







Test Report issued under
the responsibility of:



TEST REPORT IEC 61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use Part 1: General requirements	
Report Reference No	E331788-A15-CB-2
Date of issue	2015-08-03
Total number of pages	33
CB Testing Laboratory	UL International Polska Sp. z o.o.
Address	Aleja Krakowska 81, 05-090 Sekocin Nowy, Poland
Applicant's name	TDK-LAMBDA UK LTD KINGSLEY AVE
Address	ILFRACOMBE DEVON EX34 8ES UNITED KINGDOM
Test specification:	
Standard	IEC 61010-1:2010, 3rd Edition
Test procedure	CB Scheme
Non-standard test method	N/A
Test Report Form No.	IEC61010_1H
Test Report Form originator	VDE Testing and Certification Institute
Master TRF	2011-11
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Test item description	Switch Mode Power Supply
Trade Mark	TDK-Lambda 
Manufacturer	TDK-LAMBDA UK LTD KINGSLEY AVE ILFRACOMBE DEVON EX34 8ES UNITED KINGDOM
Model/Type reference	NV700 or NV7 or NV-700 (see model differences for details of NV700 range model configurations)
Ratings	100-240Vac nominal, (90-264Vac including tolerances). 47-440Hz, 11A rms Max. (see model differences for details of model ratings)

Testing procedure and testing location:	
<input type="checkbox"/>	CB Testing Laboratory Testing location / address:
<input type="checkbox"/>	Associated CB Test Laboratory Testing location / address: Tested by (name + signature): Approved by (name + signature).....:
<input type="checkbox"/>	Testing Procedure: TMP/CTF Stage 1 Testing location / address: Tested by (name + signature): Approved by (name + signature).....:
<input type="checkbox"/>	Testing Procedure: WMT/CTF Stage 2 Testing location / address: Tested by (name + signature): Witnessed by (name + signature) ..: Approved by (name + signature).....:
<input checked="" type="checkbox"/>	Testing Procedure: SMT/CTF Stage 3 or 4 Testing location / address: TDK Lambda UK Ltd, Kingsley Avenue, Ilfracombe, Devon. EX34 8ES, United Kingdom Tested by (name + signature): Steve Hirstwood (Tester)  Approved by (name + signature).....: Bartlomeij Zmijewski (Reviewer)  Supervised by (name + signature) ..: Bartlomeij Zmijewski (Reviewer) 
<input type="checkbox"/>	Testing Procedure: RMT Testing location / address: Tested by (name + signature): Approved by (name + signature).....: Supervised by (name + signature) ..:

<p>List of Attachments</p> <p>National Differences (0 pages)</p> <p>Enclosures (0 pages)</p> <p>Summary Of Testing</p> <p>Unless otherwise indicated, all tests were conducted at TDK Lambda UK Ltd, Kingsley Avenue, Ilfracombe, Devon. EX34 8ES, United Kingdom.</p>
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Tests performed (name of test and test clause)	Testing location / Comments
Component Abnormal (4.4.1) Dielectric Strength Test (6.8)	
Summary of Compliance with National Differences: Countries outside the CB Scheme membership may also accept this report. List of countries addressed: AT, BE, CA, CH, CZ, DE, DK, FI, FR, GB, IL, IT, JP, NO, SE, SI, SK, US The product fulfills the requirements of: UL 61010-1 3rd Ed. CAN/CSA 22.2 No. 61010-1-12 3rd Ed. EN 61010-1:2010 3rd Ed.	

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.

T-N

11A rms max
 IEC/EN/ULCSA60801-1-1
 47-83Hz (For
 61010-1)
 IEC/EN/ULCSA60950-1-2
 47-440Hz (For
 100-240Vac nom
 input)

NV-Power
NV-700

Product Code : NV7238DS

 Serial Number : 1111111111

TDK-Lambda
 www.amea.tdk-lambda.com

Made in the UK
 11-Mar-13

Refer to www.amea.tdk-lambda.com for installation manual.
 For Test Certificate: Refer to <http://testcert.amea.tdk-lambda.com>

Configuration Code: **NV7SSS12_12DB12_12DB5_12DB5B**

DB 12V 12V 13A 5A 	DB 12V 12V 13A 5A 	DB 5V 12V 25A 5A 	B 5V 40A
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Test item particulars :

Type of item tested	Laboratory
Description of equipment function	Switch Mode Power Supply for building in.
Connections to mains supply	None unless via the IEC60320 inlet.
Overvoltage category	II
Pollution degree	2
Means of Protection	Class I (PE connected)
Environmental conditions	50°C ambient
For use in wet locations	No
Equipment mobility	Built-in
Operating conditions	continuous
Overall size of the equipment: (W X D X H) (mm) :	280 x 125 x 41mm Max.
Mass of the equipment (kg)	2kg Max.
Marked degree of protection to IEC 60529	N/A

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(s) of receipt of test item	2017-11-20
Date(s) of Performance of tests	2017-11-20

General remarks:

"(see Enclosure #)" refers to additional information appended to the report.

"(see Form A.xx)" refers to a table appended to the report.

Bottom lines for measurement tables Form A.xx are optional if used as record.

Throughout this report a point is used as the decimal separator.

Manufacturer's Declaration per Sub Clause 4.2.5 of IEC60080-1:

Yes

The application for obtaining a CB Test Certificate includes more than one factory 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

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 DEVON EX34 8ES UNITED KINGDOM PANYU TRIO MICROTRONIC CO. LTD
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SHIJI INDUSTRIAL ESTATE
DONGYONG
NANSHA
GUANGZHOU GUANGDONG CHINA

GENERAL PRODUCT INFORMATION:

Report Summary

The original report was modified on 2018-04-26 to include the following changes/additions:
The original report was modified to add an alternate boost capacitor C12/C13 to the critical components list. (Technical amendment)

Based on previously conducted testing and the review of product technical documentation including photos, schematics, wiring diagrams and similar, it has been determined that the product continues to comply with the standard.

Only the tests listed below were considered necessary.

Product Description

NV700 or NV-700 series. Switch mode power supplies for building into end equipment. (See model differences for details of model configurations)

This product range is available as a forced air cooled version (in-built fan) with screw terminal connections or an IEC 60320 inlet. It is also available as a customer air cooled version where the end cap is not fitted and the customer must provide an air flow and measure appropriate temperatures of components within the product.

Model Differences

NV700 models as described below:

Units may be marked with a Product Code: K7x or NV7x where x may be up to any six letters and/or numbers 0 to 9.

Unit Configuration (Description:) Code may be prefixed by NS # followed by / or - (where # may be any characters indicating non-safety related model differences).

Unit Configuration (Description :) Code:

a) NV-700x or NV7x (these models are identical)

where x = H for high hold-up or blank for standard hold-up

b) followed by: S, C or U

where S = Forward airflow, standard fan
C = Customer air, fan not fitted
U = Customer air, fan not fitted, cover not fitted

c) followed by: S or I

where S = Screw input terminals
I = IEC input

d) followed by: S, M, L, R, or T

where	S	=	Standard Leakage (Class B Filter)
	M	=	Medium Leakage
	L	=	Low Leakage
	R	=	Reduced Leakage
	T	=	Tiny Leakage

Unit configuration may be given using the above code and/or by the option description. The input terminal type (screw or IEC) may alternatively be determined by examination of the unit.

e) optionally followed by: EN#V, EN*V, IN#V, IN*V, ES#V, ES*V, IS#V, IS*V.

where	EN#V	=	AC good, global module good, PSU enable, 5-5.5V, 2A standby output
	EN*V	=	AC good, global module good, PSU enable, 12-13.5V, 1A standby output
	IN#V	=	AC good, global module good, PSU inhibit, 5-5.5V, 2A standby output
	IN*V	=	AC good, global module good, PSU inhibit, 12-13.5V, 1A standby output
	ES#V	=	AC good, PSU enable, 5-5.5V, 2A standby output
	ES*V	=	AC good, PSU enable, 12-13.5V, 1A standby output
	IS#V	=	AC good, PSU inhibit, 5-5.5V, 2A standby output
	IS*V	=	AC good, PSU inhibit, 12-13.5V, 1A standby output

where # represents the standby output voltage and is in the range 5 to 5.5V
where * represents the standby output voltage and is in the range 12-13.5V

The Global Options Inhibit and Enable functions permit the customer to turn off or on the main psu outputs and the fan. The standby supply is for use by the customer and provides an SELV output that continues to operate when all the main psu outputs have been turned off using the Inhibit or Enable functions. All the functions of the Global Option pass through a single 8 way PWB socket and are all rated SELV.

Modules:

Up to 4 of the following modules types may be fitted:

@B
or @C
or @CM
or @BH

where @ is the output voltage of the module and is within the range given in the single output module table.

or @/#DB or @_#DB

where @ is the output voltage of channel 1 and # is the output voltage of channel 2 of the module. Voltages are within the range given in the DB module tables.

or @/#DA or @_#DA

where @ is the output voltage of channel 1 and # is the output voltage of channel 2 of the module. Voltages are within the range given in the DA module tables. Only 1 DA module may be fitted.

or B/S or B_S

where B/S or B_S indicates that a blanking plate is fitted in place of a module.

The following nomenclature may optionally be used for outputs connected in series:
(Note that outputs may be connected in series even when this nomenclature is not used)

@BB or @ BHB or @BBH or @BHBH or @CC or @CCM

where @ is the total voltage of any two B, BH, C or CM modules connected in series.

or @/#BDB or @_#BDB or @BHDB

where @ is the total series voltage of any B or BH module and DB module channel 1. # is the output voltage of the DB module channel 2. Voltages for # are within the range given in the DB module tables.

or @HDB

where @ is the total series voltage of any DB module channel 1 and channel 2.

For all outputs connected in series:

Permissible min. value for @ is given by summing the min. voltage ratings of the outputs connected in series.
Permissible max. value for @ is given by summing the max. voltage ratings of the outputs connected in series.

Custom Models:

Model: NV-700 RSS IN5V 12BH 12BH

Maximum outputs: 12.5V, 20A; 12.5V, 20A (total power 500W max.)

Maximum ambient: 65°C with 2.5%/°C derating of total power and module current above 50°C

Orientations: Horizontal with chassis lowest, on either side or vertical with the airflow upwards.

Comments: PSU has reverse air.

Model: NV-700 CSS ES5V 12C (NV722DCC and NV7Y019T)

Maximum output: 12V, 37.5A (peak power rating as given in electrical and thermal ratings section on following page)

Maximum ambient: 65°C with 2.5%/°C derating of total power and module current above 50°C

Orientations: Horizontal with chassis lowest, on either side or vertical with the airflow upwards.

Maximum operating altitude: 5000m

Output Interface Assembly:

One of the following output interface assemblies may optionally be fitted:

Wxxx

where xxx is a number between 001 and 999. These assemblies attach to the module output(s) and contain circuitry providing one or more of the following: current sharing, reduced current limit, fusing, sequencing, diode or-ing, module good, filtering, connectors or terminal blocks for outputs or signaling purposes, indicator lamps or LEDs.

Documentation to be made available to the customer detailing ratings of all assembly outputs.

ELECTRICAL AND THERMAL RATINGS

Nominal Input Voltage 100 - 240 Vac

Input Voltage Range 90 - 264 Vac #

Input Frequency Range 47 - 440 Hz
 Maximum Input Current 11 A rms

Subject to limitations, see table below.

Code	Cooling Option	Input Voltage) Range (Vac)	Total output power (W)	Maximum ambient (°C)	Derating
S	Forward airflow standard fan	90 - 99.9	700W continuous (850W peak if 700W average #)	65	2.5% per °C above 45°C
S	Forward airflow standard fan	100 - 149.9	700W continuous (850W peak if 700W average #)	65	2.5% per °C above 50°C
S	Forward airflow standard fan	150 - 264	1150W continuous (1450W peak if 1150W average #)	65	2.5% per °C above 45°C
C, U	Customer air fan not fitted	Refer to Customer Air Cooling section for details			

Global Option standby outputs (12-13.5V at 1A or 5-5.5V at 2A) should not be included when calculating total PSU output power.

The total output power, module output currents and Global Option output currents are derated by the given value.

The PSU may output the given peak power for up to 10 seconds providing that the average power from the PSU does not exceed the stated value.

Global Options with output voltages between 5.01 and 5.5V have their max. output current linearly derated from 2A at 50°C ambient to 1.4A at 65°C ambient.

Permitted orientations: Horizontal with chassis lowest, on either side or vertical with the airflow upwards.

Single Output Modules:

Module	Nominal Voltage (V)	Voltage Range (V) #	Max. Current
B	3.3	3.135 - 3.6	40A
	5	4.75 - 5.5	4.75 - 5.0V: 40A 5.0 - 5.5V: Linearly derate from 40 to 36A
	8	7 - 9	7 - 8V: 22.5A 8 - 9V: Linearly derate from 22.5 to 20A
	12	12 - 15.5	12 - 12.5V: 19.5A 12.5 - 15.5V: Linearly derate from 19.5 to 15A
	24	24 - 28	24V: 10A 24 - 28V: Linearly derate from 10 to 8A
BH	12	12 - 15.5	12 - 12.5V: 20A 12.5 - 15.5V: Linearly derate from 20 to 15.5A
	24	24 - 28	24V: 10A 24 - 28V: Linearly derate from 10 to 8.5A
C & CM	12	12 - 13.2	12V: 37.5A. Derated to 450W above 12V

16	15 - 17.6	15 - 16V: 28.12A. Derated to 450W above 16V
24	24 - 26.4	24V: 18.75A. Derated to 450W above 24V
30	27 - 32	27V: 16.67A. Derated to 450W above 27V

C & CM modules may output up to 600W for up to 10 seconds providing that the average power from the module does not exceed 450W.

Dual Output Modules:

Dual Output Modules, Output 1

Module	Nominal Voltage (V)	Voltage Range (V) #	Max. Current
DA	12	12.25	3A
DB	3.3	3.135 - 3.6	25A
	5	4.75 - 5.5	25A
	6	5.5 - 6.5	25A
	12	12 - 15.5	12 - 12.5V: 13A 12.5 - 15.5V: Linearly derate from 13 to 10A
	24	24 - 28	24 - 25V: 7A 25 - 28V: Linearly derate from 7 to 6A

Dual Output Modules, Output 2

Module	Nominal Voltage (V)	Voltage Range (V) #	Max. Current(A)	Max. Power(W)
DA	12	(-)11.6 - (-)11.9	1	11.9
DB	5	3.3 - 6	10	60
	12	7 - 15.5	5	60
	24	24 - 32	2	50

Voltage measured at the module power terminals. This voltage must not be exceeded when remote sense is used.

DB modules with 6V nominal channel 1 derated as follows:

Ch.1 : 5.5 - 6V	Ch.1 + Ch.2 : 195W total.
Ch.1 : 6.01 - 6.5V	Ch.1 + Ch.2 : 170W total.

The DB module may be used with output 1 up to 24V at 8.3A and output 2 up to 16V at 3.13A provided the ambient temperature does not exceed 42°C.

SELV and Outputs Connected In Series:

All individual outputs are SELV. Outputs connected in series are non-SELV if the total output voltage + 30% of the highest of those outputs exceeds 60Vdc (the 30% addition allows for a single fault in any one individual channel).

If the total voltage of outputs connected in series exceeds the 60Vdc SELV limit then all outputs must be considered non-SELV.

The total voltage of outputs connected in series must not exceed 160V.

Non-SELV outputs are hazardous and must be guarded or a deflector fitted during installation to avoid a service engineer making inadvertent contact with the output terminals, or dropping a tool onto them.

All outputs have operational spacings to earth, and due consideration must be given to this in the end product design.

Additional Information

Customer Air Cooling:

The following method must be used for determining the safe operation of PSUs when C or U options (Customer Air) are fitted, i.e. fan not fitted to PSU. The minimum permitted airflow for customer air cooling is 0.5m/s.

For PSUs and assemblies cooled by customer supplied airflow the components listed in the following table must not exceed the temperatures given. Additionally ratings specified for units with an internal fan shall still be complied with, e.g. mains input voltage range, maximum output power, module voltage/current ratings and maximum ambient temperature. To determine the component temperatures the heating tests shall be conducted in accordance with the requirements of IEC61010-1. Consideration should also be given to the requirements of other safety standards.

Test requirements include: PSU/assembly to be fitted in its end-use equipment and operated under the most adverse conditions permitted in the end-use equipment handbook/specification and which will result in the highest temperatures in the PSU/assembly. To determine the most adverse conditions consideration shall be given to the end use equipment maximum operating ambient, the PSU/assembly loading and input voltage, ventilation, end use equipment orientation, the position of doors & covers, etc. Temperatures shall 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 shall be run until all temperatures have stabilized.

Circuit Ref. (°C)	Description	Max Temperature
L2, L3	Filter/PFC assy: Choke winding	155
C1, C3, C4	Filter/PFC assy: X capacitors	100
L1	Filter/PFC assy: Boost choke winding	130
C12, C13	Filter/PFC assy: Electrolytic capacitor	105
T1	Filter/PFC assy: Flyback transformer winding	130
RL1	Filter/PFC assy: Relay	100
TX1, TX2	Modules: Power transformer windings	130
L1, XL1	B, BH & DB module chokes	125
L1	C & CM module chokes	140
T2	Global Options: Transformer winding	130
Various	All other choke & transformer windings	120
Various	All <=10mm diameter electrolytic capacitors	105
Various	All 12.5mm diameter electrolytic capacitors	105

The schematics are kept in file at the CBTL and can be provided by the manufacturer upon request by NCB's/CBTL's.

This report to include IEC61010-1 is a re-issue of CBTR Ref. No. E331788-A15-CB-1 dated 2013-07-25 including amendments and corrections with CB Test Certificate Ref. No. DK-33974-UL dated 2013-07-25. Based on previously conducted testing and the review of product technical documentation including photos, schematics, wiring diagrams and similar, it has been determined that the product continues to comply with the standard.

Only the tests below were deemed necessary.

The original report was modified on 2015-05-05 to include the following changes/additions:-

1. Addition/deletion of multilayer PWBs to critical component list
2. Alternative input connector (J1) same ratings, no testing considered.
3. Critical component certificates updated
4. Correction/addition to critical components list
5. Enclosures updated to include revised handbook and drawings
6. Alternative fuse (F2 (Daito)) tested
7. Alternative fan (YS Tech) tested
8. Assessed to IEC61010-1
9. Cemented joint test updated

Project 4787707401 information:

This is Amendment 1 to the CB Test Report E331788-A15-CB-2 dated 2015-08-03 with Correction 1 dated 2015-09-22 and with CB Test Certificate DK-48638-UL.

This Amendment is published due to changes provided in Report Summary.

No additional testing has been done.

This amendment shall be read in conjunction with Original Test Report and Test Certificate and with previous Correction 1.

Technical Considerations

- Equipment classification: Commercial, Professional
- Equipment class: Class I
- Equipment type: For building in
- The product was submitted and tested for use at the maximum recommended ambient temperature (T_{mra}) of: 50°C. From 50°C to 65°C the total output power and the module current ratings are both derated at 2.5% per °C.

Engineering Conditions of Acceptability

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

- This component has been judged on the basis of the creepage and clearances required in the indicated Standards, which would cover the component itself if submitted for Listing: UL 61010-1 3rd Ed., CAN/CSA 22.2 No. 61010-1-12 3rd Ed., IEC 61010-1:2010 3rd Ed., EN 61010-1:2010.
- The end-product shall consider that: The enclosure does not serve as a fire/electrical/mechanical enclosure excluding the external face of the IEC60320 inlet.
- The need for the following shall be considered in the end-product: Bonding to protective earthing terminal (Class I construction)
- The output connectors are: Suitable for factory wiring only
- Creepage and clearance distances were based on a maximum working voltage of: Primary to earth dead metal: 622V_{peak}, 343V_{rms}., Primary to secondary: 650V_{peak}, 363V_{rms}.
- Insulation between primary circuits and accessible dead metal complies with the requirements for : Basic insulation
- Insulation between primary and secondary circuits complies with the requirements for: Double and Reinforced insulation
- The following tests shall be performed in the end-product evaluation: Temperature for customer air models, Permissible Limits for Accessible Parts, Dielectric Strength

- The unit is considered acceptable for use at on a max branch circuit of: 20A
- The unit is considered acceptable for use in a max ambient of: 50°C. From 50°C to 65°C the total output power and the module current ratings are both derated at 2.5% per °C.
- End-product temperature tests for power supplies shall consider that the following transformers employ the indicated insulation system: Transformer TX1 Class F (155°C), Transformer TX2 Class F (155°C), Transformer T1 Class F (155°C), Transformer T2 Class F (155°C),
- End-product dielectric strength tests shall be based on the maximum working voltage of: Primary to earth dead metal: 622Vpeak, 343Vrms., Primary to secondary: 650Vpeak, 363Vrms.
- The leakage current tests have been provided for information only. This test must be considered in the end product application and must be repeated for frequencies above 63Hz. --
- This product has been assessed for a maximum altitude of 3000m --
- The risk associated with clause 5.4.5 shall be assessed in the end product. --