

## UL TEST REPORT AND PROCEDURE

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|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Standard:</b>                   | UL 60950-1, 2nd Edition, 2007-03-27 (Information Technology Equipment - Safety - Part 1: General Requirements)<br>CSA C22.2 No. 60950-1-07, 2nd Edition, 2007-03 (Information Technology Equipment - Safety - Part 1: General Requirements)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Certification Type:</b>         | Component Recognition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>CCN:</b>                        | QQGQ2, QQGQ8 (Power Supplies for Information Technology Equipment Including Electrical Business Equipment)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Complementary CCN:</b>          | QQHM2, QQHM8 (Power Supplies, Medical and Dental)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Product:</b>                    | Switch mode power supply                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Model:</b>                      | NVM175 series<br>or<br>NVMx-abcde-f-g-h-i-jkl (may be prefixed by NS - # / where # may be up to any four letters)<br><br>Unit Configuration Code where:<br>x = 1 for 175<br>a = Number of Outputs : 1 .<br>b = Channel 1 Output Voltage where: T is for 12V, F is for 15V and G is for 24V<br>c,d,e = O (for omit) - non-safety related options.<br>f = Standby supply: 12Vdc (S,S1,S2,S3,C4 versions) 5Vdc (S5, S6)<br>g = U for U chassis, C for U chassis with cover, K for custom chassis with cover and IEC inlet or blank for Open Frame.<br>h = Blank is the standard upright output connector, R is for the right angle output connector.<br>i = Blank for standard leakage, L for low leakage.<br>jkl = 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 or blank for standard output setting.<br><br>Non standard models: X50001#, X50005# and X50007# (# can be any letter not affecting safety)<br><br>X50007# - NVM1D - double insulated model.<br><br>100-240Vac nom, 45-440Hz, 3A rms max.<br><br>(See Model Differences) |
| <b>Rating:</b>                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Applicant Name and Address:</b> | TDK-LAMBDA UK LTD<br>KINGSLEY AVE<br>ILFRACOMBE<br>DEVON<br>EX34 8ES UNITED KINGDOM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

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Page 2 of 15

Report Reference #

E135494-A59-UL

This is to certify that representative samples of the products covered by this Test Report have been investigated in accordance with the above referenced Standards. The products have been found to comply with the requirements covering the category and the products are judged to be eligible for Follow-Up Service under the indicated Test Procedure. The manufacturer is authorized to use the UL Mark on such products which comply with this Test Report and any other applicable requirements of UL LLC ('UL') in accordance with the Follow-Up Service Agreement. Only those products which properly bear the UL Mark are considered as being covered by UL's Follow-Up Service under the indicated Test Procedure.

The applicant is authorized to reproduce the referenced Test Report provided it is reproduced in its entirety.

UL authorizes the applicant to reproduce the latest pages of the referenced Test Report consisting of the first page of the Specific Technical Criteria through to the end of the Conditions of Acceptability.

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL.

Prepared by: Chiang Shiau Hui

Reviewed by: Dennis Butcher

### Supporting Documentation

The following documents located at the beginning of this Procedure supplement the requirements of this Test Report:

- A. Authorization - The Authorization page may include additional Factory Identification Code markings.
- B. Generic Inspection Instructions -
  - i. Part AC details important information which may be applicable to products covered by this Procedure. Products described in this Test Report must comply with any applicable items listed unless otherwise stated in the body of this Test Report.
  - ii. Part AE details any requirements which may be applicable to all products covered by this Procedure. Products described in this Test Report must comply with any applicable items listed unless otherwise stated in the body of each Test Report.
  - iii. Part AF details the requirements for the UL Certification Mark which is not controlled by the technical standard used to investigate these products. Products are permitted to bear only the Certification Mark(s) corresponding to the countries for which it is certified, as indicated in each Test Report.

### Product Description

The NVM-175 Series are switched mode power supplies for building into host equipment.  
Both supply lines are fused. Appropriate cooling conditions must be fulfilled by the end-use product.  
Storage temperature is -40 to 85°C (except NVM1D models as stated below)  
No applied parts.  
Marking label attached as Enclosure to this report is representative of all models.

### Model Differences

Unit Configuration Code:

NVMx-abcde-f-g-h-i-jkl (may be prefixed by NS - # / where # may be up to any four letters)

where:

x = 1 for 175

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 :

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.

g = U for U chassis, C for U chassis with cover, K for custom chassis with cover and IEC inlet or blank for Open Frame.

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

i = Blank for standard leakage, L for low leakage.

ijkl = 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 or blank for standard output setting

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:

Non- Standard model: X50001# (# can be any letter), (modified NVM1-1T000-S1-K-R-L)

| Output Channel | Voltage Designation | Vout Nom. | Adjustment Range (V) | Output Current (A) | Maximum Power(W) |
|----------------|---------------------|-----------|----------------------|--------------------|------------------|
| Channel 1      | T                   | 12        | 12 - 15.5            | 15                 | 180              |
| Standby output | S1                  | 12        | Fixed                | 0.2                | 2.4              |

Additional Variations and limitations of use for Non- Standard model X50001#:

Ratings apply for ambient temperatures up to 60°C. From 60 to 65°C the total output power and current ratings are both derated at 2.5% per deg C.

Component temperatures must be monitored in the end use application as described in the "COOLING FOR UNIT" section.

X50005# - (# can be any letter), (modified NVM1-1T model) with 5V 0.5A standby option.

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).

## Technical Considerations

- Equipment mobility : for building-in
- Connection to the mains : Connection to mains to be determined in end use.
- 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 (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) : Less than 1 kg
- The product was submitted and evaluated for use at the maximum ambient temperature (T<sub>ma</sub>) 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 means of connection to the mains supply is: To be determined in the end-use product
- The product is intended for use on the following power systems: IT (Norway only), TN
- 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+ A11:2009

(which includes all European national differences, including those specified in this test report).

- 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
- Maximum altitude of operation is 5000m for all models. The requirements of IEC60664-1 table A.2 were applied for calculating the required clearances.

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

For use only in or with complete equipment where the acceptability of the combination is determined by UL LLC. When installed in an end-product, consideration must be given to the following:

- The following Production-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-SELV: 410 Vrms, 697 Vpk, Primary-Earthed Dead Metal: 398 Vrms, 662 Vpk
- The following secondary output circuits are SELV: All
- The following secondary output circuits are at non-hazardous energy levels: All
- 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
- 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 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 1.5.1 for details of insulation systems used

- The following end-product enclosures are required: Mechanical, Fire, Electrical
- 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.

**Additional Information**

N/A

**Additional Standards**

The product fulfills the requirements of: CSA C22.2 No. 60950-23-07, EN 60950-1:2006 + A11:2009, UL 60950-1 2nd Ed. Revised 2007-03-27

**Markings and instructions**

| Clause Title                                  | Marking or Instruction Details                                                                                                 |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Power rating - Company identification         | Listee's or Recognized company's name, Trade Name, Trademark or File Number                                                    |
| Power rating - Model                          | Model Number                                                                                                                   |
| Power rating - Ratings                        | Ratings (voltage, frequency/dc, current)                                                                                       |
| Fuses - Non-operator access/soldered-in fuses | Unambiguous reference to service documentation for instructions for replacement of fuses replaceable only by service personnel |
| Warning to service personnel                  | "CAUTION: Double pole/neutral fusing"                                                                                          |

**Special Instructions to UL Representative**

N/A

**Production-Line Testing Requirements**

**Electric Strength Test Special Constructions - Refer to Generic Inspection Instructions, Part AC for further information.**

| Model | Component | Removable<br>Parts | Test probe location | V<br>rms | V dc | Test Time,<br>s |
|-------|-----------|--------------------|---------------------|----------|------|-----------------|
| N/A   |           |                    |                     |          |      |                 |

**Earthing Continuity Test Exemptions - This test is not required for the following models:**

**Electric Strength Test Exemptions - This test is not required for the following models:**

**Electric Strength Test Component Exemptions - The following solid-state components may be disconnected from the remainder of the circuitry during the performance of this test:**

**Sample and Test Specifics for Follow-Up Tests at UL**

| Model | Component | Material | Test | Sample(s) | Test<br>Specifics |
|-------|-----------|----------|------|-----------|-------------------|
| N/A   |           |          |      |           |                   |