



Test Report issued under the responsibility of:






**TEST REPORT**

**IEC 62368-1**

**Audio/video, information and communication technology equipment**

**Part 1: Safety requirements**

<b>Report Number</b> .....	E135494-A6018-CB-1
Date of issue.....	2019-12-27 ; Amendment 1 : 2020-10-20
Total number of pages .....	100
<b>Applicant's name</b> .....	<b>TDK-LAMBDA UK LTD</b>
Address .....	<b>KINGSLEY AVE</b> <b>ILFRACOMBE</b> <b>EX34 8ES UNITED KINGDOM</b>
Name of Test Laboratory preparing the Report .....	UL International Polska sp. z o.o. Równoległa 4, PL-02-235 Warszawa, Poland
<b>Test specification:</b>	
Standard .....	IEC 62368-1:2014 (Second Edition)
Test procedure .....	CB Scheme
Non-standard test method .....	N/A
<b>Test Report Form No</b> .....	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 	
Manufacturer	: TDK-LAMBDA UK LTD KINGSLEY AVE ILFRACOMBE EX34 8ES UNITED KINGDOM	
Model/Type reference	: EFE300 Series or EFE-300 Series (See model differences for details of models and nomenclature)	
Ratings	: 100-240Vac nom, 4.7Arms max, 45-440Hz (optional) 133-318Vdc nom, 3.8Adc max (optional)  (See model differences for details of ratings)	
Testing procedure and testing location:		
<input checked="" type="checkbox"/>	CB Testing Laboratory:	
Testing location/ address	: UL International Polska sp. z o.o., Równoległa 4, PL-02-235 Warszawa, Poland	
Tested by (name + signature)	Borys Bakun/Supervised by Dennis Butcher / Project Handler	
Approved by (name + signature)	Grzegorz Goraj / Reviewer	
<input type="checkbox"/>	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 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).....:		

**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):**

RESISTOR TEST (ANNEX G.10.2)

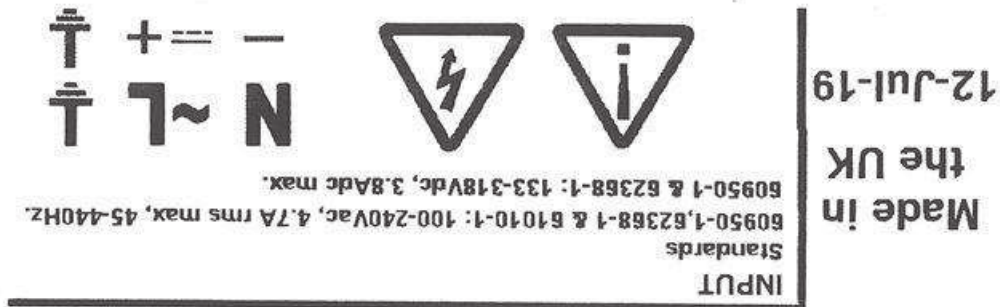
**Testing Location:**CBTL: UL International Polska sp. z o.o.,  
Równoległa 4, PL-02-235 Warszawa, Poland**Summary of compliance with National Differences:****List of countries addressed:** Australia / New Zealand, EU Group and National Differences, Japan, USA / Canada

EU Group and National Differences applies to CENELEC member countries: Austria , Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, 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.



**TDK-Lambda** **EFE-300**

[www.emea.tdk-lambda.com](http://www.emea.tdk-lambda.com)

Product Code : U2Y021K

Serial Number : 8191920219

Description : EFE300-26-ECMDS-V

Customer Data :



8191920219



<p><b>OUTPUT</b>      <b>26V_12.5A</b></p>	<p>Refer to <a href="http://emea.tdk-lambda.com/manual">emea.tdk-lambda.com/manual</a> for installation manual.</p> <p>For Test Certificate: Refer to <a href="http://testcert.emea.tdk-lambda.com">http://testcert.emea.tdk-lambda.com</a></p> <p>pat: <a href="http://uk.tdk-lambda.com/patents">uk.tdk-lambda.com/patents</a></p>
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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.

<b>TEST ITEM PARTICULARS:</b>	
Classification of use by	Skilled person
Supply Connection	AC Mains DC Mains ES3
Supply % Tolerance	+10%/-10%
Supply Connection – Type	mating connector
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	N/A
Pollution degree (PD)	PD 2
Manufacturer’s specified maximum operating ambient (°C)	50°C (Full Load); 70°C (Output power decreased linearly by 2.5%/°C above 50°C)
IP protection class	IPX0
Power Systems	TN
Altitude during operation (m)	3000 m
Altitude of test laboratory (m)	2000 m or less
Mass of equipment (kg)	< 1kg
<b>POSSIBLE TEST CASE VERDICTS:</b>	
- 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)
<b>TESTING:</b>	
Date of receipt of test item..... :	2020-09-02
Date (s) of performance of tests..... :	2020-10-05
<b>GENERAL REMARKS:</b>	
<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>	
<b>Manufacturer’s Declaration per sub-clause 4.2.5 of IEC60335-1:</b>	

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

<b>Name and address of factory (ies) .....</b> :	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  TDK-LAMBDA CORP 2704-1 SETTAYA-MACHI NAGAOKA-SHI NIIGATA-KEN 940-1195 JAPAN
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**GENERAL PRODUCT INFORMATION:**

**Report Summary**

The original report was modified on 2020-10-20 to include the following changes/additions:  
 During E135494-A6018-CB-1 Amendment 1 (technical):  
 KOA, RK73B3ATTE184J for "XR55, XR54 Discharge resistors alternate" was added to 4.1.2 table. Tests on same resistors were deemed representative for EFE300 Series or EFE-300 Series in this report and EFE300M Series or EFE-300M Series in E135494-A6010 report. CBTL has been changed to UL International Polska sp. z o.o..

**Product Description**

EFE300 or EFE-300 Series. Switch mode power supplies for building into end equipment

**Model Differences**

Model Differences –  
 Nominal Input Voltage Range 100 – 240Vac or 133 – 318Vdc (conditioned)  
 Maximum Input Voltage Range 90\* – 264Vac or 120 – 350Vdc  
 Input Frequency 45 – 440\*Hz Maximum or DC  
 Maximum Input Current 4.7A rms or 3.8A dc

\*Channel 1 output is linearly derated from 90Vac to 85Vac, 4W/Volt to 280W

All ratings apply for ambient temperatures up to 50°C. From 50 to 70°C the output power is derated at 2.5% per °C.

Unit Configuration Code:

EFE300 or EFE-300x-a-bcde-f-g-hij

(may be prefixed by NS - # / where # may be any number of characters indicating non-safety related model differences). Products may additionally be marked with U2x or Y2x where x can be any number of characters indicating non-safety related model differences.

May be prefixed by SP followed by / or – (SP represents a sales code)

Where:

x = Nothing or J for Japanese models (may have non-safety differences)

a = Channel 1 output voltage: any voltage within the adjustment range for the Vout (nom) from the Output Table below e.g. 12.8 for 12.8V output (12Vout nom), 24.6 for 24.6V output (24Vout nom).

b = CN for Open Frame with Fan Output

CU for U-Chassis with Fan Output

CC for U-Chassis and Cover with Fan Output

EC for U-Chassis and Cover with Fan

c = M for Molex input connector, J for JST connector or equivalent

d = D for Dual Fused Input or L for Single Fuse in the live line

e = S for Standard Leakage, L for Low Leakage, R for Reduced Leakage, T for Tiny Leakage\*

f = Nothing for Horizontal Output Connector, V for Vertical Output Connector

g = Nothing for standard channel 1 output voltage. xD or xPD where D is for units with programmed negative load regulation. PD is for units with programmed positive load regulation. x is the voltage of the regulation in 100mV and is within the Output Adjustment Range (example: 7D = 0.7V of negative load regulation, 24PD = 2.4V of positive load regulation)

hij = Three numbers from 0 to 9 which denotes various output voltage/current settings within the specified ranges of each output for a particular unit or blank for the standard output settings (may define non-safety related parameters/features e.g. reduced primary current limit, reduced OVP)

\* At 440Hz leakage current is > 3.5mA and therefore must be assessed in the end use application

\* L = < 300µA leakage, R = < 150µA Leakage and T = <75µA Leakage

Output Parameters:

O/P Channel Vout nom (V) Range (V) Max O/P (A) Max O/P (W)

CH1 12 11.4 – 13.2\* 25 300 (400\*\*)

24 22.8 – 26.4\* 12.5 300 (400\*\*)

Fan output 12 Fixed 0.25 3

\* Can be adjusted from nominal at the factory only

\*\* Peak power of 400W for 10 seconds maximum, maximum RMS power of 300W

Maximum continuous power output 300W (excluding fan output)

Output Limitations:

All outputs are ES1.

All outputs have functional spacing's to earth and due consideration must be given to this in the end product.



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

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

Customer Air Cooling (CN, CU and CC options):

The following components require special consideration during end-product thermal (heating) tests due to the indicated maximum temperature measurements during component-level testing. The components listed in the following table must not exceed the temperature given. To determine the component temperatures the heating tests must be conducted in accordance with the requirement of the standard concerned. There is no requirement to perform abnormal or single fault testing as this has been considered in the testing of this report.

Test requirements include: PSU to be fitted in its end-use equipment and operated under the most adverse conditions permitted in the end-use equipment handbook/specification which will result in the highest temperatures in the PSU. To determine the most adverse conditions, consideration should be given to the end use equipment maximum operating ambient, the PSU loading and input voltage, ventilation, end use equipment orientation, the position of doors & covers, etc. Temperatures should be monitored using type K fine wire thermocouples (secured with cyanoacrylate adhesive, or similar) placed on the hottest part of the component (out of any direct airflow) and the equipment should be run until all temperatures have stabilised.

Circuit Reference Description Max. Temperature (°C)

J1 Input connector 75

L1, L2 Common mode choke winding 115 (130)

C7, C8 X Capacitors 100

C9 Reservoir Capacitor (Electrolytic) 60 (105)

L3 Boost Choke Winding 115 (140)

TX2 Transformer Winding 120 (130)

TX2 Transformer Core 120 (130)

TX2 Transformer Braid 120 (130)

U2 Opto-coupler 75 (100)

C10, C11 Channel 1 Output Capacitors 80 (105)

L6 Primary Choke (24V model only) 120 (130)

L4 Channel 1 Output Choke 115 (130)

XU2/XU8 Fan Regulator 115 (130)

XQ201 Boost FET (IMS Board) 115 (130)

Q1 Channel 1 Output FET (Adjacent to R4) 115 (130)

XU3 Primary Driver IC 100 (130)

Various All Other Electrolytic Capacitors 80 (105)

**Technical Considerations**

- The product was submitted and evaluated for use at the maximum ambient temperature (T<sub>ma</sub>) permitted by the manufacturer's specification of : 50°C (full load); 70°C (power and output current decreasing linearly by 2.5%/°C above 50°C)
- The product is intended for use on the following power systems : TN
- Considered current rating of protective device as part of the building installation (A) : 20
- Mains supply tolerance (%) or absolute mains supply values : +10%/-10%
- The equipment disconnect device is considered to be : To provided in the end equipment

- 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 : Installation (Safety) Instructions / Manual
- The product was investigated to the following additional standard : EN 62368-1:2014 + A11:2017
- Capacitors are rated for 230V due to the IT power system used in Norway. Further evaluation may be required in the end use product.
- Multi-layer PWB's accepted under CBTR Ref. No. E349607-A23 dated 2014-07-31. Letter report included under Enclosure of this report –

### **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, Earthing Continuity
- The end-product Electric Strength Test is to be based upon a maximum working voltage of : Primary-Secondary: 392 Vrms, 762 Vpk, Primary – Earthed Dead Metal: 392 Vrms 668 Vpk
- The following output circuits are at ES1 energy levels : All
- 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 end-product enclosures are required : Mechanical, Fire, Electrical
- The following magnetic devices (e.g. transformers or inductor) are provided with an OBJY2 insulation system with the indicated rating greater than Class A (105°C) : Transformer TX2 (Class F) – See table 4.1.2 for details of insulation system used.
- The following components require special consideration during end-product Thermal (Heating) tests due to the indicated maximum temperature measurements during component-level testing : Customer air models require component temperatures to be monitored as detailed in the Additional Application Considerations section under additional information of this report.
- The equipment is suitable for direct connection to : AC and/or DC mains supply
- The power supply was evaluated to be used at altitudes up to : 3000m
- Fans: The fan provided in this sub-assembly is provided with a fan guard to reduce the risk of contact with the rotor. The fan provided in this sub-assembly is not intended for operator access