



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-A18-CB-1

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CB Testing Laboratory : UL International Germany GmbH

Address : Admiral-Rosendahl-Strasse 23, 63263 Neu-Isenburg (Zeppelinheim),
Germany

Applicant's name : TDK-LAMBDA UK LTD

Address : KINGSLEY AVE
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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Report and its contents can be verified by contacting the NCB, responsible for this Test Report.

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	NV175 Series NV-175 Series NV1-1G000
	(See Model Differences for details)
Ratings	NV175 Series; NV-175 Series: 100-240Vac (Nominal), 90-264V (Full Tolerance), 45-440Hz, 3Arms
	NV1-1G000 only: 88.9-240Vac (Nominal), 80-264V (Full Tolerance), 45-440Hz, 3Arms
	(See Model Differences for details)

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, UK
	Tested by (name + signature): S. Hirstwood
	Approved by (name + signature).....: K. P. Tizzard
	Supervised by (name + signature) .: Bartlomiej Zmijewski
<input type="checkbox"/> Testing Procedure: RMT	Testing location / address
	Tested by (name + signature)
	Approved by (name + signature).....
	Supervised by (name + signature) .:

List of Attachments
National Differences (3 pages)
Enclosures (97 pages)
Summary Of Testing
Unless otherwise indicated, all tests were conducted at TDK-LAMBDA UK LTD, Kingsley Avenue, Ilfracombe, Devon, EX34 8ES, UK.

Tests performed (name of test and test clause)	Testing location / Comments
<p>Temperature Test (10.1-10.4)</p> <p>Summary of Compliance with National Differences:</p> <p>Countries outside the CB Scheme membership may also accept this report.</p> <p>List of countries addressed: AT, BE, CA, CH, CZ, DE, DK, FI, FR, GB, IL, IT, JP, NO, SE, SI, SK, US</p> <p>The product fulfills the requirements of: UL 61010-1 3rd Ed., CAN/CSA 22.2 No. 61010-1-12 3rd Ed., EN61010-1:2010</p>	
<p>Copy of Marking Plate - Refer to Enclosure titled Marking Plate for copy.</p>	

Test item particulars :	
Type of item tested	Laboratory
Description of equipment function	Switch mode power supply
Connections to mains supply	To be determined in the end use equipment or IEC inlet
Overvoltage category	II
Pollution degree	2
Means of Protection	Class I (PE connected)
Environmental conditions	Normal
For use in wet locations	No
Equipment mobility	Built-in
Operating conditions	continuous
Overall size of the equipment: (W X D X H) (mm) :	174 x 103 x 41 mm
Mass of the equipment (kg)	0.6 kg max
Marked degree of protection to IEC 60529	none
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	2014-08-22
Date(s) of Performance of tests	2014-08-26
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 IEC 60384-14:	
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,
SHIJI INDUSTRIAL ESTATE,
DONGYONG,
NANSHA ,
GUANGZHOU GUANGDONG CHINA

GENERAL PRODUCT INFORMATION:

Report Summary

The original report was modified on 2015-08-04 to include the following changes/additions:

1. Addition/deletion of multilayer PWBs to critical component list.
2. Critical component certificate updates.
3. Change of factory's name and address..
4. Correction/Addition to CCL components.
5. Addition of 18V channel 1 with fan output. (thermal test carried out).
6. Removal of the DC-DC front end RA-NVDC-01/R14408 from CCL.
7. Change of CBTL from UL UK to UL Germany.
8. Add new model (NV1-1G000).

Product Description

NV175 or NV-175 series . Switch mode power supplies for building into end equipment.

Model Differences

NV175 or NV-175 models as described below:

Units may be marked with a Product Code: K1x or Q1x where x may be any number of letters and/or numbers 0 to 9.

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

Unit Configuration Code:

NVx-abcde-f-g-h-ijk

where:

x = 1 for 175

a = Number of Outputs : 1, 2, 3 or 4

b = Channel 1 Output Voltage†: 5, T, F, E or G

c = Channel 2 Output Voltage†: 1, 2, 3, 5, 5L, 7, F or 0

d = Channel 3 Output Voltage†: 3L, 5L, 7, TL, FL, T, F, G followed by Y for negative output or 0

e = Channel 4 Output Voltage†: 3H, 5H, 7, T, F, TH, FH, 0H (fan only channel 4 output) followed by V for variable output followed by P for positive output or 0

f = Global Option : N for 5V version, N1 for 12V version, N2 for 13.5V version, N3 for 5V version with ATX compatibility, N4 for 12V version with ATX compatibility, N5 for 13.5V version with ATX, N6 for 12-13.5V version, N7 for 12-13.5V version with ATX or nothing for no Global Option present

g = U for U chassis, C for U chassis and cover, F for U chassis and cover with fan, I for U chassis and cover with fan and IEC inlet or nothing for Open Frame

h = Blank is the standard upright output connector, R is for the right angle output connector, H is for high

altitude, HR is for high altitude with right angle output connector, M is for IEC60601-1, MR is for IEC60601-1 spacings with right angle connector

ijk = Three numbers from 0 to 9 which denotes various output voltages and currents within the specified ranges of each output for a particular unit or blank for standard output settings

† Table1: Output Voltage Cross Reference

Designation	Output Voltage
0	Omit output
A	1.5
1	1.8
B	2
2	2.7
3	3.3
5	5
7	7
T	12
F	15
E	18
G	24

Output channels and Global Options ratings are in accordance with the following table subject to variations and limitations of use below:

Output Channel	Designation	Vout	Adj. Range	Output Current
CH1	5	5	5 - 5.5	25A
	T	12	12 - 15.5	15A
	F	15	12 - 15.5	15A
	E	18	16 - 20	10A
	G	24	24 - 28.5	7.5A
CH2	1	1.8	0.9 - 3.8	15A
	2	2.7	2.5 - 3.8	15A
	3	3.3	2.5 - 3.8	15A
CH2 (CH1 12V)	5	5	3.3 - 5.5	10A
CH2 (CH1 15V)	5	5	3.3 - 5.5	10A
CH2 (CH1 24V)	5L	5	Fixed	2A
	5	5	3.3 - 5.5	8A
CH3	7	7	5.5 - 8	5.5A
	F	15	12-15.5	6A
	7	+/-7	7 - 8	5A
	T	+/-12	12 - 15	5A
	F	+/-15	12 - 15	5A
	G	+/-24	18 - 24.5	2.5A
	3L	+/-3.3	Fixed	2A
5L	+/-5	Fixed	2A	
CH4	TL	+/-12	Fixed	2A
	FL	+/-15	Fixed	2A
	3H	+/-3.3	Fixed	2A
	5H	+/-5	Fixed	2A
	7	+/-7	7 - 8	1A
	T	+/-12	Fixed	1A
	F	+/-15	Fixed	1A
	TH	+/-12	Fixed	2A
	FH	+/-15	Fixed	2A
	THV	+/-12	12 - 15	2A

	FHV	+/-15	12 - 15	2A
CH4 (fan output)	OH	-	-	-
Global Option	N	5	Fixed	2A
	N1	12	Fixed	1A
	N2	13.5	Fixed	1A
	N3	5(ATX)	Fixed	2A
	N4	12(ATX)	Fixed	1A
	N5	13.5(ATX)	Fixed	1A
	N6	12	12-13.5*	1A
	N7	12(ATX)	12-13.5*	1A

Channels 1 and 2 combined output currents must not exceed 25A

*Can only be set at the factory.

Variations and limitations of use:

All NV175 or NV-175 PSUs can output 180W except 5V channel 1 models which can output 175W. These power ratings are for channels 1 to 4. The global option output can be run in addition to the channel 1 to 4 maximum power outputs.

Units with channel 1 T and G outputs (no other channels fitted) have a peak power output of 200W including the global option with the following duty cycles:

In any 5 minutes 30% at 200W followed by 70% at 171W (average 180W)

In any 5 minutes 20% at 200W followed by 80% at 175W (average 180W)

Options -H and -HR meet spacings for 5000m.

Options -M and -MR meet IEC60601-1 Edition 2 Reinforced spacing's with the following limitations (interpolated creepage spacings):

Channel 1 cannot be 5V model (T1 and T2 with foils)

Channel 2 cannot be fitted

Cannot be global option variants

Fan versions:

Channel 1 with G output, 25V maximum with 5V channel 2 maximum output current of 7A.

Channel 1 with G output, 25V maximum with 7V channel 2 maximum output current of 5.5A.

Channel 1 with G output, 5L channel 2 maximum output current 1.8A.

Channel 2 with T and F outputs, channel 2 maximum output current of 9A.

Channel 4 maximum output current of 1.5A

Model NV1-1G000 (with or without global option or -M/-MR option) may also be run with Channel 1 output voltage range 22.5V to 28V with maximum current of 7.5A and maximum power of 180W

Model NV1-1G000 (with or without -M option) may also be run at 80Vac to 264Vac input, output: 24V to 28V at 6.25A maximum current and 150W maximum power.

The products listed in the following table are typical examples:

Model	CH1	CH2	CH3	CH4	Global Option
NV1-453FF	5V/25A	3.3V/15A	15V/5A	15V/1A	-
NV1-4G5FFH-N3	24V/7.5A	5V/8A	15V/5A	15V/2A	5V/2A
NV1-350TT-N	5V/25A	-	12V/5A	12V/1A	5V/2A

NV1-453TT-N1	5V/25A	3.3V/15A	12V/5A	12V/1A	12V/1A
NV1-250T0-N2	5V/25A	-	12V/5A	-	13.5V/1A

Custom Models:

All ratings as per standard models unless otherwise stated.

Model: NS-LAM/NV1-453TTH-N2-H-C (K10035)
Rated to 4600m altitude
Input voltage range from 90Vac to 264Vac

Model: NS-LAMF/NV1-4G5TTH-F (K10066)
5L low current channel 2 fitted.
Channel 2 rated: 5V, 1.4A
ELECTRICAL AND THERMAL RATINGS

Nominal Input Voltage	100 - 240 Vac
Input Voltage Range	90 - 264Vac
Input Frequency Range	45 - 440Hz
Maximum Input Current	3A rms

All ratings apply for ambient temperatures up to 50°C. From 50 to 65°C the total output power and the module current ratings are both derated at 2.5% per deg C.

ENVIRONMENTAL PARAMETERS

Operation

Temperature:	0 to 50°C (From 50 to 65°C the total output power and the
Humidity:	5 to 95% RH, non-condensing
Air Pressure:	70kPa to 106kPa
Altitude:	-200m to 3000m (-H and -HR models, 5000m)

Storage and Transportation

Temperature:	-40°C to +70°C
Humidity:	5 to 95% RH, non-condensing
Air Pressure:	54kPa to 106kPa
Altitude:	-200m to 5000m

Mounting Aspects

Orientations: All except PCB uppermost

Additional Information

The original report was modified to include the following changes/additions:

1. Addition/deletion of multilayer PWBs to critical component list.
2. Critical component certificate updates.
3. Change to additional Manufacturers address.
4. Correction/Addition to CCL components. (transformer 33489 left out of previous report by error)
5. Addition of 18V channel 1 with fan output (transformer 230089). (thermal test carried out)
6. Removal of the DC-DC front end RA-NVDC-01/R14408 from the CCL.

Based on the previously conducted testing, limited testing for this report and the review of product technical documentation including photos, schematics, wiring diagrams and similar, it has been determined that the product complies with the standard.

Cooling for NV175 or NV-175 series units with customer supplied air (open frame, U and C options):

The following method must be used for determining the safe operation of PSUs.

The components listed in the following table must not exceed the temperatures given. To determine the component temperatures the heating tests must be conducted in accordance with the requirements of the standard concerned. Consideration should also be given to the requirements of other safety standards. 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 and 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 stabilized. See handbooks for component locations.

Circuit Ref.	Description	Max. Temperature (°C)
L3, L7	Common mode choke winding	140
C1, C4	X capacitors	100
C6, C12	Capacitor	105
L2	Boost choke winding	130
C7	Electrolytic capacitor	70 (105)
T1, T2	Transformer winding	130
XU3	Control board optocoupler	100
TX701	Global option transformer	90
L5	Channel 1 Output choke	125
XL401	Channel 2 Output choke	125
XL601	5L channel 2 output choke	125
XU601	5L channel 2 IC	115
XL501 or XL601	Channel 3 and 4 output choke	125
IC1*	Channel 4 Voltage regulator	110
XQ406	Ch2 highside FET (SMA 2)	115
XV504	Ch3 highside FET (SMA 3)	115
XU601	Ch4 IC (SMA 4)	115
Various	All other electrolytic capacitors	90 (105)

* 1A channel 4 only

Higher temperatures limits (in brackets) may be used but product life may be reduced.

Technical Considerations

- Equipment classification: Professional, Commercial
- Equipment class: Class I
- Equipment type: For building in
- The product was submitted and tested for use at the maximum recommended ambient temperature (Tmra) of: 50°C (full load): 65°C maximum (output de-rated 2.5% /°C above 50°C)
- Evaluated for a maximum altitude of 3000m (5000m for the -H and -HR models) --

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 3rd Ed., EN 61010-1 3rd Ed.
- The end-product shall consider that: The enclosure does not serve as a fire/electrical/mechanical enclosure (except the IEC inlet version end cover)
- The need for the following shall be considered in the end-product: Bonding to protective earthing terminal (Class I construction), MAINS disconnect device (except the IEC inlet)
- The output connectors are: Not investigated for field wiring,
- Creepage and clearance distances were based on a maximum working voltage of: 337 Vrms; 616 Vpeak Primary to Secondary , 337 Vrms; 608 Vpeak Primary to Earth
- 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: Reinforced insulation
- The following tests shall be performed in the end-product evaluation: Dielectric Strength, Temperature (customer air models)
- The unit is considered acceptable for use at on a max branch circuit of: 20 A
- The unit is considered acceptable for use in a max ambient of: 50°C (full load): 65°C maximum (output de-rated 2.5% /°C above 50°C)
- End-product temperature tests for power supplies shall consider that the following transformers employ the indicated insulation system: Transformer T1, T2, TX701 Class F (155 °C)
- End-product dielectric strength tests shall be based on the maximum working voltage of: 337 Vrms; 616 Vpeak Primary to Secondary , 337 Vrms; 608 Vpeak Primary to Earth
- At input frequencies above 63Hz Clause 6.4.4a requires investigation in the end application --
- Customer air models must be thermally tested as described in the Additional Information --
- Input connector is: Not investigated for field wiring --
- Input connector J2 pin 1 was investigated as the protective bonding terminal for the product --
- The risk associated with clause 5.4.5 requires assessment in the end equipment --
- Multilayer PWB's accepted under CBTR Ref. No.: E349607-A23 dated 2014-07-31 and letter Report, Enclosure 8-05 of this report --