



Test Report issued under the responsibility of:



**TEST REPORT
IEC 62368-1**

**Audio/video, information and communication technology equipment
Part 1: Safety requirements**

Report Number: E135494-A6016-CB-1

Date of issue.....: 2020-03-18

Total number of pages: 104

Applicant's name.....: **TDK-LAMBDA UK LTD**

Address: **KINGSLEY AVE
ILFRACOMBE
EX34 8ES UNITED KINGDOM**

Name of Test Laboratory: UL International Polska Sp. z o.o.
preparing the Report: Aleja Krakowska 81, 05-090 Sekocin Nowy, Poland

Test specification:

Standard: IEC 62368-1:2014 (Second Edition)

Test procedure: CB Scheme

Non-standard test method: N/A

Test Report Form No.....: IEC62368_1B

Test Report Form(s) Originator: UL(US)

Master TRF.....: 2014-03

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Test Item description	:	Switch mode power supply
Trade Mark	:	TDK-Lambda TDK-Lambda
Manufacturer	:	TDK-LAMBDA UK LTD KINGSLEY AVE ILFRACOMBE EX34 8ES UNITED KINGDOM
Model/Type reference	:	NVM175 or NVM-175 models as described (See Model Differences)
Ratings	:	100-240Vac nom. 45-440Hz, 3A rms max. (See Model Differences)
Testing procedure and testing location:		
<input type="checkbox"/>	CB Testing Laboratory:	
Testing location/ address		
Tested by (name + signature)		
Approved by (name + signature)		
<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 checked="" type="checkbox"/>	Testing procedure: CTF Stage 3	
<input type="checkbox"/>	Testing procedure: CTF Stage 4	
Testing location/ address		TDK-LAMBDA UK LTD KINGSLEY AVENUE ILFRACOMBE DEVON

	EX34 8ES, UNITED KINGDOM	
Tested by (name + signature).....:	T. Wordley, N. Marsh / CTF tester	
Witnessed by (name + signature).....:	Dennis Butcher / Technical Assessor	
Approved by (name + signature).....:	T. Burgess / Authorized CTF signatory	
Supervised by (name + signature)	Hubert Koszewski / Supervisor	

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

National Differences (30 pages)

Enclosures (75 pages)

Summary of testing:

Tests performed (name of test and test clause):

Testing Location:
CTF Stage 3: TDK-LAMBDA UK LTD
KINGSLEY AVENUE
ILFRACOMBE
DEVON
EX34 8ES, UNITED KINGDOM

CLASSIFICATION OF ELECTRICAL ENERGY SOURCES (5.2, 5.7)

Conducted within this evaluation

DETERMINATION OF WORKING VOLTAGE (5.4.1.8)

See report Enclosures 7-03 for details

TESTS FOR SEMICONDUCTOR COMPONENTS AND CEMENTED JOINTS (5.4.7, 5.4.1.5.3)

See report Enclosures 7-03 for details

HUMIDITY CONDITIONING (5.4.8)

See report Enclosures 7-03 for details

ELECTRIC STRENGTH TEST (5.4.9)

Conducted within this evaluation

SAFEGUARDS AGAINST CAPACITOR DISCHARGE AFTER DISCONNECTION OF A CONNECTOR (5.5.2.2)

Conducted within this evaluation

RESISTANCE OF THE PROTECTIVE BONDING SYSTEM (5.6.6.2)

Conducted within this evaluation

PROSPECTIVE TOUCH VOLTAGE AND TOUCH CURRENT MEASUREMENT (5.7)

Conducted within this evaluation

INPUT TEST: SINGLE PHASE (B.2.5)

See report Enclosures 7-03 for details

NORMAL OPERATING CONDITIONS TEMPERATURE MEASUREMENT (B.2.6)

See report Enclosures 7-03 for details

SIMULATED ABNORMAL OPERATING CONDITIONS (B.3)

See report Enclosures 7-03 for details

SIMULATED SINGLE FAULT CONDITIONS (B.4)

See report Enclosures 7-03 for details

TRANSFORMER OVERLOAD (ANNEX G.5.3.3)

See report Enclosures 7-03 for details

LIMITED SHORT CIRCUIT TEST (ANNEX R.1, 5.6.4.1, 5.6.4.4, 5.6.5.1)

Conducted within this evaluation

STEADY FORCE TEST, 10 N (ANNEX T.2, 5.4.2.6, 5.4.3.2, G.15.3.6)

Conducted within this evaluation

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 , Bulgaria, Belgium, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Lithuania, Latvia, Luxembourg, Malta, the Netherlands, Republic of North Macedonia, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Serbia, Sweden, Switzerland, Turkey and the United Kingdom

The product fulfils the requirements of: EN 62368-1:2014 + A11:2017

UL 62368-1 2nd Edition, Issued December 1, 2014

CSA CAN/CSA-C22.2 No. 62368-1 2nd Edition, Issued December 1, 2014

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

TEST ITEM PARTICULARS:	
Classification of use by	Skilled person
Supply Connection	AC Mains
Supply % Tolerance	+10%, -10%
Supply Connection – Type	mating connector Connection to mains to be determined in end use.
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 Class II
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)	5000 m
Altitude of test laboratory (m)	64 m
Mass of equipment (kg)	Less than 1 kg
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 of receipt of test item..... :	2017-11-06 to 2019-12-04, 2020-02-18
Date (s) of performance of tests..... :	2019-06-10 to 2019-12-20
GENERAL REMARKS:	
<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>	
Manufacturer’s Declaration per sub-clause 4.2.5 of IEC62368-1:	

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"/> Yes <input type="checkbox"/> Not applicable
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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 TRIO-TRONICS (THAILAND) LTD 7/295 MU. 6 MAP YANG PHON SUB-DISTRICT PLUAK DAENG DISTRICT RAYONG PROVINCE THAILAND
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GENERAL PRODUCT INFORMATION:

Report Summary

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

Product Description

The NVM-175 Series are switched mode power supplies for building into host equipment.

Model Differences

NVM175 or NVM-175 models as described below:

Units may be marked with a Product Code: X5x or NVM1x where x may be any number of characters.

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

Unit Configuration Code:
 NVMxy-abcdefghijklm

Where:

x = 1 for 175 or 1D (1D for Double insulated or Class II unit)

y = Blank for Y2 capacitors from output to earth (except 1D models)
 P for Y1 capacitors from output to earth (except 1D models)
 a = Number of Outputs: 1.
 b = Channel 1 Output Voltage where: T is for 12V, F is for 15V and G is for 24V.
 c = O (for omit).
 d = O (for omit).
 e = O (for omit).
 f = Standby supply:
 Blank for no standby and no remote on/off (enable) or '-' followed by
 S for 12V version with power good, logic level high enables main output.
 S1 for 12V version with power good, logic level low enables main output.
 S2 for 12V version with Channel 1 good, logic level high enables main output.
 S3 for 12V version with Channel 1 good, logic level low enables main output.
 S4 for 12V 0.8A version with power good, logic level low enables main output.
 S5 for 5V 0.5A version with power good, logic level low enables main output.
 S6 for 5V 0.5A version with power good, logic level high enables main output.
 0 for no standby and no remote on/off (enable).
 g = Blank for Open Frame or '-' followed by U for U chassis, C for U chassis with cover, K for custom chassis with cover and IEC inlet.
 h = Blank for standard upright output connector or '-' followed by R for the right angle output connector, S for the screw terminal.
 i = Blank for standard leakage or '-' followed by L for low leakage, Zx for custom leakage which is less than standard leakage and x is a number between 1 and 9 for different custom leakage current options.
 jkl = Blank for standard output setting or '-' followed by three numbers from 0 to 9 which denotes various output voltages and currents within the specified range of channel 1 output for a particular unit.
 m = Blank for dual fuse input or -FL for single fuse input in the Live line

Output Parameters

There are three NVM1 standard models with various options, and 3 non-standard models with output parameters shown in the tables below:

Output Channel	Voltage Designation	Vout Nom.	Adjustment Range (V)	Output Current (A)	Maximum Power (W)
Channel 1	T	12	12 - 15.5	15	180
	F	15	12 - 15.5	15	180
	G	24	24 - 28.5	7.5	180
Standby output	S	12	Fixed	0.2	2.4
	S1	12	Fixed	0.2	2.4
	S2	12	Fixed	0.2	2.4
	S3	12	Fixed	0.2	2.4
	S4	12	12 - 13	0.8	10.4
	S5	5	Fixed	0.5	2.5
	S6	5	Fixed	0.5	2.5

Variations and limitations of use:

NVM175 PSUs can output 180W from channel 1 plus 10.4W maximum from the standby output. Component temperatures must be monitored in the end use application as described in the "COOLING FOR UNIT" section.

All ratings apply for ambient temperatures up to 50°C. From 50 to 70°C the total output power and current ratings are both derated at 2.5% per deg C.

Non- Standard model:

X50015# (where # can be any letter except A, B, C, D, E or F):

Factory fitted output loom

Earth connection made via ring tag and screw

X50007# - NVM1D - 1G-f-g-h-j

may be any letter where this indicates any of the options described in the nomenclature table above for f, g, h and j and where g will always be blank (open frame). D indicates that the product is double insulated (no earth connections). This product has 18-way output connector.

Maximum storage temperature 65°C.

For ambient temperature requirements see Conditions of Acceptability and user manual (Enclosure 6-01).

Input Parameters

Parameter	62368-1
Nominal input voltage	100 - 240 Vac
Input voltage range	90 - 264Vac
Input frequency range	45 - 63Hz
Maximum input current	3A rms

Environmental Specifications:

Description	Operation	Storage & Transportation
Use	Indoor	-
Temperature	0°C - +70°C (See O/P tables for deratings)	-40°C - +85°C
Humidity	5 - 95% RH, non-condensing	5 - 95% RH, non-condensing
Altitude	-200m - 5000m	-200m - 5000m
Pressure	63kPa - 106kPa	54kPa - 106kPa

Orientation The unit may be mounted on either side, vertical with input lowest and horizontal. (Customer Air versions can be mounted in any orientation).

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

Cooling for units:

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 in question. 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.

Cooling for unit temperature table:

Circuit Ref.	Description	Max. Temperature (°C)
L3, L7	Common mode choke winding	115 (155)
C1, C4	X capacitors	100
C6	Capacitor	105
C12	Resonant capacitor	105
T3	Aux trx windings	130
L2	Boost choke winding	120 (155)
C7	Electrolytic capacitor	70 (105)
T1, T2	Transformer winding	130
L1	Primary choke (24V channel 1 only)	140
XU3, XU4, XU106	Opto-couplers on control board	100
U1, U2	Opto-couplers on base board	100
L5	Channel 1 output choke	125 (140)
L4	Standby output choke	85
J2	Input connector	105
J1	Output connector	105
Various	All other electrolytic capacitors	90 (105)

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

Technical Considerations

- 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). Model X50001x, 60°C (full load); 65°C (power and, output current decreasing linearly by 2.5%/°C above 60°C) NVM1D max temp 65°C.
- The product is intended for use on the following power systems : TN, IT (Norway only)
- 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 : provided by 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 including French for Canada
- The product was investigated to the following additional standards : EN 62368-1:2014 + A11:2017
- 1.3 The means of connection to the mains supply is: To be determined in the end-use product

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 (except NVM1D model)
- The end-product Electric Strength Test is to be based upon a maximum working voltage of : Primary-Secondary: 410 Vrms, 697 Vpk, Primary-Earthed Dead Metal: 398 Vrms, 662 Vpk
- The following output circuits are at ES1 energy levels : All
- The following output circuits are at PS3 energy levels : All
- 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 (except for NVM1D model)
- An investigation of the protective bonding terminals has : been conducted
- The following end-product enclosures are required : Electrical, Fire, Mechanical
- 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 T1, T2 and T3 (Class F) - See table 4.1.2 for details of insulation systems used
- The following components require special consideration during end-product Thermal (Heating) tests due to the indicated maximum temperature measurements during component-level testing : Refer to enclosure Manuals ID 6-01 Cooling for units table.
- The power supply was evaluated to be used at altitudes up to : "5,000 m"
- 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 power supply terminals and/or connectors are: Suitable for factory wiring only