Test Report issued under the responsibility of:

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

Report Reference No ..... :	E135494-A45-CB-3
Date of issue ..... :	2015-03-27
Total number of pages ..... :	68
CB Testing Laboratory ..... :	UL International Demko A/S
Address ..... :	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 (Second Edition); Am1:2009 + Am2:2013
Test procedure ..... :	CB Scheme
Non-standard test method ..... :	N/A
Test Report Form No. ..... :	IEC60950_1F
Test Report Form originator ..... :	SGS Fimko Ltd
Master TRF ..... :	Dated 2014-02

This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

General disclaimer

The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing CB Testing Laboratory. The authenticity of this Test 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 ..... :	NV100 or NV-100 Range (see Model Differences for details)
Ratings ..... :	100-240Vac Nominal (90-264V max. tolerance) 45-440Hz, 1.7A 133-318Vdc Nominal (120-350Vdc max. tolerance), 1.2A (see Model Differences for details)

Testing procedure and testing location:		
[x]	**CB Testing Laboratory**	
	Testing location / address .....:	UL International Demko A/S Borupvang 5A, 2750 Ballerup, Denmark
[ ]	**Associated CB Test Laboratory**	
	Testing location / address .....:	
	Tested by (name + signature) .....:	Mike Burns
	Approved by (name + signature)....:	David Snook
[ ]	**Testing Procedure: TMP/CTF Stage 1**	
	Testing location / address .....:	
	Tested by (name + signature) .....:	
	Approved by (name + signature)....:	
[ ]	**Testing Procedure: WMT/CTF Stage 2**	
	Testing location / address .....:	
	Tested by (name + signature) .....:	
	Witnessed by (name + signature) ..:	
	Approved by (name + signature)....:	
[ ]	**Testing Procedure: SMT/CTF Stage 3 or 4**	
	Testing location / address .....:	
	Tested by (name + signature) .....:	
	Approved by (name + signature)....:	
	Supervised by (name + signature) .:	
[ ]	**Testing Procedure: RMT**	
	Testing location / address .....:	
	Tested by (name + signature) .....:	
	Approved by (name + signature)....:	
	Supervised by (name + signature) .:	

List of Attachments
National Differences (56 pages)
Enclosures (94 pages)
Summary of Testing:
All Applicable tests according to the referenced standard(s) have been carried out
Summary of Compliance with National Differences:
Countries outside the CB Scheme membership may also accept this report.

List of countries addressed: AR, AT, AU, BE, BG, BY, CA, CH, CN, CS, CZ, DE, DK, ES, EU, FI, FR, GB, GR, HU, IE, IL, IN, IT, JP, KR, MY, NL, NO, NZ, PL, PT, RO, SA, SE, SI, SK, UA, US, ZA

The product fulfills the requirements of: EN 60950-1:2006 + A1:2010 + A11:2009 + A12:2011 + A2:2013

Copy of Marking Plate - Refer to Enclosure titled Marking Plate for copy.

Test item particulars :	
Equipment mobility .....:	for building-in
Connection to the mains .....:	not directly connected to the mains (to be provided by 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%
Tested for IT power systems .....:	Yes (Norway only)
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) .....:	< 18
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 .....:	2012-10-04
Date(s) of Performance of tests .....:	2012-10-04
General remarks: "(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 point is used as the decimal separator.	
Manufacturer's Declaration per Sub Clause 4.2.5 of IECEE 02:	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 EX34 8ES UNITED KINGDOM

PANYU TRIO MICROTRONICS CO LTD
SHIJI INDUSTRIAL ESTATE
DONGYONG
NANSHA
GUANGZHOU
GUANGDONG 511453 CHINA

GENERAL PRODUCT INFORMATION:

Report Summary

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

Product Description

NV100 or NV-100 series are switch mode power supply modules for building into host equipment.

Model Differences

NV100 or NV-100 models as described below:

Units may be marked with a Product Code: U1x or Y1x where x may be any number of characters.

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

where:

x	=	A1 (NVA1 for NV100 or NV-100 series)
a	=	Number of Outputs : 4
b	=	Channel 1 Output Voltage†: 5, E or G
c	=	Channel 2 Output Voltage†: 3 or 5
d	=	Channel 3 Output Voltage†: T, F, G or K
e	=	Channel 4 Output Voltage†: T or F followed by P for positive output, or 0 for no output
f	=	U for U chassis, C for U chassis and cover or nothing for Open Frame
g	=	R for right angle connector

† Table1: Output Voltage Cross Reference

Designation	Nominal Output Voltage
3	3.3
5	5
T	12
F	15
E	18
G	24 or 24.5
K	36

ELECTRICAL AND THERMAL RATINGS:

Input parameters

NV100

	AC	DC
Nominal Input Voltage	100 - 240 Vac	133 - 318Vdc
Input Voltage Range	90 - 264Vac	120 - 350Vdc
Input Frequency Range	45 - 440Hz	DC
Maximum Input Current	1.7A rms	1.2Adc

All ratings apply for ambient temperatures up to 50°C. From 50 to 70°C the total output power and the module current ratings are both derated at 2.5% per deg C. Maximum ambient 50°C for still air.
There are five standard NV100 models with output parameters shown in the tables below:

Model: NVA1-453GF (can be followed by P, -U, -C or -R)

Output Channel	Voltage designation	Vout	Adjustment Range V	Output Current
CH1	5	5	4.75 - 5.25	10A
CH2	3	3.3	3.14 - 3.46	8A
CH3	G	24.5	Fixed*	1.5A
CH4	F	15	Fixed*	1A

Model: NVA1-453FF (can be followed by P, -U, -C or -R)

Output Channel	Voltage designation	Vout	Adjustment Range V	Output Current
CH1	5	5	4.75 - 5.25	10A
CH2	3	3.3	3.14 - 3.46	8A
CH3	F	15	Fixed*	3A
CH4	F	15	Fixed*	1A

Model: NVA1-453TT (can be followed by P, -U, -C or -R)

Output Channel	Voltage designation	Vout	Adjustment Range V	Output Current
CH1	5	5	4.75 - 5.25	10A
CH2	3	3.3	3.14 - 3.46	8A
CH3	T	12	Fixed*	3A
CH4	T	12	Fixed*	1A

Model: NVA1-4G5TT (can be followed by P, -U, -C or -R)

Output Channel	Voltage designation	Vout	Adjustment Range V	Output Current
CH1	G	24	23 - 25	4A
CH2	5	5	3.3 - 5.5	5A
CH3	T	12	Fixed*	3A
CH4	T	12	Fixed*	1A

Model: NVA1-4G5FF (can be followed by P, -U, -C or -R)

Output Channel	Voltage designation	Vout	Adjustment Range V	Output Current
CH1	G	24	23 - 25	4A
CH2	5	5	3.3 - 5.5	5A
CH3	F	15	Fixed*	3A
CH4	F	15	Fixed*	1A

*Channels 3 and 4 output voltage may vary +/-10% depending on channel 1 output voltage and current

settings.

Variations and limitations of use:

All NV100 PSUs can output 100W. These power ratings are for channels 1 to 4.
Natural convection rating limited to 50W total output power with any channel at 50% max output current.
Natural convection cannot have -C option (cover fitted).
100W output can be achieved with 2m/s forced air from input to output. The rules below for “Cooling for Unit” must be adhered to for all methods of cooling, including natural convection.
Channel 1 & 2 combined power must not exceed 60W for 5V channel 1 models.

Non-standard NV100 model:

Model: Y10001A (NVA1-3E5K0, can be followed by -U, -C or -R)

Output Channel	Voltage designation	Vout	Adjustment Range V	Output Current
CH1	E	17.25	17.25 - 17.75	3A
CH2	5	5.15	5.15 - 5.90	4A
CH3	K	34.5	Fixed*	2A
CH4	0	-	-	-

*Channel 3 output voltage may vary +4.5%, -1.5% depending on channel 1 output voltage and current settings.

Variations and limitations of use for NV100 model Y10001A:

Unit can output 110W. These power ratings are for channels 1 to 3.
No natural convection rating for this unit.
Channel 1 & 2 combined power must not exceed 70W.
110W output can be achieved with 2m/s forced air from input to output. The rules below for “Cooling for Unit” must be adhered to for all methods of cooling.

Operating temperature from 0°C to 45°C.

ENVIRONMENTAL PARAMETERS

Operation

Temperature:	0 to 50°C
Humidity:	5 to 95% RH, non-condensing
Air Pressure:	54kPa to 106kPa
Altitude:	-200m to 5000m

Storage and Transportation

Temperature:	-40°C to +85°C
Humidity:	5 to 95% RH, non-condensing
Air Pressure:	54kPa to 106kPa
Altitude:	-200m to 5000m

Mounting Aspects

Orientations:	All except base PCB uppermost

Additional Information

COOLING FOR UNIT

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 IEC60950-1:2005 Clause 4.5. 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 stabilised.

Circuit Ref.	Description	Max. Temp(°C)
L3, L7	Common mode choke winding	140
C1, C4	X capacitors	100
C6, C12	Capacitor	105
C11	Resonant capacitor	105
L2	Boost choke winding	130
C7	Electrolytic capacitor	70 (105)
T1, T2	Transformer winding	130
L1	Primary choke	130
XU3, XU4	Opto-couplers	100
L5	Channel 1 output choke	125
L4	3.3V (5V NVA1-3E5K0) channel 2 output choke	125
R3 & R4	PCB between R3 & R4	130
XU401	3.3V (5V NVA1-3E5K0) Ch2 IC XU401	115
XL402	5V Ch2 output choke	125
XV12	Ch3 FET	115
XD41	Ch4	115
Various	All other electrolytic capacitors	90 (105)

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

This report is a reissue of CBTR Ref. No. E135494-A45, CB Test Certificate Ref. No.DK-29164-UL. 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 following changes/additions for the NV100 were considered necessary for reissue of the report:

1. Update of the report to Amendment 2.
2. Assessed for 5000M
3. Addition/deletion and correction to CCL
4. Update of licenses
5. Change of factory name from Trio Engineering Co. Ltd to Panyu Trio Microtronic Co Ltd

Technical Considerations

- 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).,
- Maximum altitude of operation is 5000m for all models. --
- 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 (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, DC mains supply --
- 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 equipment disconnect device is considered to be: Provided by the end equipment --
- The product was investigated to the following additional standards: EN 60950-1:2006 + A2:2013 (which includes all European national differences, including those specified in this test report), CSA C22.2 No. 60950-1-07 + A1:2011, UL 60950-1 2nd Ed. Revised 2011-12-19 --
- Multi-layer PWB's accepted under CBTR Ref. No: E349607-A23 dated 2014-07-31 and letter report, Enclosure 8-05 of this report --

Engineering Conditions of Acceptability

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

- For the USA and Canada, double pole Neutral fusing is required, rated fuses T2AH, 250V must be fitted in the end-use application and marking in compliance with clause 1.7.6 --
- The following Production-Line tests are conducted for this product: Earthing Continuity Electric Strength --
- The following secondary output circuits are SELV: All --
- The end-product Electric Strength Test is to be based upon a maximum working voltage of: Primary-SELV: 393 Vrms, 666 Vpk Primary-Earthed Dead Metal: 395 Vrms, 411 Vpk --
- The power supply terminals and/or connectors are: Suitable for factory wiring only --
- The investigated Pollution Degree is: 2 --
- Proper bonding to the end-product main protective earthing termination is: Required --
- The following end-product enclosures are required: Mechanical , Fire , Electrical --
- The following output terminals were referenced to earth during performance testing: All outputs and their return lines individually referenced to earth to obtain maximum working voltage. --
- The maximum investigated branch circuit rating is: 20A --
- The following magnetic devices (e.g. transformers or inductor) are provided with an OBJY3 insulation system with the indicated rating greater than Class A (105°C): Transformer T1 and T2 (Class F) - See table 1.5.1 for details of insulation systems used. --
- An investigation of the protective bonding terminals has: Been conducted --
- The following secondary output circuits are at non-hazardous energy levels: All --

Abbreviations used in the report:

- normal condition	N.C.	- single fault condition	S.F.C
- operational insulation	OP	- basic insulation	BI
- basic insulation between parts of opposite polarity:	BOP	- supplementary insulation	SI
- double insulation	DI	- reinforced insulation	RI

Indicate used abbreviations (if any)