



Test Report issued under the responsibility of:



TEST REPORT
IEC 60950-1
Information technology equipment – Safety –
Part 1: General requirements

Report Number .....: E135494-A34-CB-5
Date of issue .....: 2015-04-14 ; Amendment 2 : 2020-11-25
Total number of pages..... 20

Name of Testing Laboratory UL International Demko A/S
preparing the Report .....: Borupvang 5A, 2750 Ballerup, Denmark

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

Test specification:
Standard.....: IEC 60950-1:2005, AMD1:2009, AMD2:2013
Test procedure .....: CB Scheme
Non-standard test method .....: N/A

Test Report Form No. ....: IEC60950\_1G
Test Report Form(s) Originator ....: SGS Fimko Ltd
Master TRF.....: Dated 2019-07-02

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<b>Test item description</b> .....	Switch Mode Power Supply	
<b>Trade Mark</b> .....	TDK-Lambda <b>TDK-Lambda</b>	
<b>Manufacturer</b> .....	TDK-LAMBDA UK LTD KINGSLEY AVE ILFRACOMBE DEVON EX34 8ES UNITED KINGDOM	
<b>Model/Type reference</b> .....	EFE300M Series or EFE-300M Series  (see model differences for details of models and nomenclature)	
<b>Ratings</b> .....	100-240Vac nom, 4.9Arms max, 45-440Hz (optional) 133-318Vdc nom, 3.5Adc max (optional)  (See model differences for details of ratings)	
<b>Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):</b>		
<input checked="" type="checkbox"/>	<b>CB Testing Laboratory:</b>	
<b>Testing location/ address</b> .....	UL International Demko A/S, Borupvang 5A, 2750 Ballerup, Denmark	
<b>Tested by (name, function, signature)</b> .....	Borys Bakun / Project Handler	
<b>Approved by (name, function, signature)</b> ...:	Michał Siudowski / Reviewer	
<input type="checkbox"/>	<b>Testing procedure: CTF Stage 1:</b>	
<b>Testing location/ address</b> .....		
<b>Tested by (name, function, signature)</b> .....		
<b>Approved by (name, function, signature)</b> ...:		
<input type="checkbox"/>	<b>Testing procedure: CTF Stage 2:</b>	
<b>Testing location/ address</b> .....		
<b>Tested by (name + signature)</b> .....		
<b>Witnessed by (name, function, signature) .:</b>		
<b>Approved by (name, function, signature)</b> ...:		
<input type="checkbox"/>	<b>Testing procedure: CTF Stage 3:</b>	
<input type="checkbox"/>	<b>Testing procedure: CTF Stage 4:</b>	
<b>Testing location/ address</b> .....		

<b>Tested by (name, function, signature).....:</b>	
<b>Witnessed by (name, function, signature) .:</b>	
<b>Approved by (name, function, signature)...:</b>	
<b>Supervised by (name, function, signature) :</b>	

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

National Differences (15 pages)

Enclosures (2 pages)

**Summary of testing:****Tests performed (name of test and test clause):** None**Testing Location:** None**Summary of compliance with National Differences:****List of countries addressed:** Argentina, Australia / New Zealand, China, EU Group and National Differences, Israel, Japan, Korea, 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:** CSA C22.2 No. 60950-1-07 revision date 2014/10/14, EN 60950-1:2006 + A1:2010 + A11:2009 + A12:2011+A2:2013, UL 60950-1 2nd Ed. Revised 2014/10/14

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.

INPUT

Standards  
60950-1, 62368-1 & 61010-1: 100-240Vac, 4.9A rms max, 45-440Hz.  
60601-1: 100-240Vac, 4.9A rms max, 45-63Hz.  
60950-1 & 62368-1: 133-318Vdc, 3.5Aadc max

Made in the UK  
09-Jul-19

# TDK-Lambda *EFE-300M*

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

Product Code : U5Y045B

Serial Number : 8191850118

Description : EFE300M-48-5-ECMDL-YT-V

Customer Data :



8191850118



<b>OUTPUT</b>	<b>48V_6.25A</b>
<b>STANDBY</b>	<b>5V_2A</b>

Refer to [emea.tdk-lambda.com/manual](http://emea.tdk-lambda.com/manual) for installation manual.

For Test Certificate: Refer to <http://testcert.emea.tdk-lambda.com>

pat: [uk.tdk-lambda.com/patents](http://uk.tdk-lambda.com/patents)

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> .....	
Equipment mobility	for building-in
Connection to the mains	Connection to mains via host equipment
Operating condition	continuous
Access location	for building-in
Over voltage category (OVC)	OVC II
Mains supply tolerance (%) or absolute mains supply values	+10%, -10% (AC), or 120-350Vdc
Tested for IT power systems	Yes
IT testing, phase-phase voltage (V)	230V
Class of equipment	Class I (earthed)
Considered current rating of protective device as part of the building installation (A)	20A
Pollution degree (PD)	PD 2
IP protection class	IP X0
Altitude of operation (m)	5000m
Altitude of test laboratory (m)	64m
Mass of equipment (kg)	1kg max.

<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 .....	N/A
Date (s) of performance of tests .....	N/A
<b>General remarks:</b>	
"(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.	
<b>Manufacturer's Declaration per sub-clause 4.2.5 of IEC60950-1:</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>
<b>When differences exist; they shall be identified in the General product information section.</b>	

<p><b>Name and address of factory (ies) .....</b> :</p>	<p>TDK-LAMBDA UK LTD                  KINGSLEY AVE                  ILFRACOMBE                  EX34 8ES UNITED KINGDOM</p> <p>PANYU TRIO MICROTRONIC CO LTD                  SHIJI INDUSTRIAL ESTATE                  DONGYONG                  NANSHA                  GUANGZHOU                  GUANGDONG CHINA</p> <p>TDK-LAMBDA CORP                  2704-1 SETTAYA-MACHI                  NAGAOKA-SHI                  NIIGATA-KEN 940-1195 JAPAN</p> <p>TRIO-TRONICS (THAILAND) LTD                  7/295 MU. 6                  MAP YANG PHON SUB-DISTRICT                  PLUAK DAENG DISTRICT RAYONG PROVINCE                  THAILAND</p>
<p><b>General product information:</b></p> <p><b>Report Summary</b>                  The original report was modified on 2020-11-25 to include the following changes/additions:                  Amendment (administrative modification) - factory added: TRIO-TRONICS (THAILAND) LTD</p> <p><b>Product Description</b>                  EFE300M series. Switch mode power supplies for building into end equipment.</p>	

**Model Differences**

Nominal Input Voltage Range 100 - 240V AC or 133 - 318VDC  
 Maximum Input Voltage Range 90\*\* - 264V AC or 120 - 350VDC  
 Input Frequency 45-440\* Hz maximum or DC  
 Maximum Input Current 4.9A rms or 3.5A DC

\*\* Channel 1 output is linearly derated from 90Vac to 85Vac, 4W per 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 deg C.

EFE300M or -EFE300M models as described below:

(may be prefixed by NS - # / where # may be any characters indicating non safety related model differences)

Products may additionally be marked with U5x or Y5x where x can be any characters indicating non-safety related model differences excluding itemized models shown below.

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

Unit Configuration Code: EFE300Mxy-a-b-cdef-ghijk  
 where:

- x= Nothing or J for Japanese models (may have non-safety differences).
- Y= Blank for Y2 capacitors from output to earth, P for Y1 capacitors from output to earth.
- a= Channel 1 output Voltage: see Ch1 in the outputs table below, adjustment range column.
- b= Standby voltage: see standby voltage table below or 0 for omitted
- c= HN for Open frame, no fan, with 12V / 1A fan supply. HU for U chassis, no fan, with 12V / 1A fan supply. HC for Cover + chassis, no fan, with 12V / 1A fan supply. EC for Cover + chassis, end fan (temp controlled). NN for Open frame, no fan, no fan supply. NU for U chassis, no fan, no fan supply. NC for Cover + chassis, no fan, no fan supply. CN for Open frame, no fan, with 12V / 0.25A fan supply. CU for U chassis, no fan, with 12V / 0.25A fan supply. CC for Cover + chassis, no fan, with 12V / 0.25A fan supply.
- d= M for Molex input connector or equivalent, J for JST connector or equivalent.
- e= D for dual fused input or L for single fuse in the live line.
- f= S for standard Leakage, L for low Leakage, R for reduced Leakage, T for tiny Leakage. \*
- g= Y for Oring FET included or N for nothing.
- h= E for enable, T for inhibit, N for no inhibit, no enable.
- i= Nothing for horizontal output connector, -V for vertical output connector, -S for screw terminal
- j= 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 100mVolts and is within the Output Adjustment range (example, 7D = 0.7V of negative load regulation, 24PD = 2.4V of positive load regulation).
- k= Nothing or -x where x is 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 standard output settings. (may define non-safety related parameters/feature, 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 < 300uA leakage, R < 150uA leakage and T < 75uA 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**)
	28	27 - 32*	10.72	300 (400**)
	40	36 - 42*	7.5	300 (350***)
	48	47 - 50*	6.25	300 (350***)
	50	50.1 - 54*		6.0
Standby	5	Fixed	2	10
	12	12	1	12



	13.5	12-13.5*	1		13.5
Fan output	12	Fixed	0.25	3	
	12	Fixed	1	12	

\* Can be adjusted from nominal at the factory only.

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

\*\*\* Peak power of 350W for 10 seconds maximum, in any 1 minute cycle, maximum rms power of 300W:

where T1 = peak power time on  
 and T2 = reduced power time on

Maximum continuous power output 300W (excluding fan output)

#### Output Limitations

All standard outputs are SELV up to and including 48V nominal. Voltages above 48V nominal are non SELV and must not be accessible to an end operator..

All outputs have basic spacings to earth, and due consideration must be given to this in the end product design, except for Y50029# which has functional spacings to earth.

#### Non Standard models.

Model: Y5J008# (where # can be any letter) or EFE300MJ-12.1-5-008 or EFE300MJ-12.1-5-008-SGP

Maximum outputs: 12.1V, 21.49A, plus 5V, 2A standby.

Maximum ambient: As standard model.

Orientations: As standard model.

Comments: Fan speed is controlled at 6600rpm up to and between 45 to 50 degrees C ambient after which the fan resumes its normal nominal voltage rating. Can be fitted with or without fan guard.

Model: Y5J006# (where # can be any letter) or EFE300MJ-12-5-006.

Maximum outputs: 11.4V to 13.2V\*, 25A, (300W max) plus 5V, 2A standby.

Maximum ambient: As standard model.

Orientations: As standard model.

Comments: Longer version than standard model to accommodate additional reservoir capacitor for a greater hold up time.

Model: Y5J015# (where # can be any letter) or EFE300MJ-12.1-5-009 or EFE300MJ-12.1-5-009-SGP

Maximum outputs: 12.1V, 24.79A plus 5V, 2A standby.

Main output may also be 11.4 to 13.2V at 25A max. limited to 300W max.

Maximum ambient: As standard model.

Orientations: As standard model.

Comments: Model is the same as Y5J008# but is a NN.

Model Y50016# (where # can be any letter), NS-TLA/EFE300M-48.5-12-HNMDL-YE-V

Maximum outputs: 47-54V, 6.25A 300W max, plus 12V, 1A standby plus 12V, 1A fan output.

Maximum ambient: As standard model.

Orientations: As standard model.

Comments: OCP raised by 5% compared to the standard model.

Model Y50018# (where # can be any letter), NS-TLG/EFE300M-54-5-ECMDL-YT

Maximum outputs: 54V 5.5A, plus 5V, 2A standby.

Maximum ambient: As standard model.

Orientations: As standard model.

Comments: Extended U chassis with non-standard OVP to maintain SELV

Model Y50029# (where # can be any letter except E), EFE300M-13-5-HNMDS-NT-S/NS-TLA

Maximum outputs: As standard model

Maximum ambient: As standard model.

Orientations: As standard model.

Comments: Elongated PWB to accommodate additional filtering components.

Model Y50029E, EFE300M-13-5-HNMDS-NT-S/NS-TLA

Maximum outputs: As standard model

Maximum ambient: As standard model.

Orientations: As standard model.

Comments: Based on Y50029# but with a larger value boost capacitor, up to a value of 220 micro-farads, for a better hold up time.

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

N/A

#### **Technical Considerations**

- Equipment was evaluated for a maximum supply range of 85-264Vac and 120-350Vdc
- The equipment was evaluated for operation at a maximum altitude of 5 000m. The requirements of IEC60664-1 table A.2 were applied for calculating the required clearances.
- The 50V module is the 48V module, factory preset to 50V nominal output. Testing has been conducted on the 48V model at the worst case conditions including up to 54V output.
- 1.7 The product was investigated to the following additional standards: EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011 +A2:2013 (which includes all European national differences, including those specified in this test report).
- 1.2 The product was submitted and evaluated for use at the maximum ambient temperature (Tma) permitted by the manufacturer's specification of: 50°C (full load); 70°C (output power decreasing linearly by 2.5%/°C above 50°C)
- 1.4 The product is intended for use on the following power systems: IT (Norway only),
- TN,
- DC mains supply
- 1.11 The following were investigated as part of the protective earthing/bonding: Printed wiring board trace (refer to Enclosure - Schematics + PWB for layouts)
- 1.13 The following are available from the Applicant upon request: Installation (Safety) Instructions / Manual
- 1.5 The equipment disconnect device is considered to be: Provided by the end equipment
- Multi-layer PWB's accepted under CBTR ref. No. E349607-A23 dated 2014-07-31 and letter report in Enclosure 8-06 of this report.

#### **Engineering Conditions of Acceptability**

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

- When operated at frequencies in excess of 63Hz, the requirements of clause 5.1.7 must be considered in the end use equipment as the leakage current for input frequencies above 63Hz may exceed 3.5mA.
- The 48V output is SELV, but due to component tolerances consideration should be given to verifying this in the end-use equipment except for Model EFE300M-54-5-ECMDL-YT (Y50018A) which does meet SELV limits.
- 1.2 The following Production-Line tests are conducted for this product: Electric Strength  
Earthing Continuity
- 1.3 The end-product Electric Strength Test is to be based upon a maximum working voltage of: Primary-SELV: 408 Vrms, 880 Vpk  
Primary-Earthed Dead Metal: 392 Vrms, 668 Vpk
- 1.5 The following secondary output circuits are SELV: All standard models up to and including 48V nominal. Voltages above 48V nominal are non SELV and must not be accessible to an end operator.
- 1.6 The following secondary output circuits are at hazardous energy levels: Channel 1 output
- 1.11 The power supply terminals and/or connectors are: Suitable for factory wiring only
- 1.12 The maximum investigated branch circuit rating is: 20 A
- 1.13 The investigated Pollution Degree is: 2
- 1.15 Proper bonding to the end-product main protective earthing termination is: Required
- 1.16 An investigation of the protective bonding terminals has: Been conducted
- 1.18 The following magnetic devices (e.g. transformers or inductor) are provided with an OBJ3 insulation system with the indicated rating greater than Class A (105°C): Transformers TX1 & TX2: Class F (140°C) - See table 1.5.1 for details of insulation systems used.
- 1.19 The following end-product enclosures are required: Mechanical  
Fire  
Electrical
- 1.20 The following components require special consideration during end-product Thermal (Heating) tests due to the indicated maximum temperature measurements during component-level testing: Input connector J1 (75°C),  
Common mode choke winding L1, L2 (140°C mounted on Nema PWB material),  
X capacitors C7, C8 (100°C),  
Reservoir capacitor C9 (105°C),  
Boost choke winding L3 (140°C),  
Transformer winding TX1 (130°C),  
Transformer core TX1 (130°C),  
Transformer winding TX2 (130°C),  
Transformer core TX2 (130°C),  
Transformer braid (to pin 13) TX2 (130°C),  
Optocoupler U2, U4, U5, U6 (100°C),  
Channel 1 output capacitors C10, C11 (105°C),  
Primary choke (excluding 12V model) L6 (140°C mounted on Nema),  
Channel 1 Output choke L4 (140°C mounted on Nema),  
Fan regulator XU602 (125°C minimum coating rating),  
Boost FET (IMS board) XQ201 (125°C minimum coating rating),  
Channel 1 output FET (adjacent to R4) Q1, Q2 or Q5 (125°C minimum coating rating),  
Primary driver IC XU3 (125°C minimum coating rating),  
All other electrolytic capacitors (105°C)
- 1.35 Fans: The fan provided in this sub-assembly is provided with a fan guard to reduce the risk of operator contact with the rotor.  
The fan provided in this sub-assembly is not intended for operator access.

**Abbreviations used in the report:**

- normal conditions

**N.C.**

- single fault conditions

**S.F.C**