 650 converter.

The Vega series switch mode power supply consists of:

Main converter:

1. Input filter, consisting of the input fuse, X and Y capacitors, common mode chokes and series mode chokes up to the bridge.
2. PFC (boost circuit), consisting of the boost choke and associated switching FETs/circuitry.
3. Forward converter, consisting of the switching FETs/circuitry and of the main transformer supplying all modules.
4. Flyback transformer providing the auxiliary circuits and fan supply.

Outputs:

1. Standby circuit, consisting of the standby transformer and switching IC/circuitry supplying the standby outputs.
2. Secondary modules, all attaching to the main transformer. These may have various options.

Model Differences

Refer to enclosure 7-03

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

Refer to enclosure 7-04

Rating plates in Enclosure 13 are exemplary artwork. Due to modular nature of the products, it is impossible to include markings for all output ratings.

Technical Considerations

- The product was submitted and evaluated for use at the maximum ambient temperature (T_{ma}) permitted by the manufacturer's specification of : 50°C
- The product is intended for use on the following power systems : TN, TT, DC mains supply , (refer to model differences)
- Considered current rating of protective device as part of the building installation (A) : 20
- Mains supply tolerance (%) or absolute mains supply values : +10%/-10% for AC and DC input
- The equipment disconnect device is considered to be : Appliance inlet for models with inlet, to be considered in End Use Application for other models
- The following were investigated as part of the protective earthing/bonding : Printed wiring board trace (refer to Enclosure - Schematics + PWB for layouts)
- The following are available from the Applicant upon request : Intallation/service manual, also in languages other than English, including French language for Canadian national difference.
- The product was investigated to the following additional standard : EN 62368-1:2014 + A11:2017, AS/NZS 62368.1:2018
- When the IEC inlet option is fitted (option I) together with a plastic fan grill then the end face of the PSU with the fan grill may be Ordinary Person (operator) accessible.

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 : Earthing Continuity, Electric Strength
- The end-product Electric Strength Test is to be based upon a maximum working voltage of : AC mains supply Primary-Earthed Dead Metal: 298Vrms, 392Vpk , Primary-Secondary: 675Vpeak, 402Vrms., DC mains supply:- Primary to earth 560Vpk, 383Vrms. Primary to secondary, 588Vpeak, 393Vrms.
- The following output circuits are at ES1 energy levels : Refer to enclosure 7-03
- The following output circuits are at ES2 energy levels : Refer to enclosure 7-03
- The following output circuits are at ES3 energy levels : Refer to enclosure 7-03
- The following output circuits are at PS3 energy levels : All outputs
- The maximum investigated branch circuit rating is : 20 A
- 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 input terminals/connectors must be connected to the end-product supply neutral : terminal "N"
- The following end-product enclosures are required : Mechanical, Electrical, Fire
- The following magnetic devices (e.g. transformers or inductor) are provided with an OBJ2 insulation system with the indicated rating greater than Class A (105°C) : T1 (155), T2 (155), TX3 (155), TX1 (155), main transformer (155)
- The following components require special consideration during end-product Thermal (Heating) tests due to the indicated maximum temperature measurements during component-level testing : For cooling option C: TX1 (155°C) , main transformer (155°C), see also enclosure 7-04 for any custom cooling configuration or use outside ratings.

- The following input terminals were evaluated as suitable for direct connection to the DC Mains Supply :
Input L,N - for models with DC rating
- The equipment is suitable for direct connection to : AC mains supply for models with IEC60320 appliance coupler
- The power supply was evaluated to be used at altitudes up to : 5000m, excluding the IEC60320 inlet and cooling options d and e which are rated up to 3000m
- The End Use fixings screw penetration require special attention: see handbook in enclosures for details

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)
Primary circuits (Not accessible)	ES3
Input connector (Stored capacitance)	ES1
Module secondary circuits with up to 3 turn secondary's before output choke (Not accessible)	ES1
Module secondary circuits with 4 or 5 turn secondary's before output choke (Not accessible)	ES2
W8 module before output choke (Not accessible)	ES3
Standby secondary circuits	ES1
PSU output	ES1 or ES2 or ES3, see diagram (depending on model)
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	PS3 (Declared)
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	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)
Sharp edges/corners	MS1
Fan blades	MS1
Product mass	MS1
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)
Power supply (except option I, IEC inlet models)	TS3 (accessible to skilled person only).

ENERGY SOURCE IDENTIFICATION AND CLASSIFICATION TABLE:	
Power supply option I (IEC inlet models)	TS1
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	N/A

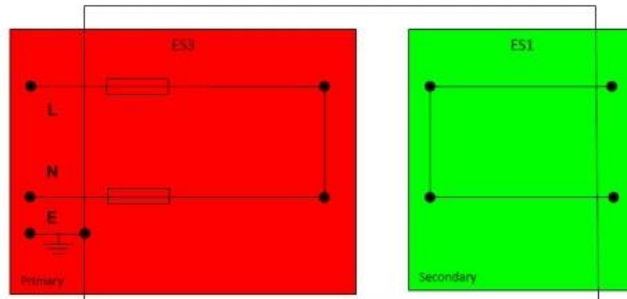
ENERGY SOURCE DIAGRAM

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

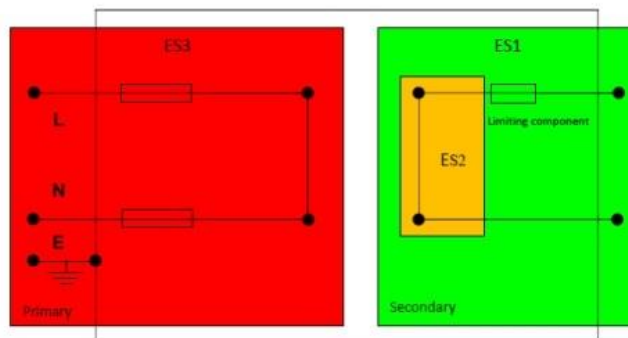
ES PS MS TS RS

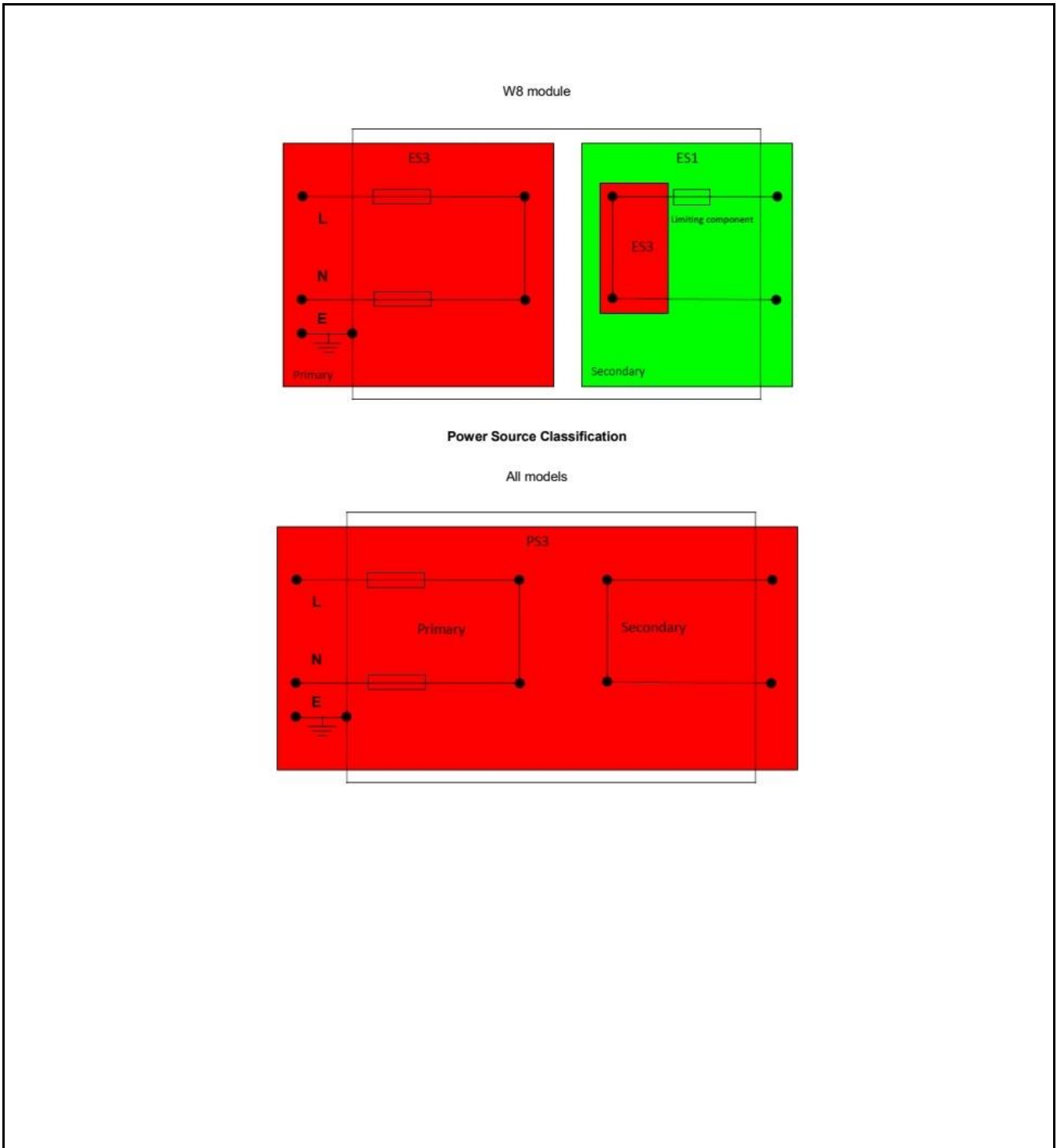
Electrical Energy Source Classification

Module's with up to 3 turn secondaries and primary option



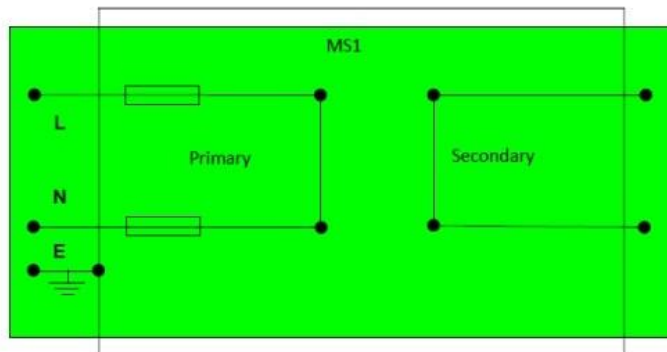
Module's with greater than 4 turn secondaries





Mechanical Energy Source Classification

All models



Thermal Energy Source Classification

All models except option I (IEC inlet model)

