Underwriters Laboratories (UL LLC)
Safety Certification Report

Model:	NV350 or NV3 or NV-350 (these models are identical). (May be prefixed by NS - # / or - where # may be any characters indicating non safety related model differences) Units may be additionally marked with a product code: K3x or Q3x where x may be any number of characters.
Device Description:	Switch Mode Power Supply
Applicant:	TDK-LAMBDA UK LTD KINGSLEY AVE ILFRACOMBE DEVON DEVON, EX34 8ES UNITED KINGDOM
Manufacturer:	Same as Applicant
Manufacturing Facility(ies):	Same as Applicant PANYU TRIO MICROTRONIC CO LTD SHIJI INDUSTRIAL ESTATE DONGYONG NANSHA GUANGZHOU GUANGDONG, 511453 CHINA
Report No.:	E331788-D1009-1/A0/C0-UL
Report (Re)Issue Date:	2021-11-16
Base Standard(s):	UL 61010-1, 3rd Edition, May 11, 2012, Revised July 19, 2019, CAN/CSA-C22.2 No. 61010-1(2012-05), 3rd Edition, with revisions through 2018-11
Additional Standards:	-
Report Types:	This report consists of the following report types: [Yes] US Certification (UL Recognition) [Yes] CAN Certification (cUL Recognition)

This report covers the Safety evaluation of the referenced model(s) according to the standard(s) specified above.

Table of Contents

Report Modifications Summary

The following changes were made to this report. If none listed in the below table, this report is the originally issued report.

The following scheme is used throughout this report to reflect the **Report No.**:

(File No.) – (Report Ref. No.) – (x) / A(y) / C(z) – YYY, where:
(x) = Report (Re)Issue No.
(y) = Amendment No.
(z) = Correction No.
YYY = Report Type (UL/CB/IEC)

Date Modified *(Year-Month-Day)*	Modifications Made (include Report Reference Number)	Modified By
2021-11-16	This report is a reissue of CBTR Ref. No. E331788-A17-CB-1, CB Test Certificate Ref. No. DK-33998-UL and E331788-A17-CB-1-Amendment-1, CB Test Certificate Ref. No. DK-33998-A1-UL. and CBTR Ref. No. E331788-A17-CB-1-Amendment-2, CB Test Certificate Ref. No.DK-33998-A2-UL. The original report was modified to include the following changes: - The standard has been ugraded to the latest revision date. - Standards were updated on critical omponent list - Components licenses were attached to the report - Capacitor Murata SA series and RA series with the same electrical ratings has been added as alternate to critical component list. No testing was considered necessary to make these changes. Based on the previously conducted testing and the review of product technical documentation including photos, schematics, wiring diagrams and similar, has been determined that the product continues to comply with the standard.	Marcin Zurek

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

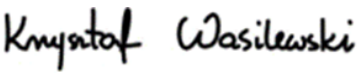
Report Reference No. ..... :	E331788-D1009-1/A0/C0-UL
Date of issue ..... :	2021-11-16
Total number of pages ..... :	193
Testing Laboratory ..... :	UL International (UK) Ltd.
Address ..... :	Unit-1 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Applicant's name ..... :	TDK-LAMBDA UK LTD
Address ..... :	KINGSLEY AVE ILFRACOMBE DEVON DEVON, EX34 8ES UNITED KINGDOM
Test specification:	
Standard ..... :	IEC 61010-1:2010, IEC 61010-1:2010/AMD1:2016
Test procedure ..... :	UL Certification
Non-standard test method…….:	N/A
Test Report Form No..... :	IEC61010_1P

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 UL testing laboratory. The authenticity of this Test Report and its contents can be verified by contacting UL.

Test item description:	Switch Mode Power Supply
Trade Mark:	TDK-Lambda
Manufacturer:	Same as Applicant
Model/Type reference:	NV350 or NV3 or NV-350 (these models are identical). (May be prefixed by NS - # / or - where # may be any characters indicating non safety related model differences) Units may be additionally marked with a product code: K3x or Q3x where x may be any number of characters.
Ratings:	100-240Vac nominal, (85-264Vac including tolerances). 47-440Hz, 5.5A rms Max.

Testing procedure and testing location:		
[X] UL/DAP Testing Laboratory:		
Testing location/ address:	UL International (UK) Ltd. Unit-1 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom	
Tested by (name, function, signature):	Marcin Zurek, Handler	
Approved by (name, function, signature):	Krzysztof Wasilewski, reviewer	
[ ] Testing procedure: WMT:		
Testing location/ address:		
Tested by (name, function, signature):		
Approved by (name, function, signature):		

List of Attachments (including a total number of pages in each attachment): Refer to Appendix A of this report. All attachments are included within this report.
Summary of testing
Tests performed (name of test and test clause): Testing location: *Refer to the Test List in Appendix D of this report if testing was performed as part of this evaluation.*

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 owners of these marks.

Refer to the enclosure(s) titled Marking Label in the Enclosures section in Appendix A of this report for a copy.

Test item particulars :	
Type of item:	Laboratory
Description of equipment function:	Switch Mode Power Supply for building in.
Connection 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 equipment (W x D x H)	280 x 95 x 41mm Max.
Mass of equipment (kg):	2kg Max.
Marked degree of protection to IEC 60529:	N/A
Testing	
Date of receipt of test item(s) .....:	2013-06-25, 2014-05-19 to 2014-10-07
Dates tests performed .....:	2013-07-05 to 2013-07-08, 2014-05-20 to 2014-10-07
Possible test case verdicts:	
- test case does not apply to the test object .....:	N/A
- test object does meet the requirement.....:	Pass (P)
- test object was not evaluated for the requirement ..... :	N/E
- test object does not meet the requirement.....:	Fail (F)
Abbreviations used in the report:	
- normal condition: N.C.	- single fault condition: S.F.C.

General remarks:

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 NCB. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.

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

GENERAL PRODUCT INFORMATION:

Report Summary

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

Refer to the Report Modifications for any modifications made to this report.

Product Description

NV350 series. Switch mode power supplies for building into end equipment.

Model Differences

Unit Configuration Code:

a) Series NV350 or NV3 or NV-350 (these models are identical)
(May be prefixed by NS - # / where # may be any characters indicating non safety related model differences)
Products may additionally be marked with K3x or Q3x where x can be any characters indicating non-safety related model differences.
b) Followed by: S, R, Q, P, V, C, T, U or K. Where:

S = Forward airflow, standard fan
R = Reverse airflow, standard fan
Q = Forward airflow, quiet fan
P = Reverse airflow, quiet fan
V = Forward airflow, temperature controlled fan
C = Customer air, fan not fitted
T = Forward airflow, top fan
U = Customer air, fan not fitted, cover not fitted
L = Fixed speed fan (Non standards only)
K = Custom fan/chassis assembly (non -standard model X00004# (IEC/EN/UL/cUL 60950-1 approval only)

c) Followed by: S, I or J. Where:

S = Screw input terminals
I = IEC input
J = IEC input. Dual fused

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 5-5.5V
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.

NV350 Modules:

Up to 3 of the following modules types may be fitted:

@B
or @BH
or @C
or @CM

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

or @/#DB (/ maybe replaced with a _)

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 (/ maybe replaced with a _)

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

Where 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 @BHDB (/ maybe replaced with a _)

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 (as standard models unless specified otherwise):

Model: NV350 SJS 24B 24/24DB 12/12DB (K30012)
Maximum outputs: 24V, 8A; 24V, 7A; 24V, 2A; 12V, 13A; 12V, 5A (total power 350W max.)
Maximum ambient: 50°C
Orientations: Horizontal with chassis lowest, on either side or vertical with the airflow upwards.
Comments: PSU is fitted with dual fused IEC inlet and double pole mains switch (option J).

Model: NV350 SJS 24B 24/24DB 24/12DB (K30036)
Maximum outputs: 24V, 8A; 24V, 7A; 24V, 2A; 24V, 7A; 12V, 5A (total power 350W max.)
Maximum ambient: 50°C
Orientations: Horizontal with chassis lowest, on either side or vertical with the airflow upwards.

Comments: PSU is fitted with dual fused IEC inlet and double pole mains switch (option J).

Model: NV350 LSS 24/24DB 15.5/5.5DB (K30045A)
Maximum outputs: 24V, 1A; 24V, 0.7A; 15.5V, 6.4A; 5.5V, 6.4A. (total power 175W max.)
Maximum ambient: 50°C
Orientations: Horizontal with chassis lowest, on either side.
Comments: PSU has fan drive voltage fixed at 5.5V.

Model: NV350 LSS 24/24DB (K30045B)
Maximum outputs: 24V, 7A; 24V, 0.7A. (total power 184.8W max.)
Maximum ambient: 50°C
Orientations: Horizontal with chassis lowest, on either side.
Comments: PSU has fan drive voltage fixed at 5.5V.

Model: NV350 TSS 24/15DB 5/15DB (K30052x where x can be any number of characters indicating non safety related differences)
Maximum outputs: 350W max.
Comments: PSU has top fan fitted.
Compliant with EN/IEC/UL/cUL 60950-1 only.

Model: NV350 KISES5V 12/12DB 5B (X00004# where # can be any number of characters indicating non safety related differences)
Maximum outputs: 350W max.
Comments: PSU has top fan, at an angle fitted. Output cables of 12 to 24AWG, Max. 50cm long are supplied with this model.
Compliant with EN/IEC/UL/cUL 60950-1 only.

NV350FEP models as described below:

Unit Configuration Code:

a) NV350FEP or NF3 or NF3-350FEP (these models are identical)

followed by: S, R, C, T or U. Where:

S = Forward airflow, standard fan
R = Reverse airflow, standard fan
C = Customer air, fan not fitted
U = Customer air, fan not fitted, cover not fitted
T = Top fan, forward airflow

followed by: S, I or J. Where:

S = Screw input terminals
I = IEC input
J = IEC input. Dual fused

followed by: S. Where:

S = Standard Leakage (Class B Filter)

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.

optionally followed by: ES#V or IS#V. Where:

ES5V = AC good, PSU enable, 5-5.5V, 2A standby output
ES12V = AC good, PSU enable, 12-13.5V, 1A standby output
IS5V = AC good, PSU inhibit, 5-5.5V, 2A standby output

IS12V = AC good, PSU inhibit, 12-13.5V, 1A standby output

where # represents the standby output voltage.

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.

NV350 FEP Module:

One of the following modules is fitted:

@FE

where @ is the output voltage of the module and is within the range given in the FE module table on the following page

NF350 and NV350 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 signalling purposes, indicator lamps or LEDs.

Input Parameters

All models:

Nominal input voltage (V)	100 - 240
Input voltage range (V)	85 - 264
Input frequency range (Hz)	47 - 440
Maximum input current (A)	5.5
Inrush Current (A)	<15

For input voltages between 85 and 89.9V the output power is derated to 94% of the values given for 90V input

NV350PFC model:

Main Output: Voltage	355-395
Main Output: Power	350W
Auxiliary Output: Voltage	12V nominal
Auxiliary Output: Current	0.25A
Maximum Ambient	65°C ‡
Derating above 50°C	2.5% per °C †

† The main output power and the auxiliary output current are derated by the given value.
‡ Refer to Customer Air Cooling section for details.

NV350 & NF350 models:

Code	Cooling Option	Range (Vac)	Power (W)	Ambient (°C)	Derating
S,V,T	Forward airflow standard fan	90 - 264	‡ 350W continuous (400W peak if	65 above 50°C	2.5% per °C

	fixed speed & Temp. controlled	350W average #)		
S,V	Forward airflow standard fan fixed speed & Temp. controlled	115 - 264	450W continuous (510W peak if 450W average #)	65 above 50°C	2.5% per °C
S,V,T	Forward airflow standard fan fixed speed & Temp. controlled	180 - 264	664W continuous (740W peak if 600W average #)	65 above 50°C	2.5% per °C
R	Reverse airflow standard fan	90-264 ‡	250W continuous (no peak rating)	65 above 50°C	2.5% per °C
Q	Forward airflow Quiet fan	90-264 ‡	350W continuous (no peak rating)	65 above 50°C	2.5% per °C
P	Reverse airflow quiet fan	90-264 ‡	250W continuous (no peak rating)	60 above 50°C	3.8% per °C
C, U	Customer air fan not fitted	Refer to Customer Air Cooling section for details			

† Both the total output power and the module output currents are derated by the given value.
‡ For input voltages between 85 and 89.9V the output power is derated to 94% of the values given for 90V input.
# 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.
Continuous, peak and average power ratings may be linearly interpolated for input voltages between 90 and 180V.
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, but they are subject to the current deratings for operation above 50°C.
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.
5V global options used in NV350FEP PSUs are derated to 1.8A max. when the PSUs is inhibited.
For reverse airflow cooling all B, BH and DB modules are limited to a maximum output power of 150W (total for both channels on dual output modules).
Permitted orientations: Horizontal with chassis lowest, on either side or vertical with the airflow upwards.

Output Parameters

Single Output Modules:

Module	Nom. Voltage (V)	Voltage Range (V) #	Max. Current
B	3.3	3.135 - 3.6	40A
	5	4.75 - 5.5	4.75-5.2V: 40A 5.2-5.5V: 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	12-13.5V: 16A 13.5-15.5V: Linearly derate from 16 to 13A
	24	24 - 28	24-26V: 8A 26-28V: Linearly derate from 8 to 7A
BH	12	12 - 15.5	12-13.2V: 20A 13.2-15.5V: Linearly derate from 20 to 16.5A
	24	24 - 28	24-25.7V: 10A 25.7-28V: Linearly derate from 10 to 8.5A

C&CM †	12	12 - 13.2	12V:33.34A. Derated to 400W above 12V
	16	15 - 17.6	15V:26.67A. Derated to 400W above 15V
	24	24 - 26.4	24V:16.67A. Derated to 400W above 24V
	30	27 - 32	27V:14.82A. Derated to 400W above 27V

† C & CM modules may output up to 600W for up to 10 seconds providing that the converter ratings are not exceeded and the average power from the module does not exceed the following: 400W for 115 - 264Vac input or 350W for 90Vac input (average power may be linearly interpolated between 90 and 115Vac input).

Dual Output Modules:

Dual Output Modules, Output 1

Module	Nom. Voltage (V)	Voltage Range (V) #	Max. Current
DA	12	12.25	3A (forward air), 2A (reverse air)
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

‡ DB modules with 6V nominal, Output 1

Cooling options C, S & V	O/P 1 : 5.5 - 6V	O/P 1 + O/P 2 : 195W total.
	O/P 1 : 6 - 6.5V	O/P 1 + O/P 2 : Linearly derate from 195 to 170W total.
Cooling option Q	O/P 1 : 5.5 - 6V	O/P 1 + O/P 2 : 180W total.
	O/P 1 : 6 - 6.5V	O/P 1 + O/P 2 : Linearly derate from 180 to 140W total.
Cooling options P & R	O/P 1 : 5.5 - 6.5V	O/P 1 + O/P 2 : 120W total.

‡ DB modules with 6V nominal channel 1:
# Voltage measured at the module power terminals. This voltage must not be exceeded when remote sense is used.

Dual Output Modules, Output 2

Module	Nom. Voltage (V)	Voltage Range (V)	Max. Current (A)	Max. Power (W)
DA	-12	(-)11.9- (-)12	1.0 (forward air) 0.6 (reverse air)	12 (forward air), 7.2 (reverse air)
DB	5	3.3 - 5.5#	10	55*
	12	7 - 15.5	5	60
	24	24 - 32	2	50

* DB module output 2: Voltage range may be extended up to 6.0V (60W max.) for some PSU configurations. Consult factory for details.
# Voltage measured at the module power terminals. This voltage at the power terminals must not be exceeded when remote sense is used.

NV350FEP Module:

FE Module, Output 1

Nom. Voltage (V)	Voltage Range (V) #	Output Ratings
12	11.5 - 15.5	For 50°C max. ambient operation ‡: 11.5 - 12.5V: 350W total power † 12.5 - 13.7V: Linearly derate total power from 350 to 275W For 45°C max. ambient operation ¶: 13.71 - 15.5V: 210W total average power with 300W peak for up to 5% of time (1 sec max.) For 350W total output power (O/P 1 + O/P 2) †: 11.5 - 12.5V: 50°C max. ambient 12.5 - 13.7V: Linearly derate max. ambient from 50 to 42°C

FE Module, Output 2

Nom. Voltage (V)	Voltage Range (V)	Max. Current (A)	Max. Power (W)
-12	Fixed -12.1V	2	24.2

Voltage measured at the module power terminals. This voltage must not be exceeded when remote sense is used.
† Channel 1 current must not exceed 30A. Total power includes channel 2 and excludes global options.
‡ For ambient operation from 50 to 65°C apply an additional linear derating of 2.5% per °C.
¶ For ambient operation from 45 to 65°C apply an additional linear derating of 2.5% per °C.

SELV and Outputs Connected In Series:

All individual outputs are SELV. Outputs connected in series are non-SELV if the total output voltage + 1.3 times 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 exceed 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.

Customer Air Cooling:

The following method must be used for determining the safe operation of PSUs when C or U option (Customer Air) is fitted, i.e. fan not fitted to PSU, and for the NV350PFC assembly. 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 must 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 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/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 should 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 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.

Circuit Ref.	Description	Max. Temperature (°C)
L2, L3, L4	Filter/PFC assy: Choke winding	155
C3, C4	Filter/PFC assy: X capacitors	100
L1	Filter/PFC assy: Boost choke winding	130
C1	Filter/PFC assy: Electrolytic capacitor	60 (105)
T1	Filter/PFC assy: Fly back transformer winding	130
RLY1	Filter/PFC assy: Relay	100
TX1, TX2	Modules: Power transformer windings	130
L1, XL1	B, BH & DB module chokes	130
L1	C & CM module chokes	140

Global option T2	Global Options: Transformer winding	90 (130)
Various	All other choke & transformer windings	110
Various	All <=10mm diameter electrolytic capacitors	80 (105)
Various	All 12.5mm diameter electrolytic capacitors	85 (105)
TX1	DA Module: Fly back transformer windings	100 (130)

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

Additional Information

This report is a reissue of CBTR Ref. No. E331788-A17-CB-1, CB Test Certificate Ref. No. DK-33998-UL and E331788-A17-CB-1-Amendment-1, CB Test Certificate Ref. No. DK-33998-A1-UL. and CBTR Ref. No. E331788-A17-CB-1-Amendment-2, CB Test Certificate Ref. No.DK-33998-A2-UL. The original report was modified to include the following changes:
- The standard has been ugraded to the latest revision date.
- Standards were updated on critical omponent list
- Components licenses were attached to the report
- Capacitor Murata SA series and RA series with the same electrical ratings has been added as alternate to critical component list.

No testing was considered necessary to make these changes. Based on the previously conducted testing and the review of product technical documentation including photos, schematics, wiring diagrams and similar, has been determined that the product continues to comply with the standard.

Technical Considerations

- The product was investigated to the following standards:

  Main Standard(s):

  UL 61010-1, 3rd Edition, May 11, 2012, Revised July 19, 2019, CAN/CSA-C22.2 No. 61010-1(2012-05), 3rd Edition, with revisions through 2018-11

  From Country Differences:

  - USA: UL 61010-1, 3rd Edition, May 11, 2012, Revised July 19, 2019
  - Canada: CAN/CSA-C22.2 No. 61010-1(2012-05), 3rd Edition, with revisions through 2018-11
  - EU Group: EN 61010-1:2010/A1:2019 (Edition 3.1)

  Additional Standards:

  -

- The following additional investigations were conducted: -
- The product was not investigated to the following standards or clauses: -
- The following accessories were investigated for use with the product: -
- 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. From 50°C to 65°C the total output power and the module current ratings are both derated at 2.5% per °C.

  Multilayer PWB's accepted under CBTR Ref. No.: E349607-A23 dated 2014-07-31 and letter report, Enclosure Multi-layer PWB Letter Reports of this report.

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 Edition, May 11, 2012, Revised July 19, 2019, CAN/CSA-C22.2 No. 61010-1(2012-05), 3rd Edition, with revisions through 2018-11, IEC 61010-1:2010/AMD1:2016/COR1:2019, EN 61010-1:2010/A1:2019 (Edition 3.1)
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: 622Vpeak, 343Vrms.
Primary to secondary: 650Vpeak, 363Vrms.
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 forDouble and Reinforced insulation
The following tests shall be performed in the end-product evaluationTemperature 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.